INNOVATION SURVEYS AND VERY SMALL ENTERPRISES

ESRC Centre for Business Research, University of Cambridge
Working Paper No. 89

Andy Cosh
ESRC Centre for Business Research
and Queens' College
University of Cambridge
Silver Street
Cambridge CB3 9ET

Phone: 01223 335605
Fax: 01223 335566
E-Mail: adc1@eng.cam.ac.uk

Alan Hughes
ESRC Centre for Business Research
University of Cambridge
Sidgwick Avenue
Cambridge CB2 9DE

Phone: 01223 335248
Fax: 01223 335768
E-Mail: ah13@econ.cam.ac.uk

Eric Wood
ESRC Centre for Business Research
University of Cambridge
Sidgwick Avenue
Cambridge CB3 9DE

Phone: 01223 335287
Fax: 01223 335768
E-Mail: easw1@econ.cam.ac.uk

June 1998

This Working Paper relates to the CBR Research Programme on Surveys, Databases and Database Management

eurostat

ESRC CENTRE FOR BUSINESS RESEARCH

Abstract

This study was commissioned by Eurostat as part of an ongoing evaluation programme entitled Studies on Innovation and R&D Statistics. It evaluates the desirability and feasibility of including "very small enterprises" (VSEs) in future European innovation surveys. We begin by discussing the extent of VSE economic activity and innovations in a sample of seven countries in the European Union. We then present questionnaire-based evidence on the current methods employed to survey VSEs and their innovative activity in our sample countries. Then on the basis of this material we examine the case for a European VSE innovation survey and provide an operational outline for a pilot survey project in this area.

Acknowledgements

We would like to thank all those people who have provided material to make the writing of this study possible. A large number of representatives of national statistical authorities as well as governmental and non-governmental research organisations made detailed responses to our requests for information. Some of the information that we requested was not available in published reports and thus required respondents to make special written responses. In particular, we would like to mention the generous assistance of Ari Leppälahti, Pia Brugger, M. Poschl, Peter Englitz, Georg Licht, Juergen Kuehl, Christoph Grenzmann, M. Fegers, Horst Rottman, Aldo del Santo, Guilio Pirani, Alberto Silvani, Niels Lanoy Mayer, Sjaak Pronk, Norbert van den Hove, Jan van Steen, Y. Prince, M. van Riel, Frank Foyn, M. Kirste-Wille Maus, Svein Olan Nås, Ray Lambert, Michelle Whyman Williams and Claire Powell from national statistical authorities, government ministries or research agencies, Mikael Åkerblom, Youri Baeyens and Maurits Pino our advisers in Eurostat and Babak Mehmanpazir and P. Kaminski who advised us on the situation in France. We would like to make special mention of the assistance from Youri Baeyens who provided the data from the Community Innovation Survey which was used in this report. The authors are heavily indebted to Linda Brosnan and Anita Turner for their high quality and efficient secretarial assistance.

Further information about the ESRC Centre for Business Research can be found on the World Wide Web at the following address: http://www.cbr.cam.ac.uk

INNOVATION SURVEYS AND VERY SMALL ENTERPRSES

1. Introduction

This study reports the work carried out by the ESRC Centre for Business Research on behalf of Camire for Eurostat. We analyse the desirability and feasibility of including "very small" or "micro" enterprises in European innovation surveys. Throughout the report, we use the term "VSE" or very small enterprise to refer to firms with between 1 and 9 employees inclusive.

1.1. Terms of reference

The terms of reference of the research project underlying this study were;

- "to prepare a set of recommendations for gathering pertinent information on the innovation potential of the very small enterprises in Europe."

In meeting the terms of reference the study was to provide;

- "an inventory of the methods used in France, Finland, Germany, Italy the Netherlands, United Kingdom and Norway to identify and to survey innovative very small enterprises "

- "a discussion of the pertinence of the data on their innovation activities in a European perspective"

- "a detailed outline for the undertaking of a pilot project in this particular area"

1.2. The research methodology

The method of investigation and tasks specified for the project were to;

- "gather information from the selected member states (National Statistical Institutes, Research Centres, other institutions),through letters and contacts by telephone"

- "review the information collected and.. prepare an inventory of methods, including a reference bibliography"

- "discuss the various methods used in the selected member states and.. propose a pertinent 'European' process, including suggestions for the choice of the enterprises and the choice of the variables to be used"

- "prepare an operational outline for a pilot project"

The methodology we adopted combined telephone and postal contact by letter with a short postal questionnaire to help collate responses and focus discussion. This questionnaire was sent to representatives in national statistical authorities and government research organisations in March 1997. The list of people to contact was provided by Eurostat. The CBR approached the correspondents in each country directly with the exception of France where the approach was mediated by ADEC. All of the correspondents had been involved in some capacity in the planning or evaluation of the first Community Innovation Survey in 1993. The response to this initial postal approach was good with the majority replying. In most cases, the questionnaire was followed by a phone call and faxes with requests for clarification on certain points or for further information. In several cases, respondents provided contacts in other research organisations

which were involved in separate innovation surveys in the particular country. These were then contacted by phone and fax. In all, over 25 aspects in national statistical authorities, government research organisations and other research organisations in seven countries, namely Finland, France, Germany, Italy, Netherlands, Norway and UK were contacted by letter and telephone. The questionnaire used along with an example of the covering letter which accompanied it as well as the list of people who were contacted is shown in the Appendix. Over 20 experts provided detailed information concerning their innovation surveys. In addition to these inquiries we also carried out a separate survey of the existing empirical research on the significance of economic activity in the VSE Sector in Europe and on the innovating activity of VSEs. Finally Eurostat made available to us special tabulations of data from the 1993 Community Innovation Survey.

1.3. The structure of the report

In presenting the results of our research we begin by discussing the extent of VSE economic activity and innovations in the European Union with special reference to our sample countries. We then present our questionnaire-based evidence on the current methods employed to survey VSEs and their innovative activity in the countries in our sample. Then on the basis of this material we examine the case for a European VSE innovation survey and provide an operational outline for a pilot survey project in this area.

2. The Pertinence of Innovation Data for Very Small Enterprises

2.1 Introduction

The purpose of this section is threefold: first, to consider the conceptual basis for expecting VSEs to play a significant role in innovative activity, second to measure the economic importance of the

VSE sector as a whole to Europe and, third, to examine the existing evidence on the extent and nature of innovative activity in the VSE sector and compare it to innovation patterns amongst larger firms.

Our analysis draws on published and unpublished data from Eurostat as well as our postal and telephone survey. The section on innovation includes information from a number of European surveys which have included questions on innovation activity. These include the CIS related surveys from 10 countries as well as five other surveys, namely the Institut für Wirtschaftsforschung (IFO) panel survey in Germany, the Institut für Arbeitmarkt und Berufsforschung (IAB) panel survey in Germany, the INSEE "Technology and Innovation in VSE Enterprises" (TIME) survey in France, the Centraal Bureau voor de Statistiek (CBS) Automatiseringsstatistieken survey in the Netherlands and the Centre for Business Research innovation survey in the UK. During the research for this report, we identified two additional European surveys which included questions on innovation, namely those conducted by the Economic Institute for SMEs on behalf of the Ministry of Economic Affairs in the Netherlands and Mediocredito Centrale in Italy. However, it was not possible to obtain data from these surveys in time for this study.

2.2. Very small enterprises and innovative activity: some conceptual issues

The role of small firms in innovative activity has been the subject of a lengthy theoretical and empirical debate (see for example the survey of Cohen and Levin 1989 and the more recent survey focusing on small firms by Wood 1996 on which the following discussion draws in part). Some authors have argued that the role of small firms is critical, whilst others have emphasised the dominance of large firms in the innovation process. An important first task is therefore to clarify the reasons which have been advanced for expecting that the role of very small enterprises in innovation is not an 'empty box'.

There are long-standing arguments for a positive role for small firms in the process whereby innovations are made. They centre around the notion that the small firm is motivationally and organisationally better adapted to radical change than larger firms. Schumpeter's early work on capitalist development, for instance, emphasised the role of entrepreneurship and the formation of new and hence very small firms in successful innovation. New firms are less constrained by old habits and existing combinations of technologies and markets. As he put it "new combinations, are as a rule, embodied in new firms which do not arise out of the old ones but start producing beside them" (Schumpeter 1934 p.36). Similar views can be found in more recent work which emphasises the relatively flexible management forms and high powered incentive structures which may facilitate innovation in smaller firms. Thus it has been argued that "one important strength..*(of small firms)*..is that they are less bureaucratic, without layers of 'abominable no-men' who block daring ventures in a more highly structured organisation...*(another advantage is that)*...it is easier to sustain a fever pitch of excitement in small organisations, where the links between challenges, staff and potential rewards are tight" (Scherer 1988). Similarly it has been argued that mould breaking personalities associated with radical innovation are 'selected out' in large more bureaucratic organisations. They find a more natural outlet in small entrepreneurial firms with an appropriate management and incentive structure. "Radical departures appear to emerge most readily out of flexible organisational structures... out of the kind of open, informal, high trust environments that are more readily established in the small firm... the small firm provides better incentives to management to undertake the tremendous risks surrounding major innovations" (Mueller 1988 pp 39-40, see also Pavitt *et al* 1987).

A related but somewhat different argument originally advanced by Downie (1959) and elaborated by Metcalfe and Gibbons (1986) emphasises that large firms whose success is built on past innovation will be less likely to be the source of the next major breakthrough.

They will be more likely to be wedded to the products and processes associated with their past success, and to have a lower incentive to innovate than potential newcomers or smaller rivals who lost out in the innovative race in the past. Moreover to the extent that there is an inherent randomness in the incidence of innovative ideas then the existence of a large stock of small firms will act as an important seedbed for new innovations. This view sees small firms as "..the traditional breeding ground for new industries... for innovation writ large... the natural seedbed of new industries, new talent, and the large companies of the future" (Bolton 1971 p 84). This idea is in turn related to the positive role attributed to new firm entry and small firm innovation in decreasing market concentration and challenging market leaders (Mueller 1988 p. 41, Geroski and Pomroy 1990, Acs and Audretsch 1987, 1988). Similarly it has been argued that where technologies are changing fast it is smaller more flexibly organised smaller firms who will most rapidly respond to changing opportunities (Abernethy 1978, Burns and Stalker 1961).

Arguments for the view that large firms will dominate the innovation process have also been made, most notably by Schumpeter himself in his later work (Schumpeter 1942). In this view large and/or monopolistic enterprises are the engines of innovation and economic progress. The principal arguments for believing this to be the case are essentially based on hypothesising scale effects relating innovation expenditures to the output of innovations, or to the ability of larger firms to appropriate higher returns, or a higher share of given returns to innovation outputs. Even with R&D expenditures rising proportionately with firm size larger firms will come to dominate the innovation process if they have a more ready access to cheap internal cash flows, a larger volume of sales over which to spread fixed innovation costs, a wider range of potential markets into which innovations may be launched, and, or higher mark-ups in those markets than smaller firms. The result is an insignificant role for the smaller business. "By taking over the entrepreneurial function, the innovative industrial concern makes entrepreneurs obsolete" (Winter

1984 p.294, see also for a review of these arguments Cohen and Levin 1989 p.294).

It is clear from both these sets of arguments however that even if large firms may be dominant in the innovative process relative to smaller firms there may be significant inter industry differences in that dominance. Their relative dominance will depend upon the cost per unit of innovation output, the capital intensity of production, the ease with which innovations may be imitated, and the role of advertising in launching new products and maintaining old ones, each of which will affect the availability of differential mark-ups for large as opposed to small firms (see for example Nelson and Winter 1978, Baldwin and Scott 1987, Audretsch and Acs 1990, 1992). Moreover there may be stages in the development of some industries when the relative role of large and small firms differ. The organisational and motivational arguments which we advanced earlier may mean that smaller firms are most productive in terms of innovation during the emergent phase of a new technology when change is most rapid, and flexibility and risk taking are at a premium. Once a new technology is established, or standardised incremental innovations may become the norm within known parameters, then the cost advantages of larger firms may come to dominate. The role of the smallest firms then becomes relegated once more to specialist or niche markets, and or/to the exploitation of spin-off opportunities provided by the large firm infrastructure (Mueller 1988, Rothwell 1989).

It is clear that *in principle* small firms may potentially play an important initiating role in innovation activity. It is also clear that this potential role may vary across industries and time. What is less clear is how far this potential stretches down the scale of firm sizes. Here existing theory is of less help. We review relevant empirical evidence in a later section.

So far we have concentrated on the initiation of new innovations. It is also important, however to emphasise that the extent to which smaller

firms are willing followers of best practice. This may be just as important as their role as initiators of change. The diffusion of innovations across firms of all sizes is an important aspect of the means by which innovation contributes to economic welfare. Differences in rates of diffusion across countries are therefore an important aspect of the process whereby differences in efficiency and efficiency growth are eroded or maintained. If very small enterprises account for substantial shares of economic activity then the rate of innovation diffusion across that sector is an important area for investigation.

2.3. Very small enterprises and innovative activity: definitional issues

To make progress in establishing the pertinence of VSEs in innovation activity, we need to clarify and operationalize what is meant by the terms "very small" and "enterprise". We begin with the latter.

2.3.1. Defining the "enterprise"

In principle a clear distinction can be drawn between *enterprises* which are units of independent business *ownership*, and the one or more *local units, plants, establishments or factories* which are the units of *production* which they operate. From the point of view of the motivational aspects behind the arguments that small firms will be innovation intensive the aspect of independent ownership is clearly central. In practice the definition of an independent enterprise requires that an economic concept be matched to a legal entity, or an entity defined for data gathering purposes. For legal, institutional, cultural reasons and for official data gathering purposes this matching is not treated consistently across countries. For instance the German concepts of *unternehmen* (ownership units) and *betrieb* (units of production) appear to be similar to the UK concepts of an *enterprise* and *establishment* respectively. In practice it appears that

unternehmen have not in the past been as inclusive in their ownership coverage as their UK counterparts. Thus within a given industry many unternehmen may have been reported as separate units even though they are under common ownership and are not therefore independent (see eg Prais 1981, Sengenberger *et al* 1990). Moreover even if enterprises are correctly aggregated into ownership units within a given industrial sector they may be part of a diversified group with enterprises under common ownership in several industries. Thus in the case of the UK a further level of aggregation beyond enterprises in individual industries is required to get to the larger ownership groups (see for example the discussion in Dunne and Hughes 1992).

A further issue is that enterprises, as units of ownership, may take many different forms, from sole propietorships, through partnerships, to private and public limited companies. In principle we are interested in independent enterprises irrespective of legal form but for taxation legal or other administrative reasons data may only be available for some sectors or countries for certain types of legal forms (eg accounting data may only be available for companies).

These issues pose obvious problems in defining the appropriate business unit level at which to measure and compare the pertinence of very small enterprises across different countries, and the measure of size to be used. They also pose important problems when it is necessary to choose sampling frames for conducting innovation surveys intended to cover very small independent enterprises and to be comparable across countries. The most recent attempt to deal with these issues has resulted in the harmonized estimates of enterprise structure in the EU prepared by Eurostat. These estimates relate to 1992 and have been published in *Enterprises in Europe: Fourth Report. Eurostat/DGXX111 Brussels Luxembourg 1996* and (with some added estimations) in *The European Observatory for SMEs Fourth Annual Report 1996 EIM Small Business Research and Consultancy Zoetermeer The Netherlands 1996.*

In this data the *enterprise* is defined as 'the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision making, especially for the allocation of its current resources. An enterprise carries out one or more activities in one or more locations. An enterprise may be a sole legal unit.' An *enterprise group* is defined as 'an association of enterprises bound together by legal or financial links.....It constitutes an economic entity which is empowered to make choices, particularly concerning the units which it comprises.' These units of analysis are distinguished from the *local unit* which is defined as 'an enterprise or part thereof (eg a workshop factory,warehouse, office mine or depot) situated in a geographically defined place. At or from this place economic activity is carried out for which...one or more persons work...for one and the same enterprise'(Eurostat 1996 p20).

In addition to these business units Eurostat also define *kind-of-activity unit* KAU and *local kind-of-activity units*. The former consists of all those parts of an enterprise 'contributing to the performance of an activity at a detailed sectoral level (four digit level of NACE Rev 1) and corresponds to one or more operational sub-divisions of the enterprise'. The latter 'is the part of a KAU which corresponds to a local unit'; this is close in concept to the idea of an establishment in many countries (op.cit. p20). The essential difference between the KAU level of analysis, and the enterprise and local unit level of analysis, is that the former by definition have activities confined to narrowly defined industries whereas the latter may do but are not defined to be so.

From the point of view of this study four important points emerge from this review of definitions:-

- the simplest kind of business will be a wholly independent enterprise operating at a single site in a

single 4 digit industry. In this case all the above definitions collapse into one.

- variations across countries in the estimated empirical significance of VSEs will vary in so far as the data they provide correspond to the KAU level, the enterprise/local unit level, or the enterprise group level.

- the significance of this variation will depend on the extent to which enterprise groups in different countries are;

  - diversified or vertically concentrated across Nace industries

  - multi-local-unit or multi-enterprise organisations

- a survey designed to measure innovation activity in VSEs will;

  - need to pay careful attention to the nature of the business units available in the sampling frames for each country to be included in the survey

  - need to consider carefully the inclusion of questions in the survey designed to elicit information about the independence, group membership, and industrial spread of the business activity of the business units surveyed.

2.3.2 Measuring size and choosing size classes

The second definitional issue we face is how to measure size and how to choose the size class boundaries between small, very small, medium and large.

From a conceptual point of view most definitions of a small firm based on economic characteristics have traditionally emphasised three features of "smallness" (see for example Bolton 1971, Storey 1994);

- independence in the sense of not forming part of a larger ownership group which could constrain freedom of action in the interests of the owner/manager

- little market power associated with small market shares, and weak bargaining power in supplier markets

- managed/controlled by their owners with a personalised informal management structure

The first two characteristics may not easily be mapped into a statistical definition in terms of size. It is perfectly possible to be both independent, family or owner controlled and very large. Independence is therefore only an important feature when taken in conjunction with a measure of smallness. It is also perfectly possible to find small firms with fairly dominant positions in terms of market share, if the market is defined closely enough (e.g. examples of the tuning fork and cricket ball markets in the UK: Walshe 1974). This is the general problem of niche market definition and measurement. Small firms frequently perceive themselves as having very few competitors. Thus in the UK in the early 1990's over 50% of firms employing less than 10 employees reported that they had 4 or fewer serious competitors (CBR 1995). The problem of niche markets may be particularly troublesome in so far as we are concerned with innovation and the innovation at issue creates a 'new' niche market. It is moreover the case that market share data is notoriously difficult to collect systematically and we do not pursue this as a practical approach any further here.

