

Micro Data Linking – Creating new Evidence by Utilising existing Statistical Registers. Case: International Sourcing

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STS55 - Measuring Globalisation Effects on Employment and Growth by Using Linked Employer-Employee Microdata of Enterprises, Jobs & Persons.

1. Introduction

The national statistical institutes experience the dilemma of being confronted with on the one hand the political demand for reducing the respondent burden on enterprises and on the other hand the increasing user need for exploring emerging issues such as the consequences of globalization. One way of meeting this challenge is by utilizing existing statistical registers and linking information from different surveys at micro level and thus establish new evidence instead of launching new surveys.

Utilising micro data requires high quality infra structures such as the availability of statistical business registers with updated information and unique identification numbers. Micro data linking also requires the use of such identification numbers throughout the statistical production in order to identify the same unit across different statistical registers.

Furthermore, when carrying out an international project as the project described in this paper, it also requires the use of an internationally comparable methodology, including the type of statistical unit and definitions of the variables used.

This paper presents experiences from an on-going EUROSTAT project on linking micro data on International Sourcing involving statistical institutes from Czech Republic, Denmark, Finland, Ireland, the Netherlands, Norway, Portugal and Slovenia.

The aim of the project is to build a data base with data from the International Sourcing survey, the Structural Business Statistics Register and the International Trade in Goods Register using the unique enterprise identification number from the national Business Registers to link data from the period of 2000-2007 on micro level.

By combining data from the mentioned sources, four main research questions will be addressed;

- What is the impact of international sourcing on domestic employment?

- Does international sourcing imply higher personnel costs per employee domestically assuming that mainly low-skilled jobs are being sourced internationally?
- Is it possible to identify any impact on the value creation by the enterprises carrying out international sourcing?
- Can an influence on the foreign trade patterns of the enterprises sourcing internationally be observed?

The paper addresses the methodological experiences learned from carrying out a micro data linking project involving several countries with (partly) different statistical production system and presents the main statistical findings of the project.

As the concept of international sourcing and business functions is not expected to be commonly known, the paper introduces these concepts and the ad hoc survey on international sourcing carried out by 13 European countries in 2007.

2. European survey on International Sourcing

Industrial restructuring has been an important factor influencing the economic development within the EU in recent decades. It has especially affected the manufacturing sector, and it has led to concerns amongst policy makers about a potential process of deindustrialisation in the EU. A more recent trend, increasing concerns about the future employment opportunities in Europe even further, is the apparent growth in international sourcing of services, especially to countries outside of the EU.

In the current debate the phenomenon of international sourcing has a variety of labels and terms such as off-shoring, near-shoring, delocalisation or outsourcing, which are often used without explicit definitions.

The IS survey focused on the movement of domestic production to producers located abroad (see below for the definition) as a result of a decision taken by a resident producer to reduce or close down production of goods or services domestically. This includes both core and support business functions of the enterprise. The business functions approach and related definitions are addressed further below.

Box 2.1 Definition of International Sourcing

The total or partial movement of business functions (core or support business functions) currently performed in-house or domestically outsourced by the resident enterprise to either non-affiliated (external suppliers) or affiliated enterprises located abroad.

Source: Statistics Denmark, Statistics Finland, Statistics Netherlands, Statistics Norway and Statistics Sweden, *International sourcing: Moving business functions abroad* (Copenhagen, Statistics Denmark, 2008); available at www.dst.dk/globalisation and http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/International_sourcing_statistics

The definition for international sourcing, as used in the European survey on international sourcing, is strict in terms of location, as it is limited to events replacing domestic production with foreign production. On the other hand, it is less restrictive with regard to control, as it includes all types of relocation of production of goods or services, irrespective of whether functions are sourced to an affiliated enterprise abroad or contracted out to an unaffiliated supplier abroad. The definition also includes all types of affiliated enterprises, and it does not distinguish between green-field establishments and existing affiliates.

