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A literature-based innovation output indicator

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Abstract

This paper presents an application of a recently developed method for measuring innovative activity in a national economy based on new product announcements in trade and technical journals. The 'literature-based innovation output indicator' is not meant to capture all aspects of innovation, or to substitute for other indicators, but is seen as a useful addition to the range of indicators available. The method is described in detail, and then applied to the UK. A sample of 941 innovations is constructed, and then subjected to analysis. The results suggest that the method is a useful and relatively reliable way of measuring the degree of 'radicalness' of innovations being generated, and of surveying their distribution across sectors, across firm size, and across firms which are UK-owned or foreign-owned. The method captures product innovations well, but captures process innovations less well. The results for the UK suggest that the more radical innovations come disproportionate from companies based outside the UK. Innovations originating inside the UK are skewed towards product differentiation. There is also some evidence that smaller companies produce a slightly higher than average share of the more radical innovations. The paper suggests that this small-scale testing of this indicator has produced promising results, and that there would be benefits to the policy community from establishing it on a permanent basis.

1. Introduction

In recent years there has been increasing interest in the measurement of innovative activity, using various methods, principally R&D expenditure and patents. These methods, in the main, have focused on inputs to, or partial outputs from, the innovation process. More recently there have been attempts to develop more direct output indicators of various kinds, one of which is based on product announcements in trade, engineering and technical literature. The method has been developed principally in the US (Edwards and Gordon, 1984), and in the Netherlands (Kleinknecht, 1991). This paper reports research which has developed and applied this method in the UK.

After a brief description of the general problem of 'measuring innovation', the paper presents a description of the methodology for a literature-based innovation output indicator (LBIO), and its use in several other studies. The paper then reports a study using this method in which data was collected on 941 innovation announcements in the UK trade literature, including additional information regarding the firm from which the innovation originated. The objective of the paper is twofold. First, it seeks to ascertain

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whether the LBIO can be practically applied in the UK, and whether it generates results which look broadly consistent with other evidence concerning innovative activity in the UK. Second, the data generated are used to make some modest claims concerning the patterns of innovation in the UK, focusing in particular on the relationships between the radicalness of innovations and their 'national' origin. Finally, the paper discusses the possible role of a literature-based innovation indicator in policy formulation.

2. The innovation measurement problem

2.1. The measurement problem outlined

Interest in innovation stems from the fact that the level of technology, and the rate at which it is renewed, is an important dimension of the economic activity within a country. Thus, it is useful to have some agreed measure of both the level and the renewal rate of technology, both for policy reasons and to enable firms to have some additional information on innovation activities. Yet, despite all the attention paid to the innovation process by policy-makers and academics it is still an imperfectly understood process.

The main features of the measurement problem are familiar. Firstly, R&D expenditure input measurements do not show the efficiency of the process by which inputs are transformed into outputs, or into innovative products. Second, they do not show the economic or the qualitative significance of the innovations produced. Third, there is no indication of the level of technological complexity in the resultant products. Finally, despite the recent SSAP 13 Accounting Standard disclosure for R&D, comparisons between firms and countries are still fraught with difficulty. Thus, financial information may be useful for comparing expenditure levels, but it still leaves the innovation *process* imperfectly understood.

Alongside R&D expenditures, extensive use has been made of patents as a 'raw' material for indicators. Patents have been commonly used as indicators of *technological* activity (Archibugi, 1992), but the major problem with them is that they indicate inventive, rather than innovative, activity. To overcome this, Narin and Olivastra have developed a method of using *patent citation* as an improved measure of technological performance (Narin and Olivastra, 1988). They believe that highly cited patents are of more than average technological import, and that citations suggest linkages between companies, between technological areas, and between technology and science.

Though using patent citation is an imaginative and interesting way of measuring the technological performance of a company, it is still open to the same objections as patent analysis itself. Patenting is a discretionary activity, and varies sharply across firms and industries. Many technological advances are not patentable, and firms have other methods of protecting their technological advantage. Similar strictures apply to the use of bibliometric analysis as an innovative output indicator. In the cases of both patent data analysis and bibliometrics the indicator is limited to one part of the innovative process. These are not, and cannot be, a direct measure of the commercialisation of innovations, for they focus on an intermediate part of the innovation process. Thus, there is a need to consider an approach to innovation output measurement that focuses upon the end of the innovation process, where the innovations are marketed commercially. Such output measures would aid researchers and policy-makers as they seek to improve the efficiency of technological and economic development, and the commercialisation of innovative activity.