An alternative market or industry based approach to defining a small firm is to 'ground' a definition of "smallness" in the perceptions of owner managers, consultants, and trade association representatives in

the market concerned (see e.g. Curran, Blackburn and Woods 1991). This leads to both a variety of definitions of smallness across different markets and leaves open the particular dimension along which size is grounded (e.g. number of retail outlets, employment, turnover etc). As with market share there are moreover no widely accepted, or large scale economy wide size classifications using this approach, and we do not pursue it either.

The final characteristic of informality and personalised owner control is somewhat more tractable empirically. There is a substantial literature on life cycle models of the firm which trace connections between maturity, size, and management organisation (eg Scott and Bruce 1977). There is also empirical evidence to suggest that changes in management structure and style emerge as firms enter and then cross the 10-20 employment size band (Hughes 1997, Smallbone North and Leigh 1992, Reid 1995, Atkinson and Meager 1994, ACOST 1992). This literature suggests that we should attempt to use a definition of smallness which allows a dissaggregation of size classes *within* the 0-20 employment size band to pick up this transition boundary. The current standard Eurostat employment size classification does in fact permit such a split.

These recent analyses of small firms in Europe have employed the following groupings;

- Very small 0-9 employees
- small 10-49 employees
- medium 50-199 employees
- large 200+ employees

Of these groups it worth making a few observations about the first or 'very small' class. This is both because of our concern with very small

enterprises, and because of the general problem of how to treat businesses with no employees.

Self-employment has grown substantially in Europe in the past two decades. This has often been as a result of contractual strategies adopted by larger employers for reasons of tax convenience, or to avoid certain regulatory obligations. This means that the inclusion of the self employed *with no employees* as individual businesses can lead to important differences in estimated business enterprise populations across sectors and countries. The data for the European Union permit a distinction to be drawn between self employed with no employees and for instance sole proprietorships where the EU harmonized data collection procedure requires that employment be recorded inclusive of working proprietors. In our analysis of the pertinence of very small enterprises (VSEs) we have chosen to focus wherever possible on enterprises with employees, and we define VSEs as enterprises with at least one employee and no more than nine employees. We also try, where possible, to distinguish size effects within this size band. This is important from both an economic and a statistical point of view. First, it may be the case that there are size related differences in innovative behaviour *within* this group which an analysis by size will reveal. Second, and related to this point, because the size distribution of firms is so heavily skewed the vast majority of VSEs will have less than five employees. Thus there may be substantial gains in simplicity and cost in only surveying the larger VSEs if an analysis by size within the group reveals that smaller VSEs have limited innovation activity.

2.3.3 Defining innovative activity

Prior to the late 1960s, virtually every study testing the relationship between firm size and innovation relied on proxy measures of innovation, either inputs into the process, such as R&D expenditure, or else of innovative output, such as patented inventions. The numerous shortcomings associated with these measures have been

well documented (e.g. OECD 1992). Of particular relevance here is the fact that both R&D and patent data have been shown to produce biased estimates of the extent of innovative activity in different firm size groups. R&D data underestimate the importance of innovative activity in small firms (Pavitt 1982), with a large proportion of R&D activity in small firms going unrecorded (Kleinknecht 1987, 1991). There have also been suggestions that patent data underestimate the importance of innovative activity in large firms (Pavitt 1982), though it is also recognised that small firms experience considerable obstacles in using the patent system to provide effective protection for their technologies (ACOST 1990).

More direct measures of innovation activity which focus on the introduction of new products, services and processes and which were the focus of the Community Innovation Survey (CIS) have, in part, been promoted as offering unbiased, or at least less biased, information on cross-sectional innovation patterns. However, the exclusion of the smallest category of firms from many of the recent surveys which have utilised the direct measures of innovation have undermined the goal of achieving complete and unbiased information on cross-sectional innovation patterns. In the sections below, we review a wide range of evidence on VSE innovation activity and attempt to address the question of whether questions concerning the introduction of innovative new products and processes are pertinent to the activities of VSEs. In view of the importance of innovation diffusion activity in VSEs we pay close attention to differences in rates of novel innovation (i.e. new to the industry) compared to diffusion innovation (new to the firm but not new to the industry).

2.4. The importance of the very small enterprise sector in economic activity in Europe

Comparable measures of the significance of very small enterprises (VSEs) employing less than ten employees have only recently become available for the European Union economies. Table 1 reports the most

recent of these estimates. It includes enterprises with no employees. It shows that in 1995 VSEs on this wider definition accounted for 92.5% of all enterprises and 32.4% of employment in 19 European Union and associated countries. Enterprises employing over 20 workers accounted for only 3.4% of enterprises but 58.9% of employment. Although there is a major disparity in the VSE share of enterprises and their share of employment the latter is still substantial. Moreover Table 2 shows that growth in employment in the VSE group was slightly higher than growth amongst larger firms in the period 1988-97, although there are considerable variations in this pattern depending upon the state of the business cycle.

These European wide data may conceal important differences in the significance of VSEs both between countries and between sectors. These differences are explored in Table 3 and Charts 1 and 2 where we also are able to exclude data relating to businesses with no employees. Detailed tables for each country showing the whole distribution are contained in the Appendix (see Tables A1-A7).

The first point to note in Table 3 is that VSEs are significantly more important in Italy than in our other sample countries. The second point to note from Diagrams 1 and 2 is that in each country there are significant differences in the relative importance of VSEs across different sectors. In all countries except Italy the share of VSEs in industrial employment is less than 10%, whilst their share in turnover is 5% or less. The VSE share in employment and turnover in other sectors is substantially higher and rarely falls below 25% and 15% respectively. In Italy where the proportion of employment in industry accounted for by VSEs is 23.3% it is still substantially below the share of VSE employment in construction at 74.6% and wholesale etc, and other services, where it was 74.6% and 36.6% respectively. In so far as we focus an analysis of pertinence on economic significance based on shares of employment or turnover our conclusion is that VSEs are a more pertinent group for analysis in construction and services than in industry.

2.5. The relationship between firm size and innovation in European innovation surveys

This section reviews the available evidence on VSE innovation activity in Europe. We utilise a number of different measures of innovation activity, including diffusion innovation, novel innovation, R&D activity as well as the proportion of sales incorporating new or improved products.

2.5.1. Product and process innovation new to the enterprise

Table 4 shows the proportion of innovative firms by size class for a number of European surveys which have included questions on innovation activity. These include CIS surveys from 10 countries as well as four other surveys, namely the Institut für Wirtschaftsforschung (IFO) panel survey in Germany, the Institut für Arbeitmarkt und Berufsforschung (IAB) panel survey in Germany, the INSEE "Technology and Innovation in VSE Enterprises" (TIME) survey in France, the Centraal Bureau voor de Statistiek (CBS) Automatiseringsstatistieken survey in the Netherlands and the Centre for Business Research (CBR) innovation survey in the UK.

It should be emphasised that the data are not perfectly comparable for a number of reasons. The problems with comparability for CIS surveys across different countries have been well documented (see Archibugi et al. 1994). Differences in sampling techniques, for example, make it difficult to make comparisons across countries in the proportion of innovative firms. In addition, the data from the non-CIS surveys are also not entirely comparable for a variety of reasons. For example, while the CIS data in the table indicate the proportion of firms which had introduced either a product or process innovation, the IAB survey only collected information on product innovations and the CBS survey only on particular kinds of process innovations concerning automation. Despite the imperfect comparability of survey information available, the table is useful for comparing across

different countries and surveys the pattern of innovation across different firm size groups. The non-CIS surveys are particularly valuable for the purposes of this report as they all include VSEs. Only three of CIS surveys in the table, namely those in Germany, Luxembourg and Norway, included VSEs in their sampling frames.

The table indicates that in all manufacturing innovation surveys listed, the largest firms are most likely to innovate and the smallest firms are generally the least likely to innovate. Most of the surveys suggest a monotonic relationship between innovation and firm size, with the probability of innovation rising steadily with firm size. Among the nine surveys which included firms with fewer than 20 employees in their sampling frames, the Belgian CIS, the German IFO, the German IAB, the Irish CIS, the Dutch CIS and the Norwegian CIS are all examples of a monotonic rise in the probability of innovation with firm size. Broadly speaking, the CIS surveys from Germany and Luxembourg together with the Dutch CBS survey and the CBR survey in the UK also suggest a fairly steady rise in the probability of innovation with firm size, though in each case the rise is not perfectly monotonic.

It is interesting to note that the results from the German CIS survey for the service sector are in sharp contrast to those above. The size category with the highest proportion of innovating firms is that with 5-9 employees. However, the German service sector results appear to be exceptional. The innovation pattern for the service sector in the case of the CIS survey in the Netherlands and the CBR survey in the UK are similar to those for manufacturing, with the largest firms being the most likely to innovate and the smallest firms the least likely to innovate.

Despite the uniformity of the results for most surveys for both manufacturing and service sectors, there is considerable divergence in the strength of the relationship between innovation and firm size. An indicator of the strength of this relationship, namely the ratio of the

probability of innovation in firms with 5-9 employees to that in firms with 200-500 employees, is shown in the last column of the table. The ratio is only shown for those surveys which did include firms with between 5 and 500 employees in their sampling frame and which provided separate information for both the 5-9 and 200-500 categories. The surveys suggesting the smallest differences between large and small firms in the probability of an innovation are the German CIS survey and the CBR survey in the UK, with the probability of firms with 5-9 employees innovating being only slightly lower than for firms with 200-500 employees - the former group are over 70% as likely to innovate as the latter. The equivalent figures for the German IAB and the Luxembourgois CIS surveys are around 50%. By contrast, the Dutch CBS and the Norwegian CIS surveys imply that firms with 5-9 employees are only 30% (or less) as likely to innovate as firms with 200-500 employees.

These results imply that if national statistical authorities believe, as they appear to, that the proportion of innovating firms in the category 10-19 employees is sufficient to justify their inclusion in future official innovation surveys, then it is difficult to sustain a strong argument in favour of excluding VSEs, at least those with 5-9 employees, on the basis that the proportion of innovative firms in the VSE sector is too small. There is a suggestion, however, that the proportion of innovative firms in the category with 1-4 employees may be substantially lower than that with 5-9 employees, but the only evidence for this comes from one survey.

2.5.2. Product and process innovation new to the industry

Despite doubts about the compatibility of definitions of innovation between VSE managers and managers in larger firms and the lower probabilities of innovations in VSEs than other firms, it is clear nevertheless that a substantial minority of VSEs perceive themselves to be innovators. This is in terms of new or improved products or process, the technology of which is new to the firm.

Tables 5 and 6 once again use CBR survey data to indicate that a substantial minority of VSE innovators believe that their innovations are the first of their kind in their industry. As the tables are not entirely straight forward, containing a large amount of data together with a variety of statistical tests, the reader may find it helpful to familiarise herself/himself with the "Guideline to Tables 5-6 and 14-19" in the Appendix. 12.4% of VSEs reported novel product innovations in the 1995 survey. This proportion is lower than in any other firm size category but the differences are not significantly different. In manufacturing, the probability of a novel product innovation in VSEs is only marginally different from all size groups save the largest with between 200 and 500 employees in which the probability is roughly double than in all other categories. However, there is a substantially lower probability of novel product innovation in VSE business service firms than in all other firm size categories of business service firms.

Within the VSE manufacturing sector, it can be seen that the probability of a novel product innovation drops dramatically below the 5 employee mark; the probability in this group (6.3%) is 4 times lower in those firms than in the category 5-9 employees (25.7%). Significantly, the probability of a novel product innovation in the latter category is no lower than in firms with up to 199 employees; in fact, it appears to be marginally higher. The difference in the probability of a product innovation between business services firms with 1 to 4 employees and those with 5 to 9 employees is not as great as for manufacturing. Both categories of VSE business service firms have a lower probability of a novel product innovation than larger business service firms.

Table 6 shows that 5.4% of VSEs believed that their process innovations were the first of their kind in their industry. This proportion is not significantly different from that in the categories with between 10 and 99 employees, but the probability in all these categories is significantly lower than in firms with more than 200

employees and in the smallest two categories, the proportion is also significantly lower than in firms with between 100 and 199 employees. Within the VSE manufacturing sector, as with novel product innovations, the probability of a novel process innovation drops dramatically in firms with fewer than 5 employees. No firms in this category reported novel process innovations. The probability of a novel process innovation, however, in manufacturing firms with between 5 and 9 employees does not appear to be significantly lower than in firms with up to 99 employees. There does not appear to be any significant decline in the probability of a novel process innovation in the smallest firms within the VSE business service sector.

So, despite significantly lower probabilities of innovation amongst VSEs, there is a substantial proportion of VSEs, at least those with between 5 and 9 employees, which do appear to be engaged in genuinely innovative activities. There is also a tiny minority of firms with between 1 and 4 employees which report novel product or novel process innovations.

2.5.3. R&D activity

If VSEs are indeed involved in launching products and processes which are new not only to the firm but the firm's industry, one would expect to find evidence of an internal technology development programme to support such novel innovations, perhaps in the form of R&D activity. It could be argued, of course, that R&D activity is not a prerequisite for novel innovation in a VSE. A VSE, for example, may have been started by an individual who has had considerable experience in the industry and left her/his previous employment with the specific purpose of exploiting a new idea or technology developed during their previous employment. In this case, if the technology is almost ready to be launched at the time of the start up, then there may not be much evidence of R&D activity in the firm, at least initially.

However, one would still expect R&D activity to be necessary for the sustained development of novel innovations.

Table 7 shows evidence on the proportion of innovating firms which were engaged in R&D in 1992 across a number of European countries and firm size categories. The table indicates that in most countries, the proportion of innovating firms engaged in R&D is a strong positive function of firm size. Despite this, a substantial proportion of innovating VSEs in the manufacturing sector appear to have been engaged in R&D in 1992. In manufacturing in Germany, 43% of innovating firms with 5 to 9 employees reported being engaged in R&D. The corresponding figures for Luxembourg and Norway are 47% and 42% respectively. The cases of Ireland and the UK are somewhat different with no clear positive relationship between firm size and the probability of an innovating firm being engaged in R&D. Over two-thirds of manufacturing VSE respondents in the CBR survey in the UK reported being engaged in R&D. In the service sector, it appears that innovating VSEs in Germany are no less likely to have been engaged in R&D in 1992 than do their manufacturing counterparts. In contrast, the proportion of innovating service firms engaged in R&D in the UK appears to be below that in manufacturing.

Table 8 shows the proportion of innovating firms engaged in R&D on a continuous as opposed to occasional basis. Once again, the data indicate that in most countries, the probability of an innovative firm being engaged in R&D on a continuous basis is a strong positive function of firm size. While a large proportion of innovating larger firms which reported R&D activity in 1992 also report being engaged in R&D on a continuous basis, the proportion of innovating VSEs engaged in R&D on a continuous basis is well below that which reported R&D activity in 1992. Nevertheless, a substantial minority of innovating VSEs appear to be engaged in R&D on a continuous basis, both in manufacturing and services. The proportions for manufacturing firms with 5 to 9 employees in Germany, Luxembourg

and Norway are 28%, 31% and 13% respectively. The corresponding proportion for the UK is higher at 48%.

Considering all the countries with data for the VSE sector, well over a third of innovating VSEs in both manufacturing and services reported undertaking some R&D. This proportion of VSEs undertaking R&D on a continuous basis is lower, but in all cases except for Norway, it is still above 20%. The fact that so many innovative VSEs are engaged in R&D means that it is not implausible that some of these firms are correct in believing that their innovations are new not only to their firm but also to their industry. In the UK, for example, the proportion of VSE innovating firms which believed that their product innovations were new to their industry (38%) is well below the proportion of VSEs which reported having being engaged in R&D in the financial year ending 1995.

2.5.4. Proportion of sales incorporating new or changed products

The European Union harmonised innovation questionnaire of 1992/93 included a question on the proportion of a firm's 1992 sales made up of products incrementally changed during the period 1990-92 and the proportion of sales made up of products significantly changed or newly introduced in 1990-92. The information from this question provides further insight into VSE innovation activities, by indicating whether or not the type of product innovations introduced in VSEs differs substantially from those introduced by larger firms. Table 9 shows the proportion of innovating firms which reported products incrementally changed in 1990-92. There does not appear to be a clear pattern across the firm size categories. In manufacturing in Germany and Norway, innovative VSEs are slightly less likely to have incrementally changed products by comparison with larger firms. In Luxembourg, however, manufacturing VSEs which have innovated appear slightly more likely to have incrementally changed products than larger firms. There is also no consistent pattern in services. In the UK, innovative VSEs are not significantly less likely to report

incrementally changed products. In Germany, it appears that VSEs in the service sector are more likely than larger firms to introduce incrementally changed products. This may be due to a rather liberal definition of innovation in the service sector.

Table 10 shows the proportion of innovating firms which reported products significantly changed or newly introduced in 1990-92. In most countries, including Germany, Spain, Ireland, the Netherlands, Norway and the UK, the proportions vary only slightly across the firm size groups. In Luxembourg, however, manufacturing firms with 5 to 9 employees appear to be substantially less likely to have significantly changed or newly introduced products than larger manufacturing firms. UK service firms with 5 to 9 employees also appear to be less likely than larger service firms to have new or significantly changed products, while the opposite seems true in Germany.

The evidence on the type of product innovations emerging from firms in different size groups suggests that, in general, VSEs are not distinctive from larger firms either in terms of being more or less likely to introduce incremental innovations or radical innovations.