Box 2. 2 Definition of insourcing and outsourcing

CONTROL	LOCATION	
External production outside the enterprise or enterprise group	Domestic Sourcing (Outsourcing) <i>Production outside the enterprise or group by non-affiliated enterprises but within the compiling country</i>	International Sourcing (Outsourcing) <i>Production outside the enterprise or group and outside the compiling country by non-affiliated enterprises. This involves foreign subcontracting</i>
Internal production within the enterprise group	Domestic Sourcing (Insourcing) <i>Production within the enterprise group to which the enterprise belongs and within the compiling country</i>	International Sourcing (Insourcing) <i>Production within the group to which the enterprise belongs but abroad (by affiliated enterprises)</i>

Source: Statistics Denmark, Statistics Finland, Statistics Netherlands, Statistics Norway and Statistics Sweden, *International sourcing: Moving business functions abroad* (Copenhagen, Statistics Denmark, 2008); available at www.dst.dk/globalisation and http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/International_sourcing_statistics

2.2.1 Objectives and scope

The IS survey was motivated by the fact that current discussions about the magnitude and impact of international sourcing were mainly based on anecdotal evidence as no harmonised and internationally comparable official statistics were available. Therefore EUROSTAT and the national statistical offices within the ESS launched the ad-hoc survey on international sourcing to establish statistical evidence needed by policy-makers, researchers and other users about the level, patterns and possible impacts of international sourcing for the European economies.

The overall objective of the international sourcing project was to provide decision-makers at the national and European level with relevant statistical evidence and information about factors driving international sourcing, e.g. the impact on the competitiveness, motivations and perceived benefits and barriers together with possible employment consequences in the member states.

In order to provide the statistical evidence needed, a survey tool and a methodology for monitoring the factors driving international sourcing was developed. The project was launched in 2006 and the survey was carried out in 2007 in the 13 Member States and EEA countries participating. ¹

2.2.2 Business Functions

The remarkable development, especially within information and communication technologies, in the last decades has led to an increased fragmentation of the value chain. This relates both the production process and the location for carrying out the tasks involved. In order to understand the development it is necessary to identify a unit of analysis at a more detailed level than the enterprise. Consequently, the concept of business function was further developed for statistical purposes and implemented in the survey on international sourcing (box 2.3 below).

The arguments for introducing this new and innovative unit in business surveys are several. Firstly, the

continuous integration of manufacturing and services functions within the same enterprise causes the need for an analytical tool which can unbundle this integration and open the black box of the enterprise and its production chain in a much more detailed way than the concept of an enterprise or kind of activity unit. Business functions is an aggregation of tasks/products (services and goods) carried out by the enterprise on the one hand, but on the other hand also a decomposition of the activity of the enterprise.

Secondly, the concept is well understood and found relevant by business managers as they are familiar with this way of thinking from the management literature. The relevance and familiarity of the concept of business functions make the surveys more user-friendly and easier to understand and therefore answer by the respondents.

Thirdly, the concept is accounting for the fact that activities other than the core/primary can be profit centres, either for the outsourcing firm or the supplier and so there is a need to collect information about more detailed activities than the main activity code. For analysis of sourcing this detailed level of information is crucial for understanding the nature and consequences of sourcing, e.g. the loss of jobs in a manufacturing company sourcing can be types of job very different from production jobs, if the R&D function is sourced as well. Using the traditional unit of the enterprise this unbundling of the total employment sourced will never have been possible.

Box 2.3 Definition of Business Functions

The enterprise is mostly treated as a black box in business statistics with little or no information about the organisation of the production processes. In the International Sourcing survey, eight business functions (and a residual category) were identified based on Porter's generic business functions and the empirical findings from the EMERGENCE project.¹

Core business function:

Production of final goods or services intended for the market/for third parties carried out by the enterprise and yielding income. The core business function equals in most cases the primary activity of the enterprise. It may also include other (secondary) activities if the enterprise considers these to comprise part of their core functions.

Support business function:

Support business functions (ancillary activities) are carried out in order to permit or facilitate production of goods or services intended for the market/for third parties by the enterprise. The outputs of the support business functions are not themselves intended directly for the market/for third parties. The support business functions are in the survey divided into:

Distribution and logistics:

This support function consists of transportation activities, warehousing and order processing functions. In figures and tables "Distribution" is used as an abbreviation for this function.