The major development in output measurements in recent years has been the direct innovation survey, e.g. the recent Community Innovation Survey (CIS). This involves questionnaires being sent to firms to ascertain details of specific new or modified products introduced during a particular period, their technical features, and their economic significance. Such approaches were pioneered by the Fraunhofer Institute for Economic Research (IFO) in Germany (see Kleinknecht and Bain, 1993, pp. 4ff.), and have now been institutionalised by the European Union as the CIS organised by EUROSTAT. Survey methods have great potential as another 'weapon' in the measurement battle. However, like all indicators they do suffer from their own unique problems, chief of which is the burden they place on responding firms

to provide the data (see Hansen, 1985, and Chesnais, 1992, for discussion of these issues).

2.2. Literature-based innovation output indicators

Literature-based innovation output indicators (LBIOs) originate in the work of Edwards and Gordon (1984). Later work by Acs and Audretsch (1990, 1993) and Kleinknecht (1991, 1993) has developed and refined the procedures involved. The essence of this approach is as follows.

LBIOs are generated by sampling the 'new product announcement' sections of technical and trade journals. Technical journals are chosen which have editorially controlled sections where new products are reported. This means that the details, though supplied by the companies, are not in the journals by virtue of being a paid advertisement, but by virtue of the decision of the journal editor to include them. They therefore represent a population of innovations which, though not without bias or problems, is at least independent of the judgments of the researcher or the agency constructing the indicator.

If a spread of journals covering most industrial sectors is sampled over a period of time, it is relatively easy, if time-consuming, to generate a substantial database of new or modified products introduced into a national market-place during a particular time period.

The main strengths of this method of innovation data collection are as follows:

1. The announcement times are close to the dates of commercialisation. Thus the indicator is timely.
2. The method does not burden the firms, since the data come from third party sources. This is an advantage with respect to direct surveys.
3. The method may well capture innovations from the changing population of small firms better than almost any other indicator, since these firms are harder to track through patents or surveys. Indeed, it may be that large firms are *under-represented* by this indicator, since they may feel less need to report products in journals.
4. If standard classification systems are used, the method can be applied in different countries and country comparisons made.

However, there are also the following weaknesses with the method:

1. The method does not capture in-house process innovations. Direct innovation surveys and patent data are probably superior indicators for this type of process innovation.
2. There is a danger that the indicator will be distorted by companies that wish to 'inflate' the perceived rate of new product introduction for their own company to gain public relations (PR) or market benefits. The main defence against it probably lies in the use of a significant degree of technical expertise in the process that evaluates and grades announcements. If a company tried to register minute changes in products as if they were new products, and was 'detected' by a well-designed system, it would show up on the indicator as having a lower ratio of radical to total innovations than other companies. This might achieve the opposite PR effect to that sought.
3. There are problems of judgment involved in the selection of relevant journals and in the classification of the innovations.

However, in addition to the above considerations, there are some features of the product announcement method that open up new avenues of innovation research. These include:

- The possibility of utilising the unique product identification gained through the indicator to track market growth, firm's market shares, and product life cycles. This would obviously depend on the collection of additional data direct from the companies. However, since it may be seen as useful to the companies, it may be possible to do this through partnerships between public agencies and trade associations.
- The possibility of tracking the diffusion of particular generic technologies (such as new materials) across different product domains and industry sectors by incorporating qualitative technological data in the details of each product announcement captured in the database.
- The possibility of tracking firm growth rates (in terms of sales, capitalisation, or employees) through the public records of these data, and then

linking then to time series data on product announcements. This would give insight into the relationships between innovation and performance. Again, this would be particularly interesting in the small firm sector, which is difficult to research through patents and innovation surveys.