2.6. The share of Very Small Enterprises in overall national innovation activity

In the sections above, we considered both the share of VSEs in the total number of firms in Europe as well as the proportion of VSEs and indeed other size groups which reported innovations. In this section, we combine that information to examine the share of innovative VSEs in the total number of innovative firms. For the reasons of data availability and simplicity, we consider the case of the UK. As the data on UK services are not sufficiently disaggregated for our purpose here, we consider only UK manufacturing.

Table 11 shows a breakdown of the number manufacturing firms in the UK by size category. We exclude businesses with no employees

from the analysis for the reason that no such manufacturing businesses in the CBR survey reported either a product or a process innovation. The table shows that 50.6% of manufacturing businesses in the UK employed between 1 and 4 people. Firms with 5-9 employees make up 18.2% of all UK manufacturing business. So VSEs account for slightly above two-thirds of manufacturing businesses in the UK.

Table 11 also shows estimates of the share of innovative VSEs in the total stock of innovative manufacturing firms in the UK. The table suggests that slightly below 50% of innovative manufacturing firms in the UK are VSEs. Firms with 1-4 employees account for 22.1% of innovative manufacturing firms and firms with 5-9 employees 25.4%. So, despite the fact that manufacturing firms with less than 5 employees are only 30% as likely as those with 5-9 employees to introduce either a product or a process innovation, the number of innovative firms in the size category 1-4 employees is roughly the same as that in the category 5-9 employees. This is in terms of innovations new to the firm, i.e. including both diffusion and novel innovations. It can be seen from the table that VSEs also account for roughly 50% of manufacturing firms with novel innovations.

Two important points emerge from this section. Firstly, to exclude VSEs from innovation surveys probably means that there will be no information for as many as half of all innovative firms, at least in manufacturing. Given the greater importance of VSEs in the service industry, it is possible that VSEs constitute an even greater share of innovative service firms. Secondly, even if firms with fewer than 5 employees are significantly less likely to engage in innovation than larger firms, it is likely that innovative firms in this category constitute over 20% of all innovative firms, at least in manufacturing. So, to exclude firms with fewer than 5 employees from innovation surveys probably means that there will be no information for over 20% of all innovative firms.

It is important, however, to keep this in perspective in manufacturing at least. The table indicates that VSEs account for only 9.3% of manufacturing employment in the UK, so the roughly 50% of innovative firms in manufacturing which are VSEs account for only 4.4% of employment in innovative manufacturing firms. And novel innovators amongst manufacturing VSEs account for less than 3% of employment in manufacturing firms with novel innovations. Despite the low numbers employed in innovative VSEs, it has been argued that this group is believed to contain great potential for employment growth. For example, Bolton (1971) regarded small firms as the "traditional breeding ground for new industries - that is for innovation writ large... the natural seedbed of new industries, new talent and the large companies of the future" (pg 84). "We believe that the health of the economy requires the birth of new enterprises in substantial number and the growth of some to a position from which they are able to challenge and supplant the existing leaders of industry" (pg 85).

2.7. Conclusion on the pertinence of data on very small enterprise innovation activity

The VSE sector contains the overwhelming majority of firms in Europe. The sector's share of European employment is well below its below its importance in terms of the number of firms, but the sector nevertheless accounts for roughly one-third of employment in Europe and is clearly of considerable economic importance. It should not be surprising, therefore, that there is wide interest in data on the innovation activities of the VSE sector both amongst the representatives of national statistical authorities who collaborated in this research project as well as their data users.

The remainder of this section focused on differences in the proportion of innovating firms across size categories. The evidence is very strong that VSEs are less likely to innovate than larger firms. Nevertheless, the evidence that VSEs, at least those with 5-9 employees, are only marginally less likely to innovate than firms with 10-19 employees is

just as strong. Only two surveys, namely the IAB survey in Germany and the CBR survey in the UK provided comparable data for firms with 1-4 employees. In the IAB survey, firms with 1-4 employees were only marginally less likely than those with 5-9 employees to report an innovation. In the CBR survey firms with 1-4 employees were 32% as likely to report an innovation as firms with 5-9 employees.

The data from the CBR survey indicate that firms with 5-9 employees are only marginally less likely than firms with 10-99 employees to introduce either a novel product or a novel process innovation. However, firms with 1-4 employees appear to be significantly less likely to introduce novel innovations than firms with more than 5 employees. It should be noted that the claims made by VSE managers about the novelty of their innovations appears to be backed by the evidence on R&D activity in these firms. A higher proportion of innovating VSEs report R&D activity than report novel innovations. As far as the type of product innovations go, VSEs do not appear to be distinctive either in being more or less likely to focus on incremental or radical innovations.

Despite the smaller proportion of firms with 1-5 employees which are engaged either in diffusion or novel innovations, given the sheer weight of numbers of firms with fewer than 5 employees, it was estimated for manufacturing industry in the UK that innovative firms in this category account for 22.1% of all innovative firms. This figure is only slightly below the corresponding figure for innovative firms with 5-9 employees, which constitute 25.4% of all innovative manufacturing firms in the UK. Together, therefore, VSEs probably account for nearly 50% of all innovative firms as well as nearly 50% of all novel innovating firms in UK manufacturing. However, the importance of innovative VSEs in terms of employment is substantially lower. Novel innovating VSEs, for example, probably account for less than 3% of employment amongst novel innovators in UK manufacturing. Nevertheless, it has been argued that VSEs with

novel innovations are likely to have great potential for future employment growth and thus represent a vital 'seed-bed' for large companies of the future.

In conclusion, the evidence suggests that it is difficult to justify the exclusion of VSEs either on the basis that VSEs are not engaged in innovation activity or on the basis that innovative activity is not sufficiently widespread amongst VSEs. In many respects, it appears that firms with 5-9 employees are virtually indistinguishable in terms of their innovation activity from firms with 10-19 employees. So, if there is a case for including firms with 10-19 employees, then there is also a case for including firms with 5-9 employees.

The evidence on innovation activity amongst firms with 1-4 employees is so limited that it is more difficult to draw clear conclusions for this size category. The evidence from the IAB survey suggests that firms with 1-4 employees are only marginally less likely to be engaged in innovation than firms with 5-9 employees, while the evidence from the CBR survey implies that firms with 1-4 employees are significantly less likely to be engaged in innovation activity than firms with more than 5 employees. Clearly, there is a strong case for further research on innovation activity amongst firms with 1-4 employees, perhaps in the form of a pilot study. Even if the result of that work were to corroborate the results of the CBR survey, however, it should be noted that the sheer weight of numbers of firms with fewer than 5 employees means that innovative firms in this category will probably account for over 20% of all innovative firms. Even though there share of employment is substantially lower, the group of VSE which are novel innovators are important because of their potential for future growth. There would still be a strong case, therefore, for including firms with fewer than 5 employees in future innovation surveys on those grounds but also to find out more about VSE innovation activity.

3. Innovation Surveys of Very Small Enterprises: An Inventory and Critique of Current and Prospective Practice

In this section, we provide a critique of European data on VSE innovation and an inventory of current surveys of this aspect of VSE activity. We begin our discussion by reviewing the coverage across different firm size groups of official innovation surveys in a sample of European countries. This review is based on our postal and telephone survey. We also present the views of representatives of national statistical authorities regarding the inclusion of VSEs gathered from the same survey. This provides a useful summary of current expert views of the merits of including VSEs in innovation surveys. We then analyse a number of indicators of the quality of data on VSE innovation activity gathered in recent innovation surveys. The data quality issues that we focus on concern both intra-country comparability and inter-country comparability. In particular, we evaluate differences in response rates between VSEs and larger firms as well as the comparability of responses from VSEs and larger firms.

3.1. VSEs and innovation : An inventory of current and prospective surveys in the sample countries

Information on the coverage of VSEs in previous Community Innovation Surveys (CIS) and the plans for the inclusion of VSEs in future innovation surveys in our sample of seven European countries is shown in Table 12. Only two of the seven countries, namely Germany and Norway, have included VSEs in their official innovation surveys in the past. In Germany, the cut-off size in the 1993 CIS survey was 4 employees and in Norway the cut-off size was 5 employees. Finland, France, Italy and the UK, have plans to lower their cut-off sizes in the 1997 innovation surveys. Of these, however, only Finland will be including VSEs. France, Italy and the UK plan to include firms with more than 9 employees in the 1997 innovation surveys.

Table 12 also provides information on the views of respondents to our postal and telephone inquiries concerning the desirability of including VSEs in future innovation surveys beyond 1997 and, if so, whether or not there is a preferred cut-off point within the VSE sector. The table suggests that there is considerable interest in including VSEs in future innovation surveys. Only the French response implied no interest in including them. The respondents from Finland and the Netherlands specifically mentioned considerable demand from data users for information on innovation patterns in the VSE sector. In both of these cases, the view was expressed that there should be no cut-off in terms of size of firm to be included in future innovation surveys of the VSE sector. For the UK, the view was expressed that while it would be useful to include VSEs in future innovation surveys, the balance between additional benefit and response burden becomes unattractive in firms with below 2 or 3 employees. Surveys including such firms would "impose large burdens on business without generating much useful information. The response rate would also be likely to be very low". In general, however, it should be emphasised that there is wide acknowledgement both of the importance of VSEs to each national economy and a strong user interest in innovation data for the VSE sector. While there is a clear trend toward including smaller firms in official innovation surveys, our results suggest that in most cases this will not result in the inclusion of VSEs, at least in the near future.

Table 12 indicates two types of constraint on their inclusion. In France, Germany and Italy, concerns were expressed about inadequate coverage of the VSE population as a result both of unrepresentative sampling frames and the lack of knowledge about the exact weighting factors for different firm size categories in different NACE classes. These concerns correspond with the fact that the available business registers in these countries do not provide complete coverage of the micro firm population (or "universe"). We will return to this issue in a later section. In addition, there is some concern about low response rates amongst VSEs and the costs of surveying the VSE sector adequately. In Finland, the Netherlands, Norway and the UK, the

primary constraints on the inclusion of VSEs concerns the response burden on these firms, the costs associated with surveying VSEs and the belief that only a small proportion of VSEs will be engaged in innovation. The official business registers in these countries provide almost complete coverage of the micro firm population, so it should not be surprising that respondents did not express concerns over sampling frames.

It is worth examining each of the above points carefully.

3.1.1. The quality of sampling frames

Let us first consider the concern in France, Germany and Italy over the lack of official registers with complete coverage of the VSE population. Incomplete coverage will certainly result in difficulties in the evaluation of sample bias as well as related problems in the calculation of precise weighting factors in grossing up to population estimates. It is important to note, however, that these problems are not unique to the VSE sector. Official business registers for all size classes need to be updated regularly due to the change in the size and ownership structure of firms as well as the death of firms. These problems are however more severe in the smaller size classes due to the higher level of turbulence in the small firm sector. Even when official registers do achieve fairly complete coverage of the VSE sector, inaccuracies in such registers due to lags will always be a greater problem in the VSE sector. Discussions with a representative of Eurostat revealed that the weighting factors used with the CIS data for most size categories in several countries are highly imprecise. It is also worth noting that concerns about the inadequate coverage of VSEs in sampling frames has not meant that national statistical authorities exclude this sector in other official surveys. For example, the Italian statistical authority has conducted a survey of some 140,000 VSEs which gathered statistics on turnover, employment, value added and investments.

3.1.2. The trade-off between representativeness and cost: the sample design problem

Given the extremely large number of VSEs in each country cost considerations are important in the decision to include or exclude VSEs in innovation surveys. Achieving a "representative" sample of VSEs is widely perceived to involve a large number of firms and, hence, substantial additional cost.

It is is certainly true, however, that the standard procedure of stratification by size in business surveys generates a relatively smaller proportion of the population of small firms by comparison with large firms. The sampling frame of a current official innovation survey in Britain, for example, uses factors of 100% in firms with more than 1000 employees and factors well below 1% in the size category 10-19. Using smaller factors for VSEs in order to avoid extremely large sample sizes in this sector would be an entirely logical extension of normal sampling procedures. This in fact is the view adopted by those statistical authorities and other research organisations which do include VSEs in their innovation surveys. Even when samples are stratified in this way, however, VSEs may constitute a substantial proportion of the overall sample. As examples, the inclusion of firms with 1-9 employees in the CBR SME survey in the UK meant an additional 37% of firms in the sample, while the inclusion of firms with 5-9 employees in the Norwegian survey meant the inclusion of roughly 25% more firms in the sample.

The cost implications of increasing sample sizes in this way will depend upon the precise way in which samples are drawn and how the survey is conducted. If for instance in a small economy returns are compulsory or part of other regular officially required state surveys VSE response rates and prompting may be quite different from those in large economies with a more volunteristic approach (see section 3.2 below). Without access to detailed cost information it is impossible to be more precise. Cost minimization will certainly require very careful

sample stratification. To set against this cost, the benefits of including VSEs in terms of innovation activity which such inclusion would reveal may be significant as our discussion of those countries which have included them indicates (see 3.1.4 below).

3.1.3. Burdens on survey firms

Respondents from four countries specifically mentioned the reluctance of their statistical authorities to place further questionnaire response burdens on VSEs. When pressed on the issue of response burden on VSEs, several of our expert sample acknowledged that there is general pressure to reduce, or at least not increase, response burden on all firms. The pressure to reduce the response burden on VSEs is not noticeably greater than for other firms. In addition, a representative of an industry organisation in the Netherlands confirmed that part of his organisation's responsibility was to lobby for no further increase in questionnaire response burden for all firms, but that there was no additional effort being made on behalf of VSEs by comparison with larger firms. It is worth noting, in addition, that another industry organisation in the Netherlands with the particular role of representing small and medium enterprises has recently conducted its own innovation survey amongst members and this did include VSEs.

3.1.4. VSE innovation activity: Empty boxes and non-response

Another concern which respondents expressed is whether the extent of VSE innovation activity is sufficient to justify their inclusion in innovation surveys. Section 2 above focused on this issue directly using innovation survey data. We concluded that a strong case can be made for including firms with 5-9 employees but that further research is required on the inclusion of firms with 1-4 employees. Here we consider the views of respondents regarding this issue.

A Finnish respondent reported that the tiny contribution of VSEs to national R&D effort was a reason for Finland excluding VSEs from an innovation survey. A respondent from Norway reported that they have encountered negative reactions to the innovation survey from the large proportion of VSEs which are not engaged in innovation. It appears, however, that the Norwegian experience is the exception rather than the rule as there were no other organisations which had included VSEs in their innovation surveys which reported negative reactions from them.

The pilot study conducted in Germany achieved a lower response rate for VSEs than for larger firms. While it could be argued that this may be the result of a lower probability of VSEs responding to any kind of survey, it is possible that the fact that it was an innovation survey further reduced the probability that VSEs would reply. This could be either because a greater proportion of VSE respondents are not involved in innovation activities and therefore did not perceive the survey as relevant to them or, perhaps more fundamentally, because they were not even familiar with the concept of innovation. They were thus unable to respond meaningfully. If a higher proportion of VSEs than larger firms do not to respond for these reasons, then this would contribute additional bias (over and above that introduced by, for example, bias in the sampling frame). These are important questions and will be addressed empirically in later sections of this report. Suffice to say here that even if these were shown to be a problem in practice, it is likely that it will be possible to estimate the effect of any bias arising from a higher rate of non-response amongst VSEs. Even if it were not possible to take account of the bias, there will still be a question of whether no data is better than biased data.

3.1.5. Is survey methodology appropriate for researching VSE innovation activity?

A number of respondents expressed the view that while it would be valuable to gather more information regarding innovation activity in VSEs, such information cannot or should not be collected in the same way as with larger firms. The suggested ways to approach VSEs took a number of different forms. A respondent from Norway expressed the view that if firms with fewer than 6 employees were to be included in future Norwegian innovation surveys, only "very small innovators/inventors" should be targeted and that a case study methodology 'should be employed. The reason for this approach, according to the respondent, was to avoid surveying the large numbers of VSEs which are not engaged in any innovation activity. Adopting similar reasons, a respondent from Finland reported that in future innovation surveys in Finland, VSEs in a limited number of NACE classes with innovative VSEs will be included.

The French view appears to be that innovation activity in VSEs is so fundamentally different from that in larger firms that it cannot be captured adequately with the survey instruments used in official innovation surveys. Instead, the French respondents supported the idea of the use of case study methodology for VSE innovation surveys, along the lines of the "TIME" survey conducted by INSEE. This survey covered a sample of 1016 VSEs from the manufacturing sector in five different regions in France. Data was collected via face to face interviews with the enterprise chief executive. The interviews generally lasted over an hour. The reasoning behind the French approach is that few if any VSEs initiate their own innovations, but rather have innovation thrust upon them by the demands of their customers. It is not clear, however, why this should mean that the questions used in official innovation surveys are not appropriate for VSEs and thus why VSEs cannot be included in official innovation surveys. For example, the EC Harmonised Questionnaire used in the

CIS specifically included a question on the sources of information for innovation.

It is interesting to note that each of the above suggestions implies less representative coverage of the VSE sector, greater survey costs or both. The suggestions, therefore, appear to run counter to the main thrust of concern amongst respondents regarding the inclusion of VSEs in innovation surveys, namely the representativeness of the coverage and the cost of their inclusion. In addition, the Norwegian suggestion of only surveying innovative VSEs depends by definition on a prior survey in which innovative VSEs are identified.

If each of the above approaches were to be adopted in the respective countries, the resulting data would probably not be comparable either with those on VSEs in other European countries or with those on larger firms in those countries. If enough countries were convinced of the merits of undertaking case study research of VSE innovation activity rather than including VSEs in the official postal innovation surveys, it could be argued that these countries might be able to coordinate their efforts. This could help to ensure that the data gathered, while not comparable with those on larger firms in those countries, were at least comparable within the VSE sector across the different countries. However, given the difficulty within the CIS programme to date to achieve comparability across Europe, it would seem unwise to adopt an approach which held no prospect for achieving comparability across firm size groups within each country and relied entirely on comparability across Europe. It would depend in any event on each case study group agreeing on key questions to be asked.