¹ Ursula Huws (ed.), *When work takes flight: Research results from the EMERGENCE project*, IES Report 397 (Brighton: Institute for Employment Studies, 2003)

Marketing, sales and after sales services including help desks and call centres:

This support function consists of market research, advertising, direct marketing services (telemarketing), exhibitions, fairs and other marketing or sales services. Also including call-centre services and after sales services such as help-desks and other customer supports services. In figures and tables "Marketing, sales" is used as an abbreviation for this function.

ICT services:

This support function includes IT-services and telecommunication. IT services consist of hardware and software consultancy, customised software data processing and database services, maintenance and repair, web-hosting, other computer related and information services. Packaged software and hardware are excluded. In figures and tables "ICT services" is used as an abbreviation for this function.

Administrative and management functions:

This support function includes legal services, accounting, book-keeping and auditing, business management and consultancy, HR management (e.g. training and education, staff recruitment, provision of temporary personnel, payroll management, health and medical services), corporate financial and insurance services. Procurement functions are included as well. In figures and tables "Administration" is used as an abbreviation for this function.

Engineering and related technical services:

This support function includes engineering and related technical consultancy, technical testing, analysis and certification. Design services are included as well. In figures and tables "Engineering" is used as an abbreviation for this function.

Research & Development:

This support function includes intramural research and experimental development. In figures and tables "R&D" is used as an abbreviation for this function.

Source: Statistics Denmark, Statistics Finland, Statistics Netherlands, Statistics Norway and Statistics Sweden, *International sourcing: Moving business functions abroad* (Copenhagen, Statistics Denmark, 2008); available at www.dst.dk/globalisation and http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/International_sourcing_statistics

2.2.3 The General Structure of the Questionnaire

The model questionnaire on international sourcing was designed as a general survey tool applicable for all economic activities. In addition, the core of the questionnaire was based on a qualitative approach, which was considered to be the most useful basis to provide harmonised data, allowing for comparisons between the participating countries in this difficult and not well established area.

The survey consisted of six modules, the first two of which concerned background information together with some general aspects of international sourcing. The focus of the survey was on the international sourcing activity of the enterprise (module 3). Module 4 asked information about the international sourcing plans of the enterprises that had not yet sourced internationally. Module 5 sought to estimate the expected impact on employment of the planned international sourcing. Finally, the question (in module 6) on barriers related to international sourcing activity was aimed at all enterprises.

Box 2.4 Structure of the Model Questionnaire

Module 1: General information (for all enterprises)

Module 2: Sourcing activity of the enterprise (for all enterprises)

Module 3: Sourcing activity of the enterprise carried out internationally during 2001-2006 (for enterprises already carrying out international sourcing in 2001-2006)

Module 4: Plans for international sourcing 2007-2009 (for enterprises with no prior international sourcing activity)

Module 5: Future impact on employment (for enterprises with international sourcing during 2001-2006 and/or plans for international sourcing during 2007-2009)

Module 6: Barriers on international sourcing (for all enterprises)

2.2.4 Survey Coverage and Target Population

The IS survey was an economy-wide ad-hoc survey, covering the so-called non-financial business economy (NACE sections C to I and K).

The focus of the survey was on larger enterprises, as the multinational groups of enterprises were considered to be the key players in international sourcing. In terms of employment size class a threshold of 100 or more employees was established for determining the population to be targeted by the survey. Several statistical offices decided to lower the threshold to enterprises with 50 or more employees, as this size class was seen as more relevant for especially smaller economies. The statistical unit used was the standard unit in the European Structural Business Statistics framework, i.e. the enterprise.

The survey was well received by the enterprises; determined from the relatively high response rate. The response rates are influenced by the character of the survey: Some countries - Finland, Portugal, Czech Republic, Slovenia and Denmark - carried out the survey on a mandatory basis, whereas in others - Germany, Italy, the Netherlands, Norway, Sweden and UK - the survey was voluntary. The response rate was highest in Denmark, 99 per cent, cf. table 2.1. Only in Italy, the Netherlands, Germany and United Kingdom the response rate falls below 50 per cent.

Table 2.1 Response rates for international sourcing survey. Weighted response rates (%)

Coverage of responses, measured by employment, compared to the total population of employees. Enterprises with 100+ persons employed.