3. The UK study

3.1. Size of database

The initial target was for a database of around one thousand innovation announcements. This, it was anticipated, would require an analysis of three monthly issues of approximately forty selected journals. By using the most recent issues, it was anticipated that the problem of trying to contact those companies for follow-up questions whose address was out-of-date would be avoided. Only when recent issues of these journals were not readily available in the library were they substituted by earlier editions.

The database took approximately six months to construct. When full information about the innovating company was not available in the journals, other sources were used, e.g. the Kompass computer database. Additional information about the origin of the company was also recorded in the database. Companies whose ownership and location could not be established were discarded from the database due to the lack of resources and time required to search for this information. This reduced the database to 941 product announcements.

3.2. Journal selection

The selection of the most appropriate and relevant trade, engineering, technical and commercial journals is crucial for the development of a literature-based innovation output indicator. Not all journals have a new product announcements section, nor are they the most suitable for the particular industrial sector under consideration. Therefore, a list of all 500 trade journals available in a major technical and business reference library was obtained, and a selection made from these: availability in this library (Manchester, the second biggest in the UK) was taken as an indication of being an important trade journal. Those not produced in the UK, and those not having an editorial 'new product' section were discarded. Those that did have a 'new product' section, but did not provide sufficient information about the innovating company or the products, were similarly discarded. It was then necessary to make choices between the several journals relating to each industrial sector, and to achieve a good coverage of all industrial sectors. These judgments eventually reduced the set of journals to forty: a list of those used is given in the appendix.

3.3. Information collected for the database

Broadly following the Kleinknecht (1993) approach, information was collected from the product announcements and other sources under the following headings:

3.3.1. Product and firm identity

The basic information about the product falls into two areas, first, the identity of the firm that brought the innovation onto the UK market, and second, the product or model name and a short description of the innovation.

3.3.2. The type of innovation

The method used by Kleinknecht (1993) for classifying innovations was as follows:

(a) a totally new or decisively changed product (e.g. a mountain bike),
(b) a modestly improved product (e.g. a more user-friendly laser printer),
(c) a new or improved accessory product or service (e.g. a safer child seat on a bicycle),
(d) a product or service differentiation (e.g. marmalade with a different taste),
(e) a process innovation.

In this case, category (a) was further subdivided as follows:

(a.i) a new or decisively changed product, with a completely new function or functions,
(a.ii) a new or decisively changed product with a different technology, but with the product having the same functionality as before.

This aspect of the construction of the database is the one which most depends upon judgments made by the researchers. The technique used to achieve some consistency was as follows. For each individual sector, the three research team members would *independently* classify a sample of innovations using the categories just described. They then compared their results, and discussed any discrepancies. This process was repeated until a reliable standard was reached.

3.3.3. The 'national' origin of the innovation

It is clearly valuable, for several reasons, to have information about the 'national identity' of the firm developing the innovation, and is greatly complicated by the complex distribution of innovative resources across the geographical structures of international companies. This complex problem was simplified by classifying the origin of the innovation as:

(a) introduced by a domestic (UK) firm,
(b) introduced by a domestic firm in cooperation with a foreign (non-UK) firm, or joint venture,
(c) developed by a foreign firm and introduced by a domestic (UK) sales agent,
(d) introduced by an international or multinational firm.

3.3.4. Industrial sector of innovation

The earlier studies did not have any distribution of innovation by industrial sector. In common with other researchers, i.e. Santarelli and Piergiovanni (1994), it was recognised that this was a weakness. Information of this nature would enable the propensity of some sectors to innovate to be compared with other sectors. It would also enable policy-makers to identify, or confirm, national technological and innovative strengths and weaknesses. In view of the possibility of developing a literature-based innovation output indicator on a European Community wide basis, the classification system chosen was the 1992 Standard Industrial Classification (SIC) as modified by the European NACE system.

3.3.5. Firm size

A question that is hotly debated in innovation theory is the relationship between the size of the innovating firm and its propensity to innovate. Including some indication of the size of the firm in the database entry enables comparisons to be made between size of firm and complexity, type, and origin of the innovation. The measure of firm size used was the number of employees. This information was only available with 500 of the 941 product announcements in the database.