This is not to downplay the potential benefit of case study methodology or the potential value of information gathered through that technique. Rather, the point to emphasise is that if case study data are the only source of data on VSE innovations, while postal survey data are the only source of data on larger firms, then it will not be

possible to make precise comparisons between VSEs and larger firms or to draw conclusions about the particular problems facing VSEs unless some standardization of data collection is achieved. In other words, case study data on VSE innovation activity would be far more useful if they could be analysed in the context of, for example, postal survey data for all size groups including VSEs. Gathering information on VSE innovation activity through case studies is not an alternative to the inclusion of VSEs in official postal innovation surveys. If Eurostat were to promote the gathering of information on VSE innovation activity, therefore, the first priority should be to achieve comparability across different firm size groups within each country. In the remainder of this section, however, we will examine the factors which need to be considered both for achieving intra-country as well as inter-country comparability.

3.1.6. Summary assessment of the concerns of experts over the inclusion of VSEs in innovation surveys

In summary, respondents raised a number of important problems concerning the inclusion of VSEs in innovation surveys. Of these we consider three to be central and to require further discussion. These are the problems of unit and item non-response, the meaning of innovation to VSE managers and the availability of sampling frames. We discuss each of these in turn.

3.2. Non-response to innovation surveys : further analysis using survey data

Table 13 shows the unit response rates for a number of European innovation surveys for which data could be obtained. It was possible to obtain separate non-response information for VSEs only for three surveys, namely the CBS survey in the Netherlands, the Norwegian CIS survey and the CBR survey in the UK. The table does not indicate any clear tendency for VSEs to be unique in terms of being significantly less likely than all other size groups to respond to an

innovation survey. In two of the three surveys for which it was possible to obtain VSE non-response information, VSEs were not the group with the lowest response rates and in the other, the response rate for VSEs was the same as that for firms with between 10 and 99 employees. More generally, none of the surveys indicate a strong relationship between firm size and response rates to innovation surveys.

As important as unit response rates for overall data comparability, are item response rates. Unfortunately, the information on item non-response rates for the innovation questions in the CIS surveys is rather limited. We were informed by a representative of Eurostat that data for the innovation questions in the CIS surveys were entered in such a way that the information on item non-responses was lost. The only information on item non-response in the case of innovation questions which could be obtained comes from the CBR survey of 1991. Tables 14 and 15 indicate the item non-response rates for the questions on product and process innovation in the 1991 CBR survey. Tables 14 and 15 indicate that 27% of 1991 respondents did not provide information on product innovations, whereas 38% of respondents did not provide information on process innovations. These are considerably higher item non-response rates than for other questions in that survey.

Table 14 indicates very small differences between firm size groups in the proportion of firms responding to the question on product innovation. Statistical tests were conducted on the response rates for different firm size categories and it can be seen that none of the differences are significant at the 10% level. The group which was least likely to respond to the product innovation question was firms with between 10 and 19 employees, not VSEs. Table 15 shows that VSEs are significantly less likely to have responded to the question on process innovation by comparison with firms with between 200 and 500 employees. However, VSEs are not significantly less likely to

have responded to the process innovation question by comparison with firms with between 10 and 199 employees.

This implies that VSE managers are just as likely as other managers, at least those in firms with up to 199 employees, to respond to questions about the innovation activity of their firms. However whether or not the term innovation means the same thing to VSE managers as to managers in larger firms when they answer these questions is another matter. We consider this question in a later section.

In the remainder of this section, we review the evidence on inter-country differences in response rates to innovation surveys. Although there is no evidence which suggests that VSEs are either less likely to respond to innovation surveys than larger firms or to be less likely to respond to innovation questions in innovation surveys, it is clear from Table 13 that there are large differences between countries in the response rates to innovation surveys. The available information on response rates is too limited to say whether the differences in response rates between different countries are systematic across firm size groups or whether the differences are greater for some size groups than in others. As noted above, Eurostat could not provide data on item response rates to innovation questions in the CIS and so it is also not possible to say whether item non-response rates vary across countries.

It is highly likely that variation in response rates across countries will explain at least part of the differences in the rates of innovation detected in the different surveys. A comparison of Tables 13 and 4 reveals a tendency for surveys with higher unit response rates (above 50%) such as the CBS survey in the Netherlands and the CIS survey to detect lower rates of innovation, while surveys with lower response rates (below 30%) such as the German CIS and the CBR survey in the UK to detect higher rates of innovation. This differences in the rates

of innovation between the high and low response rate surveys tend to be particularly sharp for the smaller size groups.

To the extent that these results suggest that unit non-response to innovation surveys is more likely amongst firms which are not engaged in innovation, the pattern is what one would expect as managers are likely to want to avoid releasing information which could reflect negatively on their skills. Given the strong evidence that smaller firms are less likely than larger ones to be engaged in innovation, however, we would expect the higher probability of non-response amongst non-innovators to lead to higher unit non-response amongst smaller firms which does not appear to be the case. Rather, the pattern of non-response in Table 13 suggests that the non-response "mechanism" is driven more by inter-country differences rather than by intra-country differences. For example, making a survey mandatory is likely to improve the response rate. It appears that Italy was the only country in the 1993 CIS to make its innovation survey mandatory. The Italian response rate was above the average for the CIS surveys, though the French achieved a higher response rate despite the fact that theirs was voluntary. The kind of institution conducting the survey in each country also has a large effect on the response rate. National statistical authorities or other government departments achieve higher response rates than sub-contractors either in the private or university sector.

The impact of the causes of different non-response rates to innovation surveys between countries as well as their effects on the rates of innovation detected by these surveys requires more research. In particular, more work is required to establish whether this source of bias is systematic or varies across firm size groups. It may be possible to reduce the level of variation in response rates by standardising the procedures used to survey firms across countries. It is probable, however, that some variation in response rates will remain due to myriad cultural, institutional and political differences between countries. What is essential in future is that non-response data are

released with innovation survey data to allow researchers to take account of differences in response rates across different countries.

3.3. Does the term innovation mean the same thing to VSE managers as to managers in larger firms?

An issue of primary importance is the extent to which the term innovation can be understood and contextualised in a VSE environment. If, as is suggested by the results on response rates, the term is term is as widely recognised amongst managers in the VSE sector as in larger firms, then another important question arises. This is whether or not it means the same or a comparable thing to those managers as to managers in larger firms. As noted above, a French respondent argued that innovation activity in VSEs is so different to that in larger firms that it cannot be captured by the same questions. Even if VSE managers do respond to standard innovation questions, such as the introduction of new products and processes, therefore, their responses may not be comparable with those of larger firms.

The CBR longitudinal database provides a valuable insight into this question. This insight arises from a change that occurred between surveys in the way the innovation questions were posed. The innovation questions from both the 1991 and 1995 CBR surveys are shown in the Appendix. In 1991, the questions on innovation did not have any preamble explaining what was meant by innovation and on what basis improvements in products and processes could be classified as innovations. The reason for adopting this approach was to make the question compatible with the question on innovation which had been asked in a previous survey (see Bolton 1971). By contrast, the innovation questions in the 1995 survey provided a detailed description of what was meant by innovation and on what basis product and process improvements should be classified as innovations, along the lines of the definition of innovation in the European Community harmonised innovation questionnaire for the 1992/93 Community Innovation Survey. The change in the way the

questions were asked allows us to examine whether the introduction of a definition of innovation affected the responses of VSE managers to the same extent as it affected those of managers in larger firms. This comparison is facilitated by the fact that the same firms were approached in both surveys.

Tables 14-19 show how the responses to innovation questions in both the 1991 and 1995 SME surveys carried out by the Centre for Business Research vary by firm size and sector. Table 14 reports the basic statistics relating to response rates by size class to product innovation questions in the CBR 1991 survey. It can be seen that of those VSEs which responded to the question on product innovation in 1991, 55% reported that they had introduced a product innovation. VSEs are marginally less likely to have reported a product innovation in the 1991 survey by comparison with firms with 10 to 99 employees and significantly less likely by comparison with firms with between 100 and 199 employees. If the item non-respondents are included in the denominator of the calculation of the proportion of innovative firms, then the probability of VSEs reporting a product innovation becomes significantly different from firms with between 100 and 500 employees. It should be remembered that these two measures, achieved by either excluding or including item non-respondents, provide a range within which the true proportion of innovative firms in each category is likely to lie. If we assume that unit non-respondents were no less likely to introduce product innovations than the respondents, then the true proportion of VSEs which introduced product innovations is likely to be in the range 39.7% to 55.1%. By either measure, the probability of a product innovation being reported by a VSE is not significantly different from firms with between 10 and 99 employees. This pattern appears to be common to both the manufacturing and business service sectors. Within the VSE category, there do not appear to be any significant differences in the probability of a product innovation being reported.

Table 15 provides a similar analysis for process innovation. It indicates that there are greater differences across firm sizes in the reporting of process innovations than for product innovations in the 1991 survey. VSEs are significantly less likely to report a process innovation than firms with more than 20 employees and firms with between 10 and 19 employees are significantly less likely to report a process innovation than firms with more than 100 employees. These differences appear only to be present in the manufacturing sector, with only marginal variation across firm size categories in the business services sector. Within the VSE category, there does not appear to be significant variation in the probability of a process innovation being reported. The true proportion of VSEs which introduced a process innovation is likely to lie in the range 19.6% to 34.1%.

We can obtain a measure of the compatibility of innovation definitions in the minds of VSE and other managers by evaluating the responses to innovation questions in the 1991 and 1995 surveys together. For a sample of 1991 respondents, the database contains responses on innovation activity in the 1995 survey from the same firms. The 1995 survey, based upon the Community Innovation Survey (CIS), provided a detailed description of what was meant by innovation and on what basis product or process improvements could be classified as innovations. This allows us to evaluate the effect of the introduction of a precise and restrictive definition of innovation on the probability of a firm reporting an innovation and how this might vary by firm size. Due caution should be taken, however, as there is a possibility that the extent of innovation might have changed between the time periods. If indeed it did, it may not necessarily have changed to the same extent in the different firm size categories.

Tables 16 and 17 show the proportion of firms reporting product and process innovations in the 1995 survey respectively. To avoid attributing an innovation to the wrong size category, these tables exclude those firms which were no longer independent in 1995, i.e. those firms which had been acquired between 1991 and 1995. A

comparison of Tables 14 and 16 reveals that the probability of a firm reporting a product innovation in the 1995 survey (49.5%) lies in the range created by the two measures of the proportion of firms which were product innovators in 1991 (44.1%-60.7%). This means that for the full sample in 1991 and that in 1995, the overall rate of product innovation may not have changed. If we consider each size category in turn, it can be seen that for firms with between 200 and 500 employees, the proportion of firms which were product innovators in 1995 was above the top limit of the range in 1991. In the categories 10-19, 100-199, and 200-500, the proportion of firms which were product innovators in 1995 was within the range in 1991. However, the proportion of VSEs which were product innovators in 1995 (32.6%) was below the 1991 range (39.7%-55.1%). This is mainly due to the apparent fall between 1991 and 1995 in the proportion of firms with between 1 and 4 employees reporting product innovations. The proportion of these firms which reported product innovations in 1995 (18.2%) was less than half the lower estimate in 1991 (37.1%), while the proportion of firms with between 5 and 9 employees which reported product innovations in 1995 (40.0%) was close to the lower estimate in 1991 (41.2%).

A comparison of Tables 15 and 17 reveals a similar pattern for process innovations with the proportion of process innovators in 1995 lying in or above the 1991 ranges for the samples as a whole and for size categories 10-19, 20-99, 100-199, and 200-500. In this case, the proportion of VSEs reporting process innovations in 1995 (25.6%) does lie with the 1991 range (19.6%-34.1%). However, firms in the category 1-4 reported a lower proportion of process innovations in 1995 (13.6%) than the lower estimate in 1991 (17.6%).

Unless there was a significant downward trend between 1991 and 1995 in the probability of VSEs (particularly firms with between 1 and 4 employees) introducing either product or process innovations, these results imply that the introduction of a more clearly defined and restricted definition of innovation in the 1995 survey appears to have

reduced the likelihood that VSEs would report a product or process improvement as an innovation. The introductions of the definition increased or left unchanged the probability of larger firms reporting an innovation. This suggests that VSE managers are distinctive in tending to adopt a more inclusive definition of innovation than other managers. Thus, including a definition of innovation may be uniquely important in the case of VSEs and, particularly, firms with less than 10 employees.

It was noted in Cosh et al. (1997) that those firms which responded to the 1991 survey but which subsequently failed were less likely than survivors to have introduced either a product or process innovation while those firms which were subsequently acquired were more likely than those that remained independent to have introduced a product or a process innovation. Thus, by comparing the entire 1991 sample with the 1995 sample, we have introduced two sources of bias. The inclusion in the 1991 sample of firms which subsequently failed has the effect of increasing the probability that a firm will report an innovation in 1995 relative to 1991. The inclusion in the 1991 sample of firms which were subsequently acquired has the effect of reducing the probability that a firm will report an innovation in 1995 relative to 1991. The extent of the bias is likely to be different across different firm size categories as a disproportionate number of failing firms were small and a disproportionate number of acquired firms were larger firms.

Tables 18 and 19 attempt to account for this bias. These tables show the proportion of firms which reported product and process innovations in 1991, but excluding all those firms which either had failed or had been acquired by 1995. Tables 18 and 19 are more comparable with Tables 16 and 17 as the latter exclude failed firms by definition and, as noted above, also exclude those firms which responded to the 1995 survey but had been acquired between 1991 and 1995. In fact, a comparison of Tables 14 and 15 with Tables 18 and 19 reveals that correcting for bias does not dramatically change

the picture. The only substantial change is that for both product and process innovations, the probability of firms with 5 to 9 employees reporting a product or a process innovation in 1995 is within the range in 1991. In other words, it is only firms with between 1 and 4 employees where the probability of reporting an innovation in 1995 is below the lower figure for 1991. This suggests that it is only in the smallest category of firm, i.e. those with 1 to 4 employees, where the introduction of a restrictive definition of innovation substantially reduces the likelihood of new or improved products or processes being classified as an innovation when in fact they are not comparable with innovations in other firms.

These results strongly suggest that unless a clear definition of innovation is employed, managers in firms with between 1 and 4 employees are likely to overestimate their innovation activity by comparison with managers in all other categories of firms with up to 500 employees.

3.4. The availability of sampling frames for VSEs in Europe

Even if all the statistical authorities in Europe were convinced of the importance of including VSEs in official innovation surveys, their ability to do so will be constrained by the coverage and quality of available business registers in order to generate suitable sampling frames. As noted above, however, this problem is not limited to VSEs. In many countries, the quality of business registers with regard to larger firms is also far from perfect. We outline the limitations of existing business registers in Europe.

3.4.1. The firm size coverage of sampling frames

Table 20 shows the availability of sampling frames for identifying VSEs for future innovation surveys. The table indicates that in the cases of Finland, the Netherlands and Norway, respondents from national statistical agencies reported that the business registers

provided virtually complete coverage of all firms in those countries. In the case of the UK, the "Interdepartmental Business Register" provides virtually complete coverage for all firms except those which are one person businesses. The official business registers which are available in France, Germany and Italy do not provide complete coverage of the VSE sector.

In the countries which lack business registers covering all firm size groups, organisations including VSEs in their innovation surveys are forced to rely on a variety of other sources for their sampling frames. The CIS survey in Germany has utilised a private business register, "Verband der Vereine Creditreform", which is a credit rating database. The survey conducted by the Institut für Arbeitsmarkt und Berufsforschung (IAB) made use of the business register of German establishments with more than one employee subject to compulsory social insurance which is held by the Bundesanstalt für Arbeit. The Institut für Wirtschaftsforschung (IFO) makes use of business registers provided by the relevant industry associations. One German respondent estimated that the currently available business registers cover only 50% of firms with fewer than 5 employees. The French respondents implied that researchers there have considerable difficulties in generating sampling frames of VSEs. However, difficulties in the creation of adequate sampling frames are not unique to organisations in countries which lack business registers covering all firm size groups. In Britain, for example, non-governmental organisations are not allowed access to the official government register unless the survey in question is being carried out under contract for a government department. The CBR surveys, therefore, rely on the Dun and Bradstreet credit rating database.

The coverage of official business registers in Europe is set to improve, thus reducing the difficulties associated with generating representative sampling frames and calculating weightings. According to the European Union Regulation Nos. 2186/1993 and 58/1997, member countries will be obliged to generate more complete business registers

in future. In both Germany and Italy, there are currently large projects underway to integrate data from a large number of different databases on companies to produce a single, virtually complete register of businesses. The Italian project appears to be nearing completion, while the Germans appear to be some way off generating a complete business register. A respondent engaged with the project in Germany suggested that it was unlikely that the new integrated database would achieve full coverage of VSEs but reported that it was not possible at this stage to say how good the coverage of VSEs will be in the new integrated database. It is not known what is being done in France to meet the requirements of these European regulations.

3.4.2. The definitional issue

One of the areas in which the 1993 CIS surveys did not achieve full comparability concerns the sample unit. While the Eurostat norm of focusing on legally independent enterprises was adopted in some countries, several countries adopted different sample units. In the Netherlands, principal establishment was used as the sample unit. In Denmark and Norway, the sample units were the "smallest legal identities" and these were not necessarily independent units. In Belgium and Germany, it appears that in most cases the independent enterprise was the sample unit. However, in both cases there were exceptions to this rule with some large firms in Germany being split up into business divisions on the basis of their business reports and for Belgium, in cases with firms having establishments in more than one region, the principal establishment was used as the sample unit. (Archibugi et al. 1994). In France, Ireland, Italy and Luxembourg, it appears that legally independent enterprises were surveyed.

Deviations from the accepted standard definition of sampling unit could substantially effect the results, thus limiting the value of a comparison of innovation patterns between countries for all size groups, including VSEs. Ideally, this problem should be resolved at the sampling frame stage of each survey round. However, to the

extent that differences in the choice of sample units are forced upon countries by virtue of the available business registers, it is possible to account for the effects of the bias by asking additional questions in the survey questionnaire in order to distinguish between those units which are independent and those which are not. We will return to this issue in the next section.

3.5. Summary conclusions

A number of reasons were put forward by respondents in national statistical authorities as to why VSEs could not or should not be included in future innovation surveys. One argument against the inclusion of VSEs in innovation surveys centres around fears over unrepresentative samples of VSEs in innovation surveys. This, it is argued, will be a result of both the limited coverage of the VSE sector in the available business registers in certain countries as well as the cost of surveying large numbers of VSEs. It can be argued, in response, that gathering no information on innovative activity in the VSE sector is not necessarily preferable to gathering some information, however imperfect. In this regard, it is interesting to note that all of the four major non-CIS innovation surveys which have been discussed above, namely the IFO survey in Germany, the IAB survey in Germany, the CBS survey in the Netherlands and the CBR survey in the UK included firms with 5-9 employees and three of these, namely the IFO, the IAB and CBR surveys included firms with 1-4 employees. Hence, concerns over the representativeness of data on the VSE sector do not appear to be sufficiently great to stop many researchers from including even the smallest firms in their innovation surveys.

Most of this section, however, focused on the concerns of the respondents to our questionnaire survey about two related issues. First, whether or not the term "innovation" was sufficiently well understood in VSEs and second, whether or not innovation activity

was sufficiently comparable to that in larger firms to justify the inclusion of VSEs in innovation surveys.

To begin with, we examined the extent to which VSEs were significantly different from larger ones. We did this both in terms of unit non-response rates to innovation surveys and in terms of item non-response rates to innovation questions. There does not appear to be any substantive evidence which suggests that VSEs are distinctively less likely than larger firms to respond either to innovation surveys or to innovation questions in those surveys. We concluded, on the basis of this evidence, that managers in VSEs are as likely as those in larger firms to believe that they understand the term innovation. Cross-country differences in response rates to innovation surveys were also analysed. The large disparities in response rates between countries are likely to bias inter-country comparisons of innovation rates. The bias is likely to be more severe amongst smaller firms. Ideally, disparities in response rates should be addressed in the design stage of a survey, though some differences might remain. At the very least, full information on both unit and item non-response should be released to enable researchers to estimate the impact of non-response bias.

We also addressed the question of whether VSE managers understand the term innovation in the same way as managers in larger firms. This was examined by analysing the differences between VSE respondents and those in larger firms to a change in the definition of innovation. The analysis suggested that in the absence of a restrictive definition of innovation and, in particular, a clear guide for identifying product and process innovations, VSE managers tend to err on the side of optimism, i.e. they are likely to report an innovation in cases where managers in larger firms would not. The evidence for this conclusion arises from the fact that when a restrictive definition of innovation is employed, the proportion of firms which report innovations drops significantly in the case of VSEs but not for larger firms. This was found to apply only to firms with 1-4 employees. The same was not

found to be the case for firms with 5-9 employees. This result implies that managers in firms with 1-4 employees take a more optimistic view of the innovative capabilities of their firms by comparison with managers in larger firms. However, most innovation surveys now utilise clear definitions of innovation as well as guidelines on how to classify product and process changes as innovations. This suggests that the optimism of VSE managers may not necessarily translate into biased or incomparable responses to innovation questions.

The coverage of VSEs in official business registers in some countries is some way from being complete. On its own, however, this problem does not appear to justify the exclusion of VSEs from official innovation surveys. Valuable information on VSE innovation activity can and is being gathered from samples of those VSEs which are currently included in official or private business registers. Recent EU directives will ensure more complete coverage of firms, particularly VSEs, in official business registers in the not too distant future. Difficulties in achieving comparability across countries and across firm size groups in terms of sampling unit were also noted. In cases where it remains difficult to achieve comparability for sampling frames in different countries, for example in the area of the sample unit, additional questions in the survey questionnaire will make it possible to account for this source of bias.

Finally, it is important to emphasis that treating VSEs differently from larger firms in future innovation surveys will dramatically reduce the usefulness of the data gathered. For example, a decision to gather data on VSE innovation activity through case studies only is likely to constrain severely the extent to which comparisons can be made between VSEs and larger firms. If it is decided that innovation activity in VSEs is worthy of further investigation, then the research effort should be focused on ways of achieving the maximum possible comparability with innovation data for larger firms.

4. A European Pilot Project of Innovation in VSEs: Operational Outline

4.1 Enterprise coverage

It is important that the definition of VSE is consistent across countries in a European pilot survey. The definition adopted should be the EU definition of the enterprise as discussed in Section 2.3.1 above. It is important therefore that very small businesses which are subsidiaries of larger enterprise groupings are identified in the survey process. This has implications for the sampling frames to be used and for the questionnaire and survey process which are discussed further below.

The measure of enterprise employment used in the harmonised EU enterprise data includes working proprietors and excludes businesses with no employees. This is appropriate for the pilot survey, but our review of the problems associated with the inclusion of VSEs, their significance within the business sector as a whole, and their contribution to innovation suggests that the pilot study should take a higher cut-off than one employee. Practical considerations lead to the case for excluding firms with 1 employee. There is a tendency for self-employed people whose businesses do not employ any other people to report that the business employs one person. According to official definitions, such businesses have no employees. The result of this would be to include firms with no employees mistakenly. We therefore would propose that the pilot survey should cover independent businesses with 2-9 employees. This will help ensure that the problems of including self employed with no employees and including larger numbers of VSEs with limited innovation potential are minimised.

4.2 Sector coverage

The sectoral coverage of the 1993 CIS varied from country to country. It is important that the pilot survey should not be too ambitious in its

sectoral scope in order to ensure a consistent treatment across the countries. It is desirable that the pilot survey should cover the whole of manufacturing and should take in some service sectors. At a minimum the service sector coverage should include the large and fast growing business service sector. This would have the advantage of yielding comparability with the earlier CBR survey in the UK and the Italian, German and Dutch innovation surveys.

4.3 Sampling frames and country coverage

The sampling frames available in each country vary in their coverage. The turbulence within the VSE sector means that the information, particularly about their size category, becomes dated quickly. Businesses can grow beyond the higher size threshold, or decline below the lower threshold or even fail. A survey of VSEs alone will imply some inefficiency since the questionnaire will be received by many which fall outside the size boundaries. We discuss ways of minimizing this inefficiency when we consider survey method below.

In the context of a pilot survey it may be sensible to restrict the survey to 4 or 5 countries. with different register coverage and economy size. It view of the initial issue of consistency of enterprise definition and questionnaire design an appropriate pilot structure would be for a centrally coordinated pilot. A small team of experts drawn from the chosen countries should design and translate the questionnaire and ensure consistency of enterprise definitions. A suggested sample of countries would be UK, Germany, France, Netherlands and either Finland or Norway. The cooperation of national statistical agencies would be essential but the process itself could be expeditiously organised by independent research groups with appropriate experience.

4.4 Sampling proportions and sample size

The sampling proportions required depend upon the response rate, the underlying size distribution of businesses and the desired sample size. The sample size varied dramatically across the participants in the CIS and this can be expected for the pilot survey. However, where the size of the enterprise population permits, the minimum response sought should be completed questionnaires from 300 businesses in the VSE size range in each chosen country. The possibility of industry stratification in sampling will depend upon the quality of the sampling frames and the achieved samples which are sought. With a target number of responses in the range 300-400 desegregation to the broad 2 digit NACE level is a realistic possibility. Raising the number of responses above 400 would substantially increase the possibility of distinguishing between different size bands within the VSE sector and between novel innovators and the rest, since our evidence suggests that the incidence of novel innovators is rather low.

Our analysis of response rates to innovation surveys did not suggest a significantly lower response from smaller businesses. On the other hand it did suggest a wide variation in response rates across the countries. These differences need to be taken into account in the selection of each country's sample size and would be a matter for detailed discussion at the proposed experts' meetings.

The selection of appropriate sampling proportions will depend upon the quality of data about the sampling frame. The very large numbers of VSEs suggest that the proportion will be 5-10 times lower than that for the 10-49 employees group if one were seeking approximately equal numbers of returns from these size groups in a full survey.

4.5 Survey method

Our earlier discussions in section 2 of this report suggested that VSEs do not require a special methodology. It is proposed that the prime

survey method should be by postal questionnaire. There are some additional stages which, if they can be afforded, add greatly to the response rate and quality of information gathered by this method.

In particular the use of a pre-questionnaire telephone call designed to check basic information about the business is useful. It provides a check on the quality of the sampling frame and on whether the business is an independent business of the right size in the right sector. It encourages businesses to participate and provides a person to whom the questionnaire would be sent.

4.6 Choice of questions in the survey instrument

The first set of questions should provide a check that the business is correctly included in the sample and should cover whether it is independent, its size, date of formation and its sector of activity. It is useful if this section also gathers information about the business' recent performance since this provides the basis for subsequent analysis.

The innovation questions should match those from the CIS to enable the VSE sector to be located within the findings for the whole SME sector.

4.7 Questionnaire design

Our analysis suggested that it is particularly important to stress to VSEs that we are interested in innovation within small firms. It is also important to explain carefully what is meant by innovation. The use of multiple questions about innovation activity is important so that one can assess the innovativeness of a business on a number of criteria.

It is also important to include questions which distinguish between original and imitative innovation and which explore the linkages between VSEs and larger businesses.

4.8 Survey conduct and management

The contract for the pilot survey will presumably be put to tender. Tender analysis should take account of the experience of the organisation in carrying out this sort of survey and require full details of the sampling frame, sampling methodology, pre-questionnaire checks, management of the survey, data quality audits, data processing and subsequent analysis.

The use of telephone enquiries prior to sending out the questionnaires has been discussed above. The response rate can be improved by also using a prompt 2-3 weeks after sending out the questionnaire. This prompt can be in the form of a letter. A subsequent telephone prompt is also desirable. This telephone call can be used to ask whether the questionnaire will be returned shortly but, if not, a reduced set of questions can then be asked over the telephone.

The country team carrying out the pilot survey should also be responsible for locating the findings for VSEs within the whole business sector and the timing of the survey within the economy's business cycle.

TABLES AND CHARTS

Table 1 The Share of Enterprises and Employment by Enterprise Size Class in Europe in 1995

Employment Size Class	Share of Enterprises	Share of Employment
0-9	92.5	32.4
10-19	4.1	8.7
20+	3.4	58.9
All	100.0	100.0

Source : Calculated from Fourth Annual Report 1996 The European Observatory for SMEs Table 1.1

Note : Data refers to non-primary private enterprise in 19 European Union countries and excludes non-EU enterprises.

Table 2 Average Annual Changes in Real Value Added and Employment in Non Primary Private Enterprise by Employment Size Class

	Growth in Real Value Added (% p.a.)			
	1988-90	1990-93	1993-97	1988-97
Employment Size Class				
0-9	5.0	0.5	3.0	2.5
10-49	2.8	0.5	3.0	2.3
50-249	2.5	0.5	3.0	2.3
250+	2.8	1.0	3.5	2.5
All	3.3	0.8	3.3	2.5
	Growth in Employment (% p.a.)			
	1988-90	1990-93	1993-97	1988-97
Employment Size Class				
0-9	3.0	-0.5	0.3	0.5
10-49	2.5	-1.3	0.5	0.3
50-249	2.5	-1.8	0.5	0.3
250+	0.8	-2.0	1.0	0.0
All	2.0	-1.5	0.5	0.3

Source : Calculated from Fourth Annual Report 1996 The European Observatory for SMEs Table 1.6

Table 3 The Distribution of Economic Activity by Employment Size Class of Enterprise* in Selected Countries

Country	Measure of Activity	Share of Activity by Employment Size Class				
		Very small Enterprise (%) 1-9	Small Enterprise (%) 10-49	Medium Enterprise (%) 50-199	Large Enterprise (%) 200+	All Enterprises (000's)
Finland	Enterprises	85.6	11.6	2.2	0.6	78.3
	Employment	17.5	17.7	17.6	47.2	1,019.8
	Turnover	15.4	15.8	16.7	52.2	131,681.3
France	Enterprises	83.0	14.0	2.5	0.5	821.9
	Employment	17.8	21.0	17.5	43.6	11,785.3
	Turnover	14.3	20.2	18.9	46.6	1,794,884.9
Germany	Enterprises	80.6	16.4	2.3	0.7	1,430.3
	Employment	21.1	21.0	14.8	43.0	20,467.0
	Turnover	13.8	19.8	20.2	46.2	2,758,637.8
Italy	Enterprises	93.7	5.6	0.6	0.1	2,913.2
	Employment	45.8	21.3	11.4	21.5	14,207.1
	Turnover	n/a	n/a	n/a	n/a	n/a
Netherlands	Enterprises	78.8	17.5	2.9	0.8	203.4
	Employment	18.4	23.5	18.8	39.3	3,121.6
	Turnover	18.6	23.9	20.9	36.7	416,101.5
Norway	Enterprises	89.6	8.7	1.4	0.4	118.3
	Employment	29.2	23.0	17.7	30.1	853.6
	Turnover	21.9	22.6	18.2	37.4	153,206.7
UK	Enterprises	79.7	16.6	3.0	0.7	826.6
	Employment	15.4	18.0	16.4	50.2	15,142.3
	Turnover	n/a	n/a	n/a	n/a	n/a

Note : * Enterprise with at least one salaried employee. For the Netherlands the data refers to "kind-of-activity units" (KAU) rather than enterprises.

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Table 4. Proportion of firms which introduced an innovation in the period 1990-92 by size class and by country

Country	Survey	Employment Size Class 1-4	5-9	10-14	15-19	20-99	100-199	200-500	1-500	(%)
Manufacturing										
Belgium	CIS	-	(43.2)	35.2	48.0	55.6	79.5	83.8	**62.3**	-
Germany	CIS	-	62.4	47.4	63.7	63.1	68.4	78.2	**66.3**	79.8
	IFO[a]	»	»	»	28.6	46.0	59.3	68.1	**56.1**	-
	IAB[b]	19	27	»	28	43.6	48	58	**37.9**	46.6
Denmark	CIS	-	-	(25.8)	(20.3)	50.2	69.3	77.2	**59.7**	-
Spain	CIS	-	(100)	(95.6)	(92.0)	31.3	56.8	67.6	**38.4**	-
France	CIS	-	-	(40.7)	(32.4)	34.3	44.5	57.2	**38.5**	-
	INSEE[c]	»	18	-	-	-	-	-	-	
Italy	CIS	-	(13.6)	(13.5)	(16.8)	30.0	47.6	59.0	**31.9**	-
Ireland	CIS	-	-	45.2	58.7	69.9	71.8	83.8	**66.6**	-
Luxembourg	CIS	-	21.6	24.5	16.0	31.2	46.3	41.8	**27.6**	51.7
Netherlands	CIS	-	(41.6)	30.3	44.3	50.9	75.9	80.4	**58.2**	-
	CBS[d]	-	22	30	29	42	52	70	**37.4**	31.4
Norway	CIS	-	13.4	17.4	31.6	46.2	60.3	78.6	**37.9**	17.0
UK	CBR[e]	18.8	60.0	65.0	75.9	69.1	85.0	83.3	**67.4**	72.0
Services										
Germany	CIS	-	64.5	27	62.7	28.4	44.7	59.3	**43.2**	**108.8**
Italy	CIS	-	-	-	-	30.3	46.7	38.5	**34.1**	-
Netherlands	CIS	-	(16)	16.7	28.2	27.5	48.1	59	**33.9**	-
UK	CBR[e]	39.3	57.1	63.3	71.4	71.1	69.2	72.7	**63.5**	**78.5**

Sources: Eurostat, Bellmann et al. (1996), CBR SME Database, Centraal Bureau voor de Statistiek Automatiseringsstatistieken, Schneeweis and Smolny (1996).
Note: Figures in brackets refer to firms which were mistakenly included in the sample. In all cases, the sampling frame information suggested that the firms were above the cut-off size for the particular country, but the survey later revealed that they were not above the cut-off size.

The double arrows indicate cases where a proportion refers to a larger range of firm sizes than that in any particular category in the table. For example, the available information for the German IAB survey indicates that the proportion of innovative firms in the category 10-19 employees was 28%.

In the case of the CIS, IFO and CBR surveys, the data in the table indicate the proportion of firms which introduced a product or process innovation. The reason for this is that it was reported by Eurostat that the separate data for product and process innovations is less reliable than that for whether or not the firm had introduced any innovation.

(a) Data are from the company panel 1980-92.
(b) Data cover product innovation only. The IAB survey of 1993 covers establishments rather than enterprises and includes a range of non-manufacturing industries including business and other services, agriculture, mining.
(c) Survey included enterprises with fewer than 10 employees which also turned over more than 2 million FF, were registered in "Répertoire des Métiers" and which had been in the same industrial activity for more than 5 years.
(d) The Centraal Bureau voor de Statistiek Automatiseringsstatistieken survey of 1996 provides data on whether or not a firm utilises a range of different process innovations including computer aided design, manufacturing and planning. Thus, the data provide a measure of the stock rather than the flow of process innovations. The data shown indicate those firms which use computer aided manufacturing.
(e) The UK data refer to innovations in the period 1992-95.