4. The data

This section discusses the primary analysis of the 941 innovation announcements under the following headings: type of innovation (Section 4.1); origin of the innovation (Section 4.2); sector of the innovation (Section 4.3).

4.1. Type of innovation

Table 1 shows the distribution of innovations by type. Nearly half the innovations were only slight improvements, with product differentiation being the next highest category. New or novel products make up nearly 7.5% of the database. This is significantly larger than the analogous figure for similar surveys in the other countries. While 'decisively new' products are still around 2%, which is comparable with previous surveys, the combined increase in the 'new'

Table 1
Type of innovation

Type	New [a]	Novel [b]	Improved	Accessory	Differentiation	Process
Number	19	51	470	137	247	16
%	2.02	5.42	50.00	14.56	26.27	1.7

[a] 'New' is a new or decisively changed innovation, with a completely new function.
[b] 'Novel' is a new or decisively changed product with a different technology, but with the product performing the same function as previously.

Table 2
Origin of innovations

Origin	Domestic	Joint venture	Foreign	International
Number [a]	426	17	178	319
Percent [a]	45.3%	1.9%	18.9%	33.9%
Number [b]	476	17	178	269
Percent [b]	50.7%	1.9%	18.9%	28.6%

[a] International = UK and non-UK.
[b] Domestic includes UK-owned internationals.

and 'novel' categories suggests the introduction of these two separate categories for new products has resulted in a higher perceived proportion of 'radical' innovations. The low showing of process innovations is obviously due to firms not publicising such innovations.

4.2. Origin of the innovation

Table 2 shows that nearly half the innovations are made by UK firms operating in their own domestic market, with the next largest category being international firms that operate in a global market and may or may not be UK-owned. Joint ventures and foreign firms use licensing and sales agreements as forms of product innovation. All this implies that most new products are marketed by the innovating firm themselves.

Two alternative interpretations are shown: one in which all international firms are grouped together and one in which 'UK-owned internationals' are grouped with the UK domestic firms. (There were 319 international firms in the database. It is obviously difficult to assign a 'dominant nationality' to all international firms. However, this was attempted, and the countries with the largest proportions are shown in Table 3. The 'UK international firms' are obviously candidates for inclusion in the 'domestic categories, although we have no way of telling whether the innovations were influenced by inputs from the firm's non-UK activities. Similarly, we cannot exclude the possibility that innovations from

Table 3
Innovation by country

Country	%
France	2.2
Sweden	3.4
Switzerland	4.7
Netherlands	5.9
Japan	10.3
Germany	16.6
UK	15.9
USA	32.6
Other countries	8.4

Table 4
Industrial sector and number of innovations

	Industrial sector	No. of Innovations
1	Food and beverages	92
2	Textiles	2
3	Clothing and footwear	6
4	Wood processing	9
5	Paper products and publishing	4
6	Chemicals and chemical products	73
7	Plastics and rubber	15
8	Glass, brick and concrete products	14
9	Iron and metal products	31
10	Manufacture of machinery	186
11	Weapons	1
12	Domestic and office equipment	77
13	Electrical and lighting equipment	83
14	Electronic and communication equipment	41
15	Medical equipment	29
16	Testing equipment	44
17	Process control equipment	52
18	Computing activities	67
19	Optical instruments	9
20	Motor vehicles	12
21	Aerospace	3
22	Furniture	10
23	Games and miscellaneous	15
24	Recycling and waste management	6
25	Construction	2
26	Retail services	6
27	Miscellaneous services	3
28	Financial services	38
29	Business services	6
30	Community and social activities	5

'foreign' international firms *were* developed in the UK.)

Although including the UK-owned internationals with the domestic firms increases the innovative activity, the UK still only accounts for just over 50% of the innovation announcements. An interesting exercise would be to undertake a similar historical analysis over a period of years to see if there is a trend in the balance of innovations between UK and non-UK. This could be combined with a sectoral analysis to identify strengths and weaknesses of the industrial sectors.

4.3. Distribution of innovations by industrial sectors

Table 4 shows how the innovations were distributed according to their industrial sector using the SIC system (as recently revised to align with the European NACE system).