Table 5. Reporting of novel product innovations in 1995 CBR survey in the UK

Number of employees (1-500)															
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	1-500
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4			a			b	c	d	e	
	v	u	w	x	h	i		j	k					
Totals							129			93	206	46	29	503
	6	16	9	13	44	85		50	43					
Product innovation new to industry														
All firms														
% all firms with novel product innovation														
% all firms with novel product innovation							12.4			18.3	20.9	26.1	31.0	19.3
% all firms with novel product innovation					4.5	16.5		22.0	14.0					
% all firms with novel product innovation	0	6.3	11.0	0										
Manufacturing firms														
% all firms with novel product innovation														
% all firms with novel product innovation							19.6			22.4	19.5	20.0	38.9	21.5
% all firms with novel product innovation					6.3	25.7		30.0	17.2					
% all firms with novel product innovation	0	0	25.0	0										
Business Service firms														
% all firms with novel product innovation														
% all firms with novel product innovation							7.8			13.6	22.9	30.8	18.2	17.0
% all firms with novel product innovation					3.6	10.2		16.2	7.1					
% all firms with novel product innovation	0	11.1	0	0										

Source: CBR SME Database

Table 6. Reporting of novel process innovations in 1995 CBR survey in the UK

Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	1-500
Number of employees (1-500)														
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4										
							a			b	c	d	e	
	v	u	w	x	h	i		j	k					
Totals														503
							129			93	206	46	29	
	6	16	9	13	44	85		50	43					
Process innovation new to industry														
All firms														
% all firms with novel process innovation														10.5
% all firms with novel process innovation							5.4[de]			6.5[de]	9.7[e]	21.7	34.5	
% all firms with novel process innovation					4.5	5.9		6.0	7.0					
% all firms with novel process innovation	0	6.3	0	7.7										
Manufacturing firms														
% all firms with novel process innovation														11.5
% all firms with novel process innovation							5.9[e]			4.1[e]	11.4[e]	20.0	38.9	
% all firms with novel process innovation					0	8.6		5.0	3.4					
% all firms with novel process innovation	0	0	0	0										
Business Service firms														
% all firms with novel process innovation														9.5
% all firms with novel process innovation							5.2			9.1	7.2	23.1	27.3	
% all firms with novel process innovation					7.1	4.1		6.7	14.3					
% all firms with novel process innovation	0	11.1	0	11.1										

Source: CBR SME Database

Table 7. Proportion of innovating firms which were engaged in R&D in 1992

		Employment Size Class						
Country	Survey	1-4	5-9	10-14	15-19	20-99	100-199	200-500
Manufacturing								
Belgium	CIS	-	(31)	61.6	60.8	72.6	90.3	89.2
Germany	CIS	-	42.7	55.5	41.9	56.4	73.9	86.8
Denmark	CIS	-	-	(0)	(40.8)	68.2	81.4	91
Spain	CIS	-	(71.8)	(87.9)	(92.3)	44.5	73.8	76.8
France	CIS	-	-	-	-	-	-	-
Italy	CIS	-	(52.6)	(42.9)	(40.3)	50.4	70.2	82.7
Ireland	CIS	-	-	83.9	80.6	86.4	80.1	89.6
Luxembourg	CIS		46.5	8.9	48.6	57	81.3	90.2
Netherlands	CIS	-	(38.7)	40.3	48.4	58.3	75.9	81.9
Norway	CIS	-	41.7	47.7	67.6	62.2	61.3	72.8
UK	CBR	66.7	85.7	69.2	72.7	70.6	76.5	100
Services								
Germany	CIS	-	49.4	67.6	49.5	47.8	32.2	56
Italy	CIS	-	-	-	-	25	42.9	80
Netherlands	CIS	-	(35.3)	44.3	27.3	43.3	57.7	65.2
UK	CBR	54.5	35.7	78.9	50	67.8	61.1	75

Source: Eurostat, CBR SME Database

Note: Figures in brackets refer to firms which were mistakenly included in the sample. In all cases, the sampling frame information suggested that the firms were above the cut-off size for the particular country, but the survey later revealed that they were not above the cut-off size.
The UK data refer to R&D in 1995, while all other data refer to 1992.

Table 8. Proportion of innovating firms engaged in R&D on a continuous basis

		Employment Size Class						
Country	Survey	1-4	5-9	10-14	15-19	20-99	100-199	200-500
Manufacturing								
Belgium	CIS	-	(10.8)	27.1	29.9	52.3	65.5	82.4
Germany	CIS	-	28	43.1	30.1	37.1	61.7	65.1
Denmark	CIS	-	-	(0)	(40.8)	34.1	55.2	58.5
Spain	CIS	-	(38.5)	(50.8)	(45.1)	21.9	50.7	67.9
France	CIS	-	-	-	-	-	-	-
Italy	CIS	-	(37.4)	(11.1)	(18.1)	31	56.2	72.2
Ireland	CIS	-	-	49.5	38.9	53.5	58.6	76.5
Luxembourg	CIS	-	31	8.9	28.5	45.1	67	77.2
Netherlands	CIS	-	(12.5)	9.3	24.6	31.9	52.4	61.1
Norway	CIS	-	12.6	26.8	38.7	35.1	48.1	70.9
UK	CBR	66.7	47.6	53.8	40.9	42.4	52.9	66.7
Services								
Germany	CIS	-	22.3	40.5	28.5	32.5	25.2	41.7
Italy	CIS	-	-	-	-	0	14.3	60
Netherlands	CIS	-	(15.5)	18.6	9.6	16.8	24.3	43.8
UK	CBR	27.3	21.4	47.4	40	54.2	50	62.5

Source: Eurostat, CBR SME Database

Note: Figures in brackets refer to firms which were mistakenly included in the sample. In all cases, the sampling frame information suggested that the firms were above the cut-off size for the particular country, but the survey later revealed that they were not above the cut-off size.

Table 9. Proportion of innovating firms reporting products incrementally changed in 1990-92

Country	Survey	1-4	5-9	10-14	15-19	20-99	100-199	200-500
Manufacturing								
Belgium	CIS	-	(71.4)	86.4	76	88.2	88.5	88.1
Germany	CIS	-	76.2	82.1	94.7	76.1	87.5	86.4
Denmark	CIS	-	-	(100)	(80)	81	90.5	90.6
Spain	CIS	-	(55.6)	(76.5)	(76.9)	81.8	83.1	77.4
France	CIS	-	-	-	-	-	-	-
Italy	CIS	-	(38.5)	(45.7)	(49.3)	57.2	66.8	70.2
Ireland	CIS	-	-	70.1	78.3	74.9	85.7	81.6
Luxembourg	CIS	-	92.3	90	57.1	70.4	70	57.1
Netherlands	CIS	-	(75)	80	82.4	83.9	85	90.1
Norway	CIS	-	60.7	73.1	72.2	73.9	75.4	86
UK[a]	CBR	66.7	66.7	92.3	81.8	82.4	82.4	86.7
Services								
Germany	CIS	-	60.9	38.5	53.3	57.5	44.7	54.5
Italy	CIS	-	-	-	-	100	0	40
Netherlands	CIS	-	(68.4)	55.2	73	70.3	68.9	73.5
UK[a]	CBR	81.8	67.9	73.7	90	86.4	66.7	87.5

Source: Eurostat, CBR SME Database

Note: Figures in brackets refer to firms which were mistakenly included in the sample. In all cases, the sampling frame information suggested that the firms were above the cut-off size for the particular country, but the survey later revealed that they were not above the cut-off size.
(a) The UK data refer to incremental product changes in 1992-95.

Table 10. Proportion of innovating firms reporting products significantly changed or newly introduced in 1990-92

Country	Survey	1-4	5-9	10-14	15-19	20-99	100-199	200-500
Manufacturing								
Belgium	CIS	-	(71.4)	54.5	76	81.6	82.7	77
Germany	CIS	-	76.2	73.1	74.7	67.9	71	78.6
Denmark	CIS	-	-	(100)	(100)	78	93.3	92.5
Spain	CIS	-	(88.9)	(70.6)	(84.6)	73.5	79.2	79.5
France	CIS	-	-	-	-	-	-	-
Italy	CIS	-	(30.8)	(45.7)	(50.2)	57.2	67.1	74.4
Ireland	CIS	-	-	64.9	60	73.8	77.1	64.5
Luxembourg	CIS	-	46.2	80	71.4	77.8	70	57.1
Netherlands	CIS	-	(58.3)	74.3	64.7	71	72.1	80.7
Norway	CIS	-	75	76.9	72.2	79.9	76.8	64
Uk[a]	CBR	100	76.2	69.2	86.4	72.9	76.5	86.7
Services								
Germany	CIS	-	52.2	38.5	53.3	54.7	48.9	47
Italy	CIS	-	-	-	-	5	0	20
Netherlands	CIS	-	(57.9)	48.3	54.1	59.4	59.0	63.9
Uk[a]	CBR	45.5	46.4	68.4	50	62.7	72.2	87.5

Source: Eurostat, CBR SME Database

Note: Figures in brackets refer to firms which were mistakenly included in the sample. In all cases, the sampling frame information suggested that the firms were above the cut-off size for the particular country, but the survey later revealed that they were not above the cut-off size.
(a) The UK data refer to significant product changes or new product introductions in the period 1992-95.

Table 11. The importance of innovative micro firms in UK manufacturing in the mid 1990s

	Employment Size Class							
	1-4	5-9	10-19	20-99	100-499	500+	All	No of firms
% CBR respondents in each size category reporting in 1995:								
Either product or process innovations								
New to firm in 1992-95	18.8	60.0	71.4	69.1	84.2	100[a]	-	-
New to firm's industry in 1992-95	7.1	30.3	24.4	28.6	43.2	100[a]	-	-
% UK manufacturing firms in each size category in 1994:								
All UK manufacturing firms excluding businesses with no employees[b]	50.6	18.2	13.7	13.4	3.4	0.7	**100**	**148,962**
All innovative UK manufacturing firms[c]	22.1	25.4	22.8	21.5	6.6	1.7	**100**	**64,083**
All UK manufacturing firms introducing novel innovations[d]	19.5	29.9	18.1	20.7	7.9	4.0	**100**	**27,501**
% UK manufacturing employment in each size category in 1994:								
All UK manufacturing firms excluding businesses with no employees[b]	4.7	4.6	6.8	19.6	24.4	39.9	**100**	**4,197,000**
All innovative UK manufacturing firms[c]	1.1	3.3	5.9	16.5	24.9	48.4	**100**	**3,461,000**
All UK manufacturing firms introducing novel innovations[d]	0.57	2.3	2.8	9.5	17.7	67.1	**100**	**2,494,000**

Note: Only manufacturing firms are included in this table owing to availability of employment size class data for UK SME sector. As in Tables 14 and 15 above, all firms which were acquired between 1991 and 1995 have been excluded from the table.

(a) The CBR surveys have only included SMEs, i.e. firms with up to 500 employees. For the sake of simplicity, we assume that all manufacturing firms in the UK with more than 500 employees are novel innovators.

(b) Taken from the DTI (1996). Firm data refer to 1994. The reason for excluding businesses with no employees is that no such businesses in manufacturing reported either product or process innovations in the 1995 CBR survey.

(c) Assumes that firms in each category introduce product or process innovations with the same likelihood as the corresponding firms in the CBR innovation survey.

(d) Assumes that firms in each category introduce novel product or process innovations with the same likelihood as the corresponding firms in the CBR innovation survey.

Table 12. An inventory of the coverage of micro firms in our sample countries

Country	Organisation	1993 CIS cut-off size (no. of employees	Reason for cut-off size?	1997 CIS cut-off size		Interested in including smalle firms in futurer	If so, preference for new cut off point
				Mfg	Services		
Finland	Statistics Finland	>9[a]	1. Reduce response burden on small firms 2. Cost 3. R&D in micro firms unimportant	>9 (But will survey micro firms in certain NACE classes)	>9	Yes	No
France	Statistics France	>19	1. Difficulty in constructing sampling frame 2. Micro firm innovation fundamentally different	>19	>9	No	Not applicable
Germany	BMBF	>4	1. Pilot study implied low response rate from firms with 1-4 employees 2. No official business register yet 3. Missing population information means difficulty in calculating weight factors	>4	>4	Yes for service firms (software & technical consult.)	No
Italy	ISTAT	>19	1. Lack of tradition of dealing with small firms 2. Difficulty in defining universe of small firms and in avoiding underestimation of number and importance 3. Cost of achieving good coverage of small firms (other micro surveys include 140,000 firms)	>19	>9 (in next innovation survey)	No, but recognise the numerical importance of micro firms in Italy	Not applicable
Netherlands	Statistics Netherlands	>9	1. Response burden 2. Costs	>9	>9	Yes (interest from users)	No
Norway	Statistics Norway	>5	1. Response burden 2. Costs (due to large number of small businesses) 3. Non-innovating micro firms react negatively	Undecided		Yes (But only micro innovators)	No
UK	Office of National Statistics	>19	1. Compatibility with other CIS surveys 2. Response burden (for one person businesses) 3. Low response rate (for one person businesses)	>9	>9	Yes	Yes (2 or 3 employees)

Source: CBR postal and telephone survey. (a) The Finnish survey was conducted in 1991

Table 13. Unit response rates and number of respondents for innovation surveys

Country	Survey	Employment Size Class 1-4	5-9	10-14	15-19	20-99	100-199	200-500	500+
Denmark	CIS	-	-	-	-	47	50	»	63
		-	-	-	-	(704)	(298)	»	(311)
France	CIS	-	-	-	-	76	73	73	70
		-	-	-	-	(-)	(-)	(-)	(-)
Germany	CIS	-	»	»	21	21	21†	24†	25
		-	»	»	(494)	(897)	»	(903)	(660)
Ireland	CIS	-	-	»	»	64	»	»	47
		-	-	»	»	(759)	»	»	(244)
Italy	CIS	-	-	-	-	63	66	70	75
		-	-	-	-	(19001)	(1961)	»	(1531)
Netherlands	CIS	-	-	»	51	52	51	59	62
		-	-	»	(1062)	(1801)	(558)	(497)	(166)
	CBS[c]	-	66	70	70	69	67	64	58
		-	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Norway	CIS	-	51	»	51	51	52	»	52
		-	(198)	»	(210)	(315)	(127)	»	(136)
UK	CBR[d]	21	31	28	29	27	22	16	-
		(210)	(337)	(222)	(119)	(738)	(178)	(154)	-

Sources: Archibugi et al. (1994), Centraal Bureau voor de Statistiek Automatiseringsstatistieken survey, CBR SME Database.

Note: The figues in brackets are the number of respondents. The other figures are response rates in percent. The double arrows indicate cases where a response rate figure refers to a larger range of firm sizes than that in any particular category in the table. For example, the available information indicates that the response rate in the German CIS survey was 21 percent in the category 5-19 employees.
† Estimates
All the CIS surveys were conducted in 1993.
(a) The initial Institut für Arbeitmarkt und Berufsforschung (IAB) innovation survey was conducted in 1993.
(b) The INSEE "Technology and Innovation in Micro Enterprises" (TIME) Survey was conducted in 1992 and 1993.
(c) Refers to the Centraal Bureau voor de Statistiek Automatiseringsstatistieken survey conducted in 1996.
(d) The response rates refer to the original Centre for Business Research innovation survey in 1991.

Table 14. Reporting of product innovations in 1991 CBR survey in the UK

Number of employees (1-500)														1-500
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4			a			b	c	d	e	
					h	i		j	k					
	v	u	w	x										
Totals														1958
							547			341	738	178	154	
					210	337		222	119					
	12	61	71	66										
All firms														
% firms responding to question														72.6
% respondents with product innovation														60.7
% all firms with product innovation														44.1
% firms responding to question							72.0			68.9	72.5	78.7	76.0	
% respondents with product innovation							55.1[d]			57.4	61.7	71.4	69.2	
% all firms with product innovation							39.7[de]			39.6[e]	44.7	56.2	52.6	
% firms responding to question					74.3	70.6		69.8	67.2					
% respondents with product innovation					50.0	58.4		58.1	56.3					
% all firms with product innovation					37.1	41.2		40.5	37.8					
% firms responding to question	66.7	77.0	73.2	74.2										
% respondents with product innovation	62.5	46.8	55.8	44.9										
% all firms with product innovation	41.7	36.1	40.8	33.3										
Manufacturing firms														
% all firms with product innovation														45.4
% all firms with product innovation							41.9			37.7[de]	45.0	57.7	55.8	
% all firms with product innovation					43.1	41.4		37.9	37.3					
% all firms with product innovation	40.0	53.3	28.6	52.9										
Business Service firms														
% all firms with product innovation														42.7
% all firms with product innovation							38.6			41.9	44.3	54.2	46.0	
% all firms with product innovation					34.9	41.6		43.8	38.5					
% all firms with product innovation	42.9	30.4	46.0	26.5										

Source: CBR SME Database

Table 15. Reporting of process innovations in 1991 CBR survey in the UK

Number of employees (1-500)														
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	1-500
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4										
							a			b	c	d	e	
					h	i		j	k					
	v	u	w	x										
Totals														1958
							547			341	738	178	154	
					210	337		222	119					
	12	61	71	66										
All firms														
% firms responding to question														62.1
% respondents with process innovation														49.2
% all firms with process innovation														30.5
% firms responding to question							57.4[e]			58.7	64.5	65.7	70.8	
% respondents with process innovation							34.1[cde]			45.0[de]	53.8	63.2	65.1	
% all firms with process innovation							19.6[cde]			26.4[de]	34.7[e]	41.6	46.1	
% firms responding to question					61.0	55.2		59.0	58.0					
% respondents with process innovation					28.9	37.6		43.5	47.8					
% all firms with process innovation					17.6	20.8		25.7	27.7					
% firms responding to question	50.0	72.1	52.1	62.1										
% respondents with process innovation	50.0	22.7	29.7	31.7										
% all firms with process innovation	25.0	16.4	15.5	19.7										
Manufacturing firms														
% all firms with process innovation														40.8
% all firms with process innovation							28.1[cde]			30.4[cde]	44.1	53.8	57.7	
% all firms with process innovation					24.1	29.7		28.2	34.3					
% all firms with process innovation	20.0	26.7	19.0	29.4										
Business Service firms														
% all firms with process innovation														19.2
% all firms with process innovation							14.6			20.9	21.5	25.0	22.0	
% all firms with process innovation					15.1	14.2		21.9	19.2					
% all firms with process innovation	28.6	13.0	14.0	16.3										

Source: CBR SME Database

Table 16. Reporting of product innovations in 1995 CBR survey in the UK

Number of employees (1-500)														
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	1-500
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4										
							a			b	c	d	e	
					h	i		j	k					
	v	u	w	x										
Totals														503
							129			93	206	46	29	
					44	85		50	43					
	6	16	9	13										
Product innovation new to the firm														
All firms														
% all firms with product innovation														49.5
% all firms with product innovation							32.6[bcde]			53.8	52.9	58.7	72.4	
% all firms with product innovation					18.2[jk]	40.0		48.0	60.5					
% all firms with product innovation	0	31.3	11.1	15.4										
Manufacturing firms														
% all firms with product innovation														55.9
% all firms with product innovation							39.2[b]			67.3	54.5	65.0	72.2	
% all firms with product innovation					18.8	48.6		60.0	72.4					
% all firms with product innovation	0	28.6	25.0	0										
Business Service firms														
% all firms with product innovation														42.7
% all firms with product innovation							28.6[c]			38.6	50.6	53.8	72.7	
% all firms with product innovation					17.9	34.7		40.0	35.7					
% all firms with product innovation	0	33.3	0	22.2										

Source: CBR SME Database

Note: The table excludes those respondents to the CBR survey in 1995 which had been acquired between 1991 and 1995

Table 17. Reporting of process innovations in 1995 CBR survey in the UK

Number of employees (1-500)														1-500
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4										
							a			b	c	d	e	
					h	i		j	k					
	v	u	w	x										
Totals														503
							129			93	206	46	29	
					44	85		50	43					
	6	16	9	13										
Process innovation new to the firm														
All firms														
% all firms with process innovation														43.3
% all firms with process innovation							25.6[cde]			39.8	49.0	60.9	65.5	
% all firms with process innovation					13.6[k]	31.8		36.0	44.2					
% all firms with process innovation	16.7	6.3	0	30.8										
Manufacturing firms														
% all firms with process innovation														42.9
% all firms with process innovation							17.6			34.7	48.0	70.0	72.2	
% all firms with process innovation					0[k]	25.7		25.0	41.4					
% all firms with process innovation	0	0	0	0										
Business Service firms														
% all firms with process innovation														44.0
% all firms with process innovation							31.2			45.5	50.6	53.8	54.5	
% all firms with process innovation					21.4	36.7		43.3	50.0					
% all firms with process innovation	20.0	11.1	0	44.4										

Source: CBR SME Database

Note: The table excludes those respondents to the CBR survey in 1995 which had been acquired between 1991 and 1995

Table 18. Reporting of product innovations in 1991 CBR survey excluding those firms which subsequently failed or were acquired

Number of employees (1-500)													1-500
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500
Number of employees (1-19)					1-4	5-9		10-14	15-19				
Number of employees (1-4)	1	2	3	4									
Totals													1355
							377			251	515	119	93
					148	229		159	92				
	10	39	49	50									
All firms													
% respondents with product innovation													60.1
% all firms with product innovation													43.0
% respondents with product innovation							52.8			57.7	61.6	71.3	71.0
% all firms with product innovation							37.1			40.2	43.9	56.3	52.7
% respondents with product innovation					47.2	56.7		58.6	56.2				
% all firms with product innovation					34.5	38.9		40.9	39.1				
% respondents with product innovation	66.7	41.4	54.1	41.7									
% all firms with product innovation	40.0	30.8	40.8	30.0									

Source: CBR SME Database

Table 19. Reporting of process innovations in 1991 CBR survey excluding those firms which subsequently failed or were acquired

Number of employees (1-500)													1-500
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4										
Totals														1355
							377			251	515	119	93	
					148	229		159	92					
	10	39	49	50										
All firms														
% respondents with process innovation														51.9
% all firms with process innovation														33.0
% respondents with process innovation							35.0			47.0	58.4	65.1	67.2	
% all firms with process innovation							20.2			28.3	39.0	45.4	48.4	
% respondents with process innovation					26.7	40.5		44.9	50.9					
% all firms with process innovation					15.5	23.1		27.7	29.3					
% respondents with process innovation	50.0	19.2	24.0	32.3										
% all firms with process innovation	20.0	12.8	12.2	20.0										

Source: CBR SME Database

Table 20. Methods of identifyingVSEs : Sampling frame characteristics

Country	Organisation	Available sampling frameworks	Coverage
Finland	Statistics Finland	Business Register of Statistics Finland	Complete
France	Statistics France	Chamber of Commerce ?	?
	INSEE	"Répertoire des Métiers"	
Germany	Statistisches Bundesamt	Das Unternehmensregistersystem 99 (planned for future)	Complete, except for micro firms (not yet sure how good coverage will be)
	Centre for European Economic Research (ZEW)	"Verband der Vereine Creditreform"	)
	Institute for Employment Research (IAB)	Database of the Bundesanstalt für Arbeit, Statistik de sozialversicherungspflichtig Beschäftigten	) together cover 50% of firms with fewer than 5 employees
	SV-Wissenschaftsstatistik	All firms reporting R&D	)
	Institut für Wirtschaftsforschung (IFO)	Databases from industry associations	)
Italy	ISTAT	Archivio Statistico delle Imprese Attive (ASIA), Statistical Register of Active firms (planned for testing in 1997)	Planned to be complete
	ISTAT	Official business register	Complete for firms >20 employees
	Mediocredito Centrale	?	?
Netherlands	Statistics Netherlands	Algemeen Bedrijfsregister (ABR)	Complete
Norway	Statistics Norway	Central Register for Enterprises and Establishments	Complete
UK	Office of National Statistics	Interdepartmental Business Register	Incomplete coverage of self-employed
	ESRC Centre for Business Research	Dun & Bradstreet Credit rating database	Incomplete

Chart 1 Share of Employment in Very Small Enterprises by Sector and Country

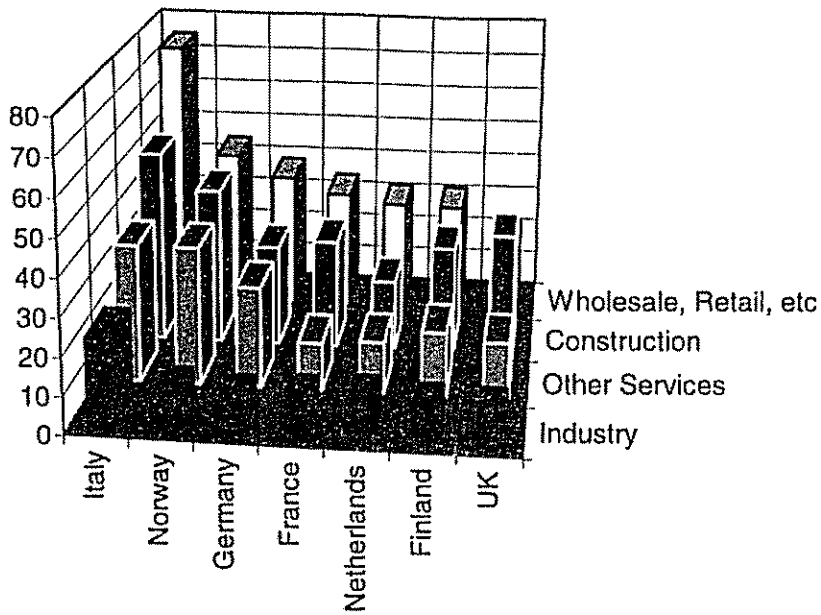
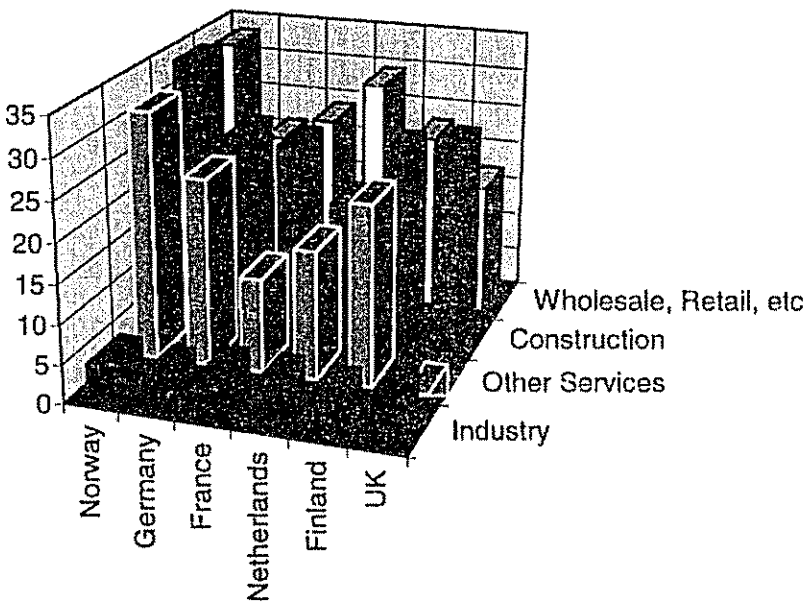


Chart 2 Share of Turnover in Very Small Enterprises by Sector and Country excluding Italy



References

Abernathy, W.J. (1978) *The Productivity Dilemma, Roadblock to Innovation in the Automobile Industry*, John Hopkins University Press, Baltimore.

ACOST (Advisory Council on Science and Technology) (1990) *The Enterprise Challenge : Overcoming Barriers to Growth in Small Firms*, HMSO, London.

Acs, Z.J., Audretsch, D.B. (1987) "Innovation Market Structure and Firm Size", *The Review of Economics and Statistics*, Vol. 69, No. 4, pp. 567-574.

Acs, Z.J., Audretsch, D.B. (1988) "Innovation in Large and Small Firms", *American Economic Review*, 78, 678-690.

Acs, Z.J., Audretsch, D.B. (1990) *Innovation and Small Firms*, MIT Press.

Archibugi, D., Cohendet, P., Kristensen, A., Schäffer, K. (1994) *Evaluation of the Community Innovation Survey, Phase 1*, EIMS project No 93/40.

Atkinson, J. and Meager, N. (1994) "Running to Stand Still: The Small Business in The Labour Market" in Atkinson, J. and Storey, D.J. (eds) *Employment, the Small Firm and the Labour Market*, Routledge, London.

Audretsch, D.B. (1995) *Innovation and Industry Evolution*, MIT Press, Cambridge, MA.

Audretsch, D.B. and Acs, Z. (1992) "Technological Regimes, Learning and Industry, Turbulence" in Scherer, F.M. and Perliman, M. (eds) *Enterpreneurship and Innovation*, A

Schrumpeterian Perspective, Ann Arbor: Universith of Michigan Press, pp. 305-320.

Baldwin, W.L. and Scott, J.T. (1987) "Market Structure and Technological Change London and New York", Harwood Academic Publishers.

Bellmann, L., Düll, H., Kühl, J., Lahner, M., Lehmann, U. (1996) *Patterns of Enterprise Flexibility in Germany: Results of the IAB Establishment Panel 1993 to 1995*, Contribution to OECD's "Flexible Enterprise" Project conducted on behalf of the Federal Ministry of Education, Science, Research and Technology, Institute for Employment Research of the Federal Employment Institute, Nuremberg.

Bolton, J.E. (1971) *Report on the Committee of Enquiry on Small Firms*, Cmnd. 4811, HMSO, London.

Burns, T., Stalker, G.M. (1961) *The Management of Innovation*, Tavistock Publications, London.

Cohen, W.M., Levin, R.C. (1989) "Emperical Studies of Innovation and Market Structure" in Schmalensee, R and Willig, R.D. (eds). *Handbook of Industrial Organization,* Volume II, pp. 1060-1107.

Cosh, A., Hughes, A., Wood, E. 1997. "Innovation in UK SMEs: Causes and Consequences for firm failure and acquisition" in Acs, Z., Carlsson, B. (eds), *Entrepreneurship, SMEs and the Macro Economy*, forthcoming Cambridge University Press. Also available as ESRC Centre for Business Research Working Paper No. 48.

Curran, J., Blackburn, R. and Woods, A. (1991) *Profiles of the Small Enterprise in the Service Sector,* paper presented at the ESRC

Small Firms Initiative Conference, Warwick University April 18, 1991.

Downie, J. (1958) *The Competitive Process*, Camelot Press, London.

DTI (Department of Trade and Industry). 1996. "Small and medium sized enterprise (SME) Statistics for the United Kingdom", 1994. Small Firms Statistics Unit.

Dunne, J.P. and Hughes, A. (1992) "The Changing Structure of Competitive Industry in the 1980s'" in Dunne, J.P. and Driver, C. (eds) *Structural Change in the Economy,* Department of Applied Economics, Occasional Paper 58, Cambridge University Press.

Eurostat (1996) *Enterprises in Europe : Fourth Report*, Eurostat/DG XXIII Brussels/Luxembourg.

Geroski, P., Pomroy, R. (1990) "Innovation and the Evolution of Market Structure", *The Journal of Industrial Economics*, Vol. 38, pp. 299-314.

Hughes, A. (1997) *Growth Constraints on Small and Medium Sized Firms: A Report Prepared for the DTI by PACEC and the ESRC Centre for Business Research*, Department of Trade and Industry, April.

Kleinknecht, A. (1987) "Measuring R&D in Small Firms: How Much are we Missing?". *Journal of Industrial Economics*, Vol. 36, No.2, pp 253-256.

Kleinknecht, A., Reijnen, J.O.N. (1991) "More Evidence on the Undercounting of Small Firm R&D", *Research Policy*, 20, pp. 579-87.

Metcalf, J.S., Gibbons, M. (1986) "Technological Variety and the Process of Competition", *Economie Appliquée*, Vol. 39, pp. 493-520.

Mueller, D.D. (1988) "The Corporate Life-Cycle", in Thompson, S., Wright, M. (eds) *Internal Organsiation, Efficiency and Profit*, London : Phillip Allan, pp. 38-64.

Nelson, R.R., Winter, S.G. (1978) "Forces Generating and Limiting Concentration under Schumpeterian Competition", *The Bell Journal of Economics*, Vol 9, pp. 524-544.

OECD 1992 *Proposed guidelines for collecting and interpreting technological innovation data - Oslo Manual*, Paris.

Pavitt, K. (1983) "Characteristics of Innovation Activities in British Industry", *Omega*, Vol. 11, pp. 113-130.

Pavitt, K. 1982. "R&D, patenting and innovative activities. A statistical exploration." *Research Policy*, Vol. 11 No. 1. pp.33-51.

Pavitt, K., Robson, M. and Townsend, J. (1987) "The Size Distribution of Innovating Firms in The UK : 1945-1983", *The Journal of Industrial Economics*, Vol. 35, No. 3, pp. 297-316.

Prais, S.J. (1981) *Productivity and Industrial Structure : A Statistical Study of Manufacturing Industry in Britian, Germany and the United States*, Cambridge University Press.

Reid, G.C. (1995) *Early Life-Cycle Behaviour of Micro Firms in Scotland*, Small Business Economics, No. 7 pp. 89-95.

Rothwell, R. (1989) "SMFs, Inter-Firm Relationships and Technological Change", in *Enterpreneurship and Regional Development*, Vol. 1, pp. 275-291.

Scherer, F.M. (1988) *Innovation and Small Firms*, Testimony before the Subcommittee on Monopolies and Commercial Law, Committee of Judiciary, US House of Representatives, February 24.

Schneeweis, T., and Smolny, W. 1996. Das ifo Unternehmenspanel 1980-92. *Einige Ergebnisse einer Verknüpfung der Umfragen des ifo Instituts*, Diskussionspapier, Nr. 32, IFO.

Schumpeter, J.A. (1934) *The Theory of Economic Development*, Harvard University Press, Cambridge, MA.

Schumpeter, J.A. (1942) *Capitalism, Socialism and Democracy*, Harper, New York.

Sengenberger, W., Loreman, G. W., and Piore, M.J. (eds) (1990) *The Reemergence of Small Enterprises : Industrial Restructuring in Industrialized Countries*, Geneva International Institute for Labour Studies.

Smallbone, D., North, D. and Leigh, R. (1992) "Managing Change for Growth and Survival : The Study of Mature Manufacturing Firms in London during the 1980s'" *Working paper No.3,* Planning Research Centre, Middlesex Polytechnic.

Storey, D.J. (1994) *Understanding the Small Business Sector,* Routledge, London.

Walshe, G. (1974) *Recent Trends in Monopoly in Great Britian*, Cambridge University Press.

Winter, S.G. (1984), *Schumpetarian Competition in Alternative Technological Regimes, Journal of Economic Behaviour and Organization*, September-December, Vol. 5, pp. 287-320.

Wood, E. (1996) "Small and Large Firms in the Innovation Process", *ESRC Centre for Business Research*, University of Cambridge mimeo.

APPENDIX

6. APPENDIX

Example of covering letter and questionnaire to representatives in national statistical authorities

Mr. Ari LEPPÄLAHTI
Statistics Finland
FIN - 00022 STATISTICS FINLAND
Finland

21 March 1997

Dear Mr Leppalahti

Innovative Activity and Micro-Business Surveys

The ESRC Centre for Business Research has been commissioned by Eurostat to prepare a report on the usefulness and feasibility of including micro businesses (those employing less than 10 people) in future European Community Innovation Surveys. An authorising letter from Eurostat is attached for your information. I am writing to you at the suggestion of Eurostat in view of your expertise in this area, and in the anticipation that you may be able to assist us in our inquiry.

In carrying out our research Eurostat wishes us to establish

a) the extent to which micro businesses are currently included in official government or private sector surveys of innovation activity in the countries of the European Union.

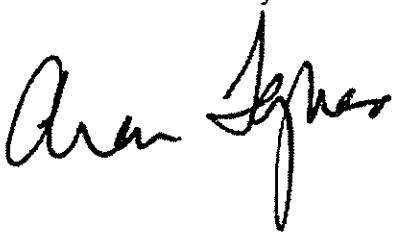
b) the extent to which sampling frames for micro business surveys exist and could be used as a basis for surveys of micro business innovation activity in the future.

c) the state of best practice knowledge about the choice of micro business sampling frameworks and micro-business questionnaire design with special reference to micro-business innovative activity.

It would extremely helpful if you could let us know whether it is possible to obtain answers to these questions for your country. Your reply will be invaluable in helping to frame future EU work in this area and we hope you will be able to spare the time to fill in the short attached pro forma. We would of course be delighted if you were able to amplify your responses in a covering letter.

We would be grateful if you could reply by fax or letter by Thursday April 10th. If it would be easier to discuss the issues raised by telephone then we would of course be happy to arrange a mutually convenient time to speak. If you would prefer to discuss on the phone or if you have any queries about this research or the associated Eurostat project please feel free to contact Eric Wood, Email: easw1@econ.cam.ac.uk, Fax: +44 1223 335768, Telephone: +44 1223 335287.

Yours sincerely



Alan Hughes
Director

PRO FORMA

Name: .....

Institution: .....

Position: .....

Date: .....

1. In your country's most recent official census or survey of businesses **which included questions on innovation**, was there a cut-off point (in terms of a minimum number of employees) below which firms were not included in the survey?

   Yes ☐ No ☐

   IF YES

   What was the cut-off point?

2. What was the reason for your country choosing the above cut-off point?

3. Was this decision based on a pilot study or some previous survey of innovation activity in micro enterprises?

Yes ☐ No ☐

IF YES

How many firms were included and what were the results?

4. Has your country chosen a different cut-off size (in terms of a minimum number of employees) for the 1997 European Community Harmonised Innovation Survey from that in your most recent innovation survey?