It is difficult to be precise about the extent to which these divergent innovation levels by sector are a result of the process of journal selection, of differing innovation rates in different sectors, of differing sectoral reporting rates, or of UK under-performance. This uncertainty is a real limitation of the LBIO method, which can only be overcome by comparison with other independent data such as that resulting from direct surveys.

5. Analysis

5.1. Variations in type of innovations related to firm's 'nationality'

The data presented in the previous section now permit an examination of which types of innovation are more likely to take place in particular types of firms.

Table 5 shows, for each type of innovation in the database, the proportions of the total produced by different types of firms. It is noticeable that:

- domestic firms have a larger share of the innovative activity as the radicalness of the innovation decreases;
- international firms are relatively strong at new and novel innovations, but lose their dominance as the radicalness of the innovation decreases;
- domestic and international firms have comparable shares of improvement and differentiation innovations;
- 'foreign' product innovations are mainly in the improved products or accessory categories;
- joint ventures are better at producing new or novel products and process innovations than any other type of innovation;
- process innovations are of mainly domestic origin (69%).

These findings suggests that the larger changes in product technology that result in new and novel innovations are more often associated with those international firms that in turn are likely to be among the larger R&D spenders. Obviously it is reasonable to assume that such firms may have significant advantages in producing new products, due to their access to the necessary input factors required in the innovation process, i.e. personnel, production facilities and capital.

However, a corollary of this is that domestic firms may have an advantage in accessory or differentiated product innovations because of specific local market

Table 5
Breakdown of origin per innovation type as a percentage

Origin	Type of innovation					
	New	Novel	Improved	Accessory	Differentiation	Process
Domestic	26.32%	37.25%	36.16%	49.63%	59.32%	68.75%
Joint venture	5.26%	7.84%	1.03%	2.19%	1.21%	6.25%
Foreign	10.53%	13.72%	24.59%	18.99%	8.91%	12.5%
International	57.89%	41.18%	35.12%	29.20%	29.96%	12.5%
Total	100 %	100 %	100 %	100 %	100 %	100 %

Table 6
Breakdown of types of innovation and originating firm as a percentage

Type of firm	Innovation						
	New	Novel	Improved	Accessory	Differentiate	Process	Total
Domestic	1.17	4.46	41.08	15.45	35.24	2.58	100%
Joint venture	5.88	23.53	29.41	17.65	17.65	5.88	100%
Foreign	1.12	3.93	66.85	14.62	12.36	1.12	100%
Inter-national	3.45	6.58	53.29	12.54	23.51	0.63	100%

knowledge. The technology embodied in such innovations may be more easily available, and less dependent on high levels of R&D competence.

Joint ventures have a significant share of the new or novel categories despite having a low frequency in the survey ($n = 17$). This probably reflects the fact that a frequent rationale for joint ventures is the search for and acquisition of new technology, and therefore there appears to be a relatively high incidence of radical or novel innovations in this category.

The low frequency of process innovations ($n = 16$) is in accord with the view that firms have little incentive to make process innovations public, especially when the innovation only concerns their own processes.

Table 6 looks at the same data in a different way, and asks, for each type of firm, how these innovations are distributed across innovation types.

The interesting patterns are:

- joint ventures produce a disproportionately high share of radical innovations;
- radical innovations have a greater probability of being produced by 'international' firms than 'domestic' firms;
- new and novel innovations do not feature strongly in 'foreign' and 'domestic' firm's innovative behaviour;
- improved products are the main categories of innovation for foreign and international firms;

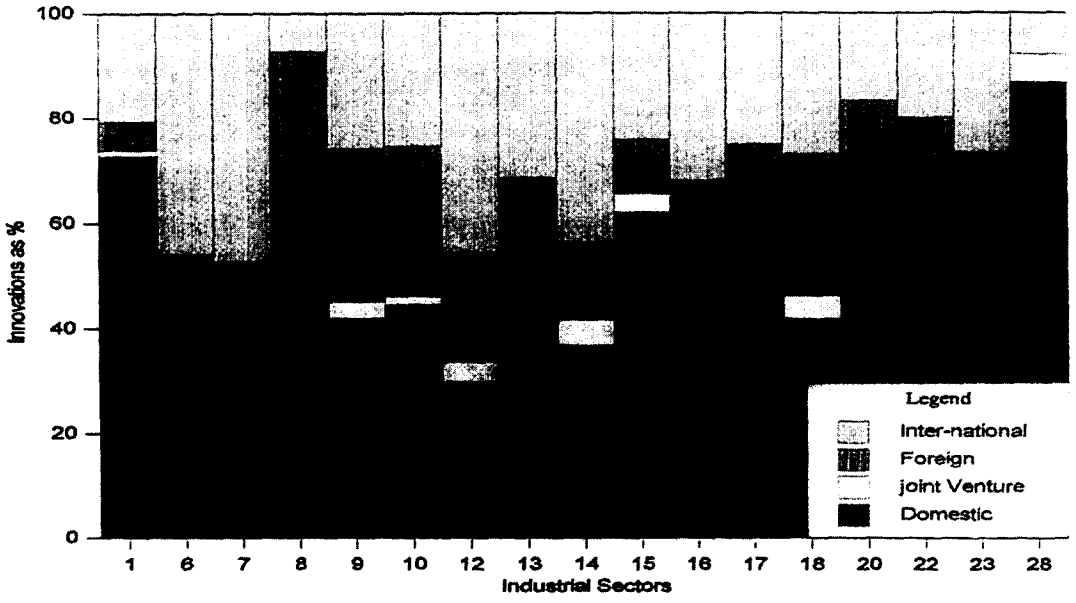

Fig. 1. Origin of innovation in selected industrial sectors (by percentage).

- accessory innovations are produced by all sources;
- differentiated products are mainly produced by domestic firms (that may have stronger local market knowledge and customer awareness);
- process innovations have a greater probability of creation through joint ventures, because of the need for collaboration between supplier and customer.

These observations refine some earlier points:

- joint ventures and international firms produce a higher proportion of radical innovations, while domestic firms are stronger in more incremental innovations;
- all sources of innovation are equally strong at producing modestly improved products or accessory products.

5.2. Industrial sectors and 'nationality' of the innovating firm

Fig. 1 shows how the innovations in each sector are divided between domestic, international and other categories of originating firms. From an examination of the raw percentages it is clear that domestic innovations have a relatively high incidence in the food, glass, brick and concrete building products, and the financial services sectors. Possible explanations of this could be couched in terms of relative transport costs of bulky materials in the former case, or specificity to local market conditions in the latter case.

The absolute number of domestic innovations in the chemical, iron and metal products, domestic and office equipment, electronics and communication, testing, and computer activities sectors is reasonably high. However, in relative terms these sectors appear weak, since innovations by foreign and international firms are much more numerous. It is also interesting to find that in this database the chemical industry, frequently seen as a strong performer both within Britain and internationally, has a lower than expected level of innovations. Conversely, international firms are strong in sectors such as chemicals, computing and communication equipment, where domestic firms are weakest. Foreign firms that market products through third parties are strong in the manufacture of machinery and furniture sectors, but weak in those sectors that require higher levels of R&D.

Joint venture innovations are most popular in the high technology sectors such as computing and communication, and in the financial sector.

5.3. Analysis by firm size

A question that is hotly debated in innovation theory is the relationship between the size of the firm and its propensity to innovate. The database enabled some limited examination of this issue by obtaining the size of the firm, where available, and comparing it with the complexity, type and origin of the innovation. Information about the size of the firm, using the number of employees as a suitable measure, could only be obtained for 500 of the 941 firms in the database: the issue of subsidiaries was not considered owing to the difficulty in obtaining the necessary information. This information was checked to ensure that the 500 firms were representative of the whole database. The only significant deviation from the main sample occurs with respect to the nationality of the innovating firm. Foreign firms are more likely to use small domestic (UK) firms as sales agents, and information about number of employees for these firms are not so readily available.