Yes ☐ No ☐

IF YES

What is the cut-off size for manufacturing firms in the 1997 survey?

What is the cut-off size for service firms in the 1997 survey?

What was the reason for the change?

5. Do you believe that it would be desirable in future to include even smaller firms (in terms of a minimum number of employees) than those which will be included in your country's 1997 innovation survey?

Yes ☐ No ☐

IF YES

Could you please give brief reasons for your view?

6. Is there a specific lower limit on the number of employees below which you do not think it would be worthwhile to include firms in an innovation survey?

Yes ☐ No ☐

IF YES

Could you please give brief reasons for your view?

7. Has your country ever carried out an innovation survey which included firms with fewer employees than the cut-off level chosen for your most recent innovation survey?

Yes ☐ No ☐

IF YES, could you please provide brief details of them:

Survey 1

the industrial coverage.....

timing .....

publication of results.....

name and contact address for further information.....

Survey 2

the industrial coverage.....

timing .....

publication of results.....

name and contact address for further information.....

Survey 3

the industrial coverage.....

timing .....

publication of results.....

name and contact address for further information.....

Please continue on a separate sheet if necessary.

8. Does there exist for your country private or public sector database(s) or business registers which could be used to draw samples of businesses with fewer employees than the cut-off level chosen for your most recent innovation survey (for example, credit rating databases)?

Yes ☐ No ☐

IF YES, could you please give brief details of them:

Register 1

the name of the database or register .....
its industrial coverage .....
name and contact address for further information.....

Register 2

the name of the database or register .....
its industrial coverage .....
name and contact address for further information.....

Please continue on a separate sheet if necessary.

The postal and telephone survey : expert respondents

Country	Person	Organisation	Questionnaire Sent	Questionnaire Response	Responded via post, telephone or fax
Finland	Mr. Ari LEPPÄLAHTI	Statistics Finland	**Yes**	**Yes**	**Yes**
France[a]	M. P. KAMINSKI	INSEE			**Yes**
	M. J.C. PACITO	INSEE			**Yes**
	M. J.P. FRANCOIS	Ministry of Industry			**Yes**
	M R. BARRE	Ministry of Industry			**Yes**
Germany	Mrs. Pia BRUGGER	Statistisches Bundesamt	**Yes**	**Yes**	**Yes**
	Mrs Poschl	Statistisches Bundesamt			**Yes**
	Mr. Peter ENGLITZ	Bayerisches Landesamt für Statistik und Datenverarbeitung	**Yes**	**Yes**	**Yes**
	Dr. Georg LICHT	Centre for European Economic Research (ZEW)	**Yes**	**Yes**	**Yes**
	Dr. Erika ROST	Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie (BMBF)	**Yes**	**Yes**	**Yes**
	Juergen KUEHL	Institute for Employment Research (IAB)			**Yes**
	Christoph GRENZMANN	SV-Wissenschaftsstatistik			**Yes**
	Ms FEGERS	"Verband der Vereine Creditreform"			
	Dr Horst ROTTMAN	Institut für Wirtschaftsforschung (IFO)			**Yes**
Italy	Mr. Aldo DEL SANTO	ISTAT	**Yes**		**Yes**
	Mr Guilio PIRANI	ISTAT			**Yes**
	Mr. Alberto SILVANI	CNR - ISRDS	**Yes**		**Yes**
Netherlands	Mr. Niels LANOY MEYER	Centraal Bureau voor de Statistiek	**Yes**		**Yes**
	Mr. Sjaak PRONK	Statistics Netherlands	**Yes**	**Yes**	**Yes**
	Mr. Norbert VAN DEN HOVE	Centraal Bureau voor de Statistiek	**Yes**		
	Mr. Jan VAN STEEN	Ministry of Education, Culture and Science	**Yes**		
	Dr Y. PRINCE	Economic Institute for SMEs			**Yes**
	Mr Van RIEL	Verbond van Nederlandse Omename (VNO)			**Yes**
Norway	Mr. Frank FOYN	Statistics Norway	**Yes**	**Yes**	**Yes**
	Mrs. Kirste-Wille MAUS	Norwegian Institute for Studies in Research and Higher Education (NIFU)	**Yes**		
	Mr. Svein Olav NÅS	STEP Group	**Yes**		**Yes**
UK	Mr Ray LAMBERT	Dept. of Trade and Industry	**Yes**	**Yes**	**Yes**
	Mrs Michelle WHYMAN WILLIAMS	Office of National Statistics			**Yes**
	Ms Claire POWELL	Office of National Statistics			**Yes**
Total responses				**8**	**25**

The French respondents were contacted by ADEC.

Summary tables : Enterprise Size distribution in Finland, France, Germany, Italy, Netherlands, Norway and United Kingdom

Table A1. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in Finland in 1992

Broad Sector	Measure of Activity	Enterprises with salaried employment				
		Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-249	Large (%) 250+	All (000's)
Industry	Enterprises	74.0	18.5	5.6	1.9	14.0
	Employment	7.6	13.5	20.2	58.6	412.0
	Turnover	4.5	8.5	16.2	70.8	54,589.1
Construction	Enterprises	87.3	10.9	1.6	0.2	10.9
	Employment	28.7	27.1	18.6	25.6	84.3
	Turnover	25.1	22.8	20.2	31.9	9,083.3
Wholesale and Retail Trades, Hotels Repairs and Catering	Enterprises	88.2	10.2	1.2	0.3	30.8
	Employment	30.6	23.4	14.8	31.1	253.1
	Turnover	22.8	21.4	16.3	39.5	52,772.0
Other Services	Enterprises	88.3	9.4	1.8	0.4	22.7
	Employment	16.8	15.8	15.9	51.4	270.4
	Turnover	23.0	18.2	17.6	41.3	15,236.9
All Sectors	Enterprises	85.6	11.6	2.2	0.6	78.3
	Employment	17.5	17.7	17.6	47.2	1,019.8
	Turnover	15.4	15.8	16.7	52.2	131,681.3

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Table A2. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in France in 1992

Broad Sector	Measure of Activity	Enterprises with salaried employment				
		Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-249	Large (%) 250+	All (000's)
Industry	Enterprises	69.4	22.9	6.1	1.6	145.0
	Employment	8.1	17.7	21.2	52.9	4,339.6
	Turnover	5.1	12.6	17.7	64.6	661,977.2
Construction	Enterprises	85.4	12.8	1.5	0.2	145.3
	Employment	29.3	31.5	17.2	22.1	1,237.0
	Turnover	24.4	28.2	18.2	29.2	102,730.8
Wholesale and Retail Trades, Hotels, Repairs and Catering	Enterprises	88.1	10.4	1.3	0.2	373.6
	Employment	33.5	27.4	15.6	23.5	2,918.5
	Turnover	23.8	29.5	20.6	26.1	627,204.3
Other Services	Enterprises	81.0	15.4	2.9	0.7	158.0
	Employment	12.5	15.8	14.5	57.2	3,290.2
	Turnover	12.0	16.1	18.6	53.4	402,972.7
All Sectors	Enterprises	83.0	14.0	2.5	0.5	821.9
	Employment	17.8	21.0	17.5	43.6	11,785.3
	Turnover	14.3	20.2	18.9	46.6	1,794,884.9

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Table A3. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in Germany in 1992

Broad Sector	Measure of Activity	Enterprises with salaried employment				
		Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-199	Large (%) 200+	All (000's)
Industry	Enterprises	63.8	27.4	6.3	2.5	230.8
	Employment	7.4	14.3	15.8	62.6	9,237.1
	Turnover	4.1	7.1	12.8	76.0	1,260,185.1
Construction	Enterprises	71.6	25.7	2.4	0.3	176.4
	Employment	27.1	39.2	18.0	15.7	2, 012.3
	Turnover	25.1	35.4	18.5	20.9	166,723.3
Wholesale and Retail Trades, Hotels Repairs and Catering	Enterprises	86.7	11.7	1.3	0.3	666.4
	Employment	37.8	24.8	12.8	24.7	5,726.0
	Turnover	20.9	30.1	25.9	23.1	1,015,889.3
Other Services	Enterprises	84.6	13.3	1.6	0.5	356.7
	Employment	26.6	22.2	14.0	37.1	3,491.5
	Turnover	23.8	28.8	32.3	15.0	315,840.2
All Sectors	Enterprises	80.6	16.4	2.3	0.7	1,430.3
	Employment	21.1	21.0	14.8	43.0	20,467.0
	Turnover	13.8	19.8	20.2	46.2	2,758,637.8

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Table A4. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in Italy in 1992

Broad Sector	Measure of Activity	Enterprises with salaried employment				
		Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-249	Large (%) 250+	All (000's)
Industry	Enterprises	82.0	15.7	2.0	0.3	540.8
	Employment	23.3	29.2	18.9	28.5	5,421.6
	Turnover	n/a	n/a	n/a	n/a	n/a
Construction	Enterprises	92.6	6.8	0.5	0.1	334.1
	Employment	52.3	29.6	11.0	7.1	1,350.6
	Turnover	n/a	n/a	n/a	n/a	n/a
Wholesale and Retail Trades, Hotels, Repairs and Catering	Enterprises	97.3	2.6	0.1	0.0	1,511.6
	Employment	74.6	16.0	4.5	4.8	4,025.9
	Turnover	n/a	n/a	n/a	n/a	n/a
Other Services	Enterprises	96.2	3.3	0.4	0.1	526.8
	Employment	36.6	11.6	7.6	44.3	2,659.3
	Turnover	n/a	n/a	n/a	n/a	n/a
All Sectors	Enterprises	93.7	5.6	0.6	0.1	2,913.2
	Employment	45.8	21.3	11.4	21.5	14,207.1
	Turnover	n/a	n/a	n/a	n/a	n/a

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Table A5. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in The Netherlands in 1992

Broad Sector	Measure of Activity	Enterprises* with salaried employment				
		Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-199	Large (%) 200+	All (000's)
Industry	Enterprises	62.2	26.9	8.3	2.5	28.6
	Employment	8.9	18.6	23.8	48.7	965.1
	Turnover	5.1	12.6	21.7	60.6	144,163.5
Construction	Enterprises	68.5	26.5	4.4	0.6	23.7
	Employment	18.6	37.2	25.5	18.7	342.1
	Turnover	17.5	31.9	28.4	22.2	33,029.0
Wholesale and Retail Trades, Hotels Repairs and Catering	Enterprises	84.7	13.8	1.2	0.3	109.2
	Employment	31.0	26.8	13.1	29.0	999.3
	Turnover	29.3	31.4	19.4	19.9	192,643.8
Other Services	Enterprises	78.6	17.2	3.3	1.0	32.7
	Employment	13.5	20.6	18.0	47.9	641.7
	Turnover	16.4	21.9	19.3	42.4	43,468.9
All Sectors	Enterprises	78.8	17.5	2.9	0.8	203.4
	Employment	18.4	23.5	18.8	39.3	3,121.6
	Turnover	18.6	23.9	20.9	36.7	416,101.5

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

* Note :The data refers to kind of activity units (KAU) rather than to enterprises

Table A6. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in Norway in 1992

Broad Sector	Measure of Activity	Enterprises with salaried employment				
		Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-249	Large (%) 250+	All (000's)
Industry	Enterprises	73.1	19.6	5.5	1.8	14.1
	Employment	8.7	18.5	22.7	50.1	321.3
	Turnover	4.5	13.1	19.4	63.0	59,463.0
Construction	Enterprises	93.0	6.2	0.6	0.1	24.0
	Employment	42.6	25.6	12.5	19.3	106.7
	Turnover	34.0	25.3	14.5	26.2	9,029.7
Wholesale and Retail Trades, Hotels, Repairs and Catering	Enterprises	90.1	8.8	0.9	0.2	50.2
	Employment	43.9	29.2	14.4	12.5	274.3
	Turnover	33.1	29.5	17.5	19.9	69,171.6
Other Services	Enterprises	93.7	5.2	0.9	0.2	30.0
	Employment	36.7	19.4	16.6	27.3	151.3
	Turnover	31.4	26.5	18.4	23.7	15,542.3
All Sectors	Enterprises	89.6	8.7	1.4	0.4	118.3
	Employment	29.2	23.0	17.7	30.1	853.6
	Turnover	21.9	22.6	18.2	37.4	153,206.7

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Table A7. The Distribution of Economic Activity by Broad Industrial Sector and Employment Size Class in The United Kingdom in 1992

Broad Sector	Measure of Activity	Enterprises with salaried employment Very small (%) 1-9	Small (%) 10-49	Medium (%) 50-249	Large (%) 250+	All (000's)
Industry	Enterprises	65.3	25.3	7.5	1.9	139.2
	Employment	7.2	15.6	21.7	55.5	4,867.1
	Turnover	5.5	9.4	16.0	69.2	482,505.0
Construction	Enterprises	86.0	12.1	1.6	0.3	102.4
	Employment	32.8	25.7	17.2	24.4	894.1
	Turnover	26.3	21.4	24.3	28.0	71,078.8
Wholesale and Retail Trades, Hotels, Repairs and Catering	Enterprises	80.0	17.5	2.1	0.4	313.7
	Employment	20.8	21.3	13.0	44.9	4,907.3
	Turnover	16.9	18.7	17.4	46.9	523,904.9
Other Services	Enterprises	84.3	12.8	2.4	0.6	271.4
	Employment	14.8	15.4	14.3	55.5	4,472.8
	Turnover	n/a	n/a	n/a	n/a	n/a
All Sectors	Enterprises	79.7	16.6	3.0	0.7	826.6
	Employment	15.4	18.0	16.4	50.2	15,142.3
	Turnover	n/a	n/a	n/a	n/a	n/a

Source : Enterprises in Europe Fourth Report Eurostat/DGXXIII/Brussels Luxembourg, 1996

Guidelines to Tables 5-6 and 14-19

Each of the Tables 1-6 present a combination of aggregated and selected disaggregated information on the responses to innovation questions in the 1991 and 1995 surveys conducted by the CBR. Owing to the focus of this report, disaggregated information is only shown for the smaller firm size categories, including firms with less than 20 employees. Firms with fewer than 5 employees warrant the highest level of disaggregation in the tables.

For a particular category of information, for examples "Totals" or "% all firms with product innovation", each row (i.e. horizontal line) of data represents a level of aggregation. If we take the example of the information under "Totals", it can be seen that the first row of information only contains one item of information, i.e. 1958 in the last column. This figure represents the total number of firms which responded to the 1991 survey. The next row of data indicate, for example, that 547 of those had between 1 and 9 employees. The remaining rows under "Totals" indicate, for example, that 210 of those had between 1-4 employees and 71 of those had 3 employees. Under the category of information "% all firms with product innovation", the same applies. In this case, however, the figures do not represent numbers of firms but the proportion of firms in each category which responded to a particular innovation question.

The letters in each table provide information relevant to the statistical tests which were conducted to test for differences in the proportions in each firm size group. Each letter defines a particular firm size category at a particular level of aggregation. The test which was used is the Bonferroni One Way Anova Test which is a method of comparing mean values across different categories of cases. The tests were all conducted at the 5% level of significance. The statistical tests are not conducted across different levels of aggregation, but rather each refers exclusively to a particular level of aggregation. So, for example, the proportion of all firms which reported a product innovation in firm size category (a) is only compared with those in categories (b), (c), (d), and (e) and not to any of (h), (i), (j), (k), (v), (u), (w) or (x). The superscripted characters (d) and (e) next to the figure 39.7 indicate that the proportion of product innovators in group (a) was significantly lower than the corresponding proportion in groups (d) and (e). The absence of any superscripted characters next to the figures in the bottom two rows of the table indicate that there were no significant differences in the proportion of product innovators between groups (h), (I), (j), (k) or between groups (v), (u), (w), (x).

Example Table (taken from Table 14)

Number of employees (1-500)													1-500
Number of employees (1-500)							1-9			10-19	20-99	100-199	200-500	
Number of employees (1-19)					1-4	5-9		10-14	15-19					
Number of employees (1-4)	1	2	3	4										
							a			b	c	d	e	
					h	i		j	k					
	v	u	w	x										
Totals														1958
							547			341	738	178	154	
					210	337		222	119					
	12	61	71	66										
% all firms with product innovation														44.1
% all firms with product innovation							39.7[de]			39.6[e]	44.7	56.2	52.6	
% all firms with product innovation					37.1	41.2		40.5	37.8					
% all firms with product innovation	41.7	36.1	40.8	33.3										

Innovation questions in the 1995 Survey

In this section we would like you to tell us about your innovative activity. We are interested in innovation in products and processes which are ***new to your firm.***

In answering the questions in this section, please count innovation as occurring when a new or changed product is introduced to the market (product innovation) or when a new or significantly improved production method is used commercially (process innovation), and when ***changes*** *in knowledge or skills, routines, competence, equipment, or engineering practices are required to make the new product or to introduce the new process.*

Please do ***not*** *count as product innovation, changes which are purely aesthetic (such as changes in colour or decoration), or which simply involve product differentiation (that is minor design or presentation changes which differentiate the product while leaving it technically unchanged in construction or performance).*

H1 Has your firm introduced any innovations in products (goods or services) or processes during the last three years which were new to your firm? *(Please tick only* ***one*** *box in* ***each*** *row)*

	Yes	No
Products		
Processes		

If you ticked No for <u>both</u> products <u>and</u> processes please skip H2-H6 and move onto question H7.

H2 If you introduced a product innovation, was it, to the best of your knowledge, already in use in other firms either in (a) your industry or (b) other industries? If you made more than one

product innovation please answer with respect to your most important product innovation. *(Please tick only **one** box in **each** row)*

Product Innovation	Yes	No	Don't Know
(a) in use in your industry			
(b) in use in other industries			

H3 If you introduced a process innovation was it, to the best of your knowledge, already in use in other firms either in (a) your industry or (b) other industries? If you made more than one process innovation please answer with respect to your most important process innovation. *(Please tick only **one** box in **each** row)*

Process Innovation	Yes	No	Don't Know
(a) in use in your industry			
(b) in use in other industries			

Innovation question in the 1991 Survey

F1. Has your firm been successful in introducing any major innovations during the **last 5 years**? tick as appropriate

	Yes	No
In products or services		
In production processes		
In work practices, or workforce organisation		
In supply, storage or distribution systems		
In administration and office systems		