Table 7 shows the total number of innovations (of all levels of radicalness) produced by firms in three size categories, and the number of firms in each size

Table 7
Innovations per firm

Firm size (employees)	Number of firms	Innovations	Innovations per firm
< 200	171	237	1.38
200–1000	89	96	1.078
> 1000	51	56	1.098

Table 8
Distribution of innovations by type and firm as a percentage

Firm size (employees)	New	Novel	Improvement	Accessory	Differentiation	Process	Total
< 200	2.1%	5.9%	54.0%	13.9%	23.6%	0.4%	100%
200–1000	1.04%	8.33%	42.7%	14.6%	31.25%	2.08%	100%
> 1000	5.35%	–	44.64%	8.92%	37.5%	3.57%	100%
Total	2.3%	5.6%	49.8%	13.6%	27.4%	1.3%	100%

category in the sample. The data suggest a slightly higher number of innovations from smaller firms. However, it is possible that this difference may reflect a higher propensity to report innovations in the literature by smaller firms.

Table 8 shows the distribution of the innovations by type amongst three size categories of firms. Although the differences are not large, the data do suggest a slightly higher incidence of new, novel and improvement innovations for the two smaller size categories of firms (< 200 and < 1000 employees).

6. Summary and conclusions

We can now review the results arising from this study using a literature-based innovation output indicator method, and the feasibility and attractiveness of this particular method of generating an innovation indicator. The main features of the results are:

6.1.

The sectoral distribution of the innovations, when examined in conjunction with the nationality of the innovating firms, suggests that UK-based firms are generating a relatively high proportion of innovations in the food, machinery, and financial sectors, but a relatively low proportion of innovations in the electrical and electronic sectors. This is in accordance with the results of other research on the relative strengths of different sectors of the UK economy.

6.2.

The degree of radicalness of the innovations in the database is related in an interesting way to the national character of the innovating firms. The innovations produced by UK firms are strongly biased towards product improvements and product differentiations. UK firms have only a modest share of the genuinely radical or novel innovations. It is the international firms that generate the largest share of the more radical innovations in the sample. This is consistent with other research on technical change which has shown that R&D expenditure and innovative capacity is increasingly concentrated in large international firms.

6.3.

The data also show a significant role for joint ventures in the production of the more radical innovations in the sample. This could be consistent with a frequently offered explanation for joint venture behaviour, namely that certain more 'discontinuous' examples of innovation are difficult for individual firms to carry out alone, because they require new combinations of technical capabilities.

6.4.

The data give some limited support to the view that smaller firms generate a larger than expected share of innovations. It was only possible to gather data on the size of the firms for approximately half the sample, and the data therefore have to be interpreted cautiously. Nevertheless it does appear that firms of around 100 to 200 employees (both domestic and non-domestic) are particularly well represented in the subset of the innovations which are genuinely radical (this subset is some 7.5% of the total sample of innovations).

Thus, the data exhibit some broad patterns that mirror those found in other types of innovation

research on the UK. It suggests that the literature-based innovation output method used is really 'capturing' data which have some validity and reliability. This suggests that steps should be taken to institutionalise and regularise this type of information collection and entry in an appropriate database. Once this is done then the relationship between the broad patterns and trends of the data and other economic factors can be examined.

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Appendix. Trade magazines selected (after consultation with trade associations)

Aircraft Engineering; *Chartered Builder*; *Chemist and Druggist*; *Control and Instrumentation*; *Electronics Production*; *Electrical Review*; *Food Trade Review*; *Glass*; *International Dyer*; *Manufacturing Chemist*; *Metal Working Production*; *Micro Decision*; *Office Equipment News*; *Pharmaceutical Journal*; *Precision Toolmaker*; *Process Engineering*; *Product Finishing*; *Body Magazine*; *Steel Times*; *Surveyor*; *Wire*; *Wood Worker*; *Banker*; *Brewing and Distilling International*; *Freight Management International*; *Furniture Manufacturer*; *Hospital Equipment and Supplies*; *Interavia* (ceased 12/1992); *Material Reclamation*; *Milk Producer*; *Packaging UK*; *Toy Trader*; *European Electro-Optics*; *Mining (International)*; *Insurance Age*.

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