NACE Rev. 1.1	CZ	DK	FI	IT	NL	NO	PT	SE	SI	UK	DE
Sector											
C	90	100	100	91	0	85	48	100	100	d	26
D	55	98	90	33	34	85	59	60	97	2	50
E	48	100	93	62	14	77	86	58	93	d	56
F	49	99	94	27	15	88	50	21	96	d	47
G	42	100	89	31	8	89	69	77	92	17	29
H	49	100	89	31	17	66	80	100	92	d	35
I	81	98	90	31	8	90	80	34	98	d	46

K	47	100	92	27	24	88	77	71	90	3	38
TOTAL	56	99	90	32	20	86	68	61	96	7	44
Analytical breakdown											
IS_HIT*	63	99	93	38	40	84	72	56	98	2	53
IS_MLT**	48	98	88	30	31	86	54	65	96	3	45
KIBS***	67	97	90	25	29	89	72	58	99	3	32

* NACE 24+29+30+31+32+33+34+35.2+35.3+35.4+35.5
 ** NACE 15+16+17+18+19+20+21+22+23+25+26+27+28+35.1+36+37
 *** NACE 64.2+72+73+74.1-74.4
 d = disclosure
 Czech Republic: includes enterprises with >49 persons employed
 Source: Statistics Denmark: *International Sourcing. Final methodological report (2008)*

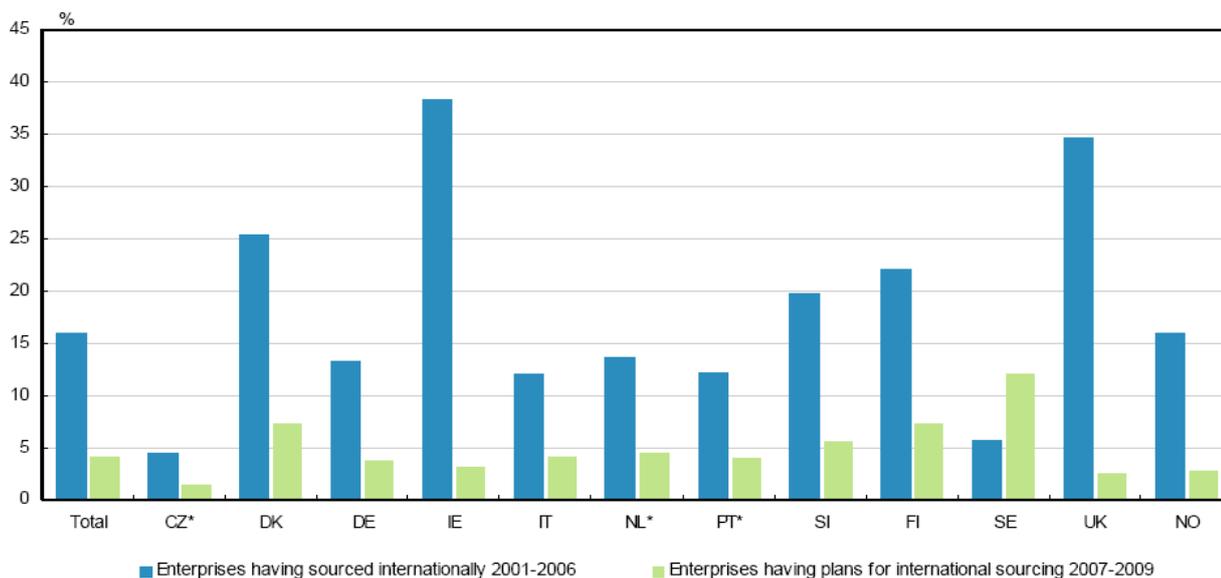
2.2.5 Main Statistical Results

The survey showed that 16 % of the enterprises with 100+ employees in the participating countries had moved one or more business functions abroad. More than twice as many enterprises in Ireland and the United Kingdom did so (38.3 % and 34.7 % respectively). The two small and open Nordic economies, Denmark (25.4 %) and Finland (22 %), were also significantly above the average.

With the exception of Slovenia (19.7 %), the remaining countries participating in the survey were either at the average level (Norway 16 %), or under it, the lowest share being registered in the Czech Republic (4.5 %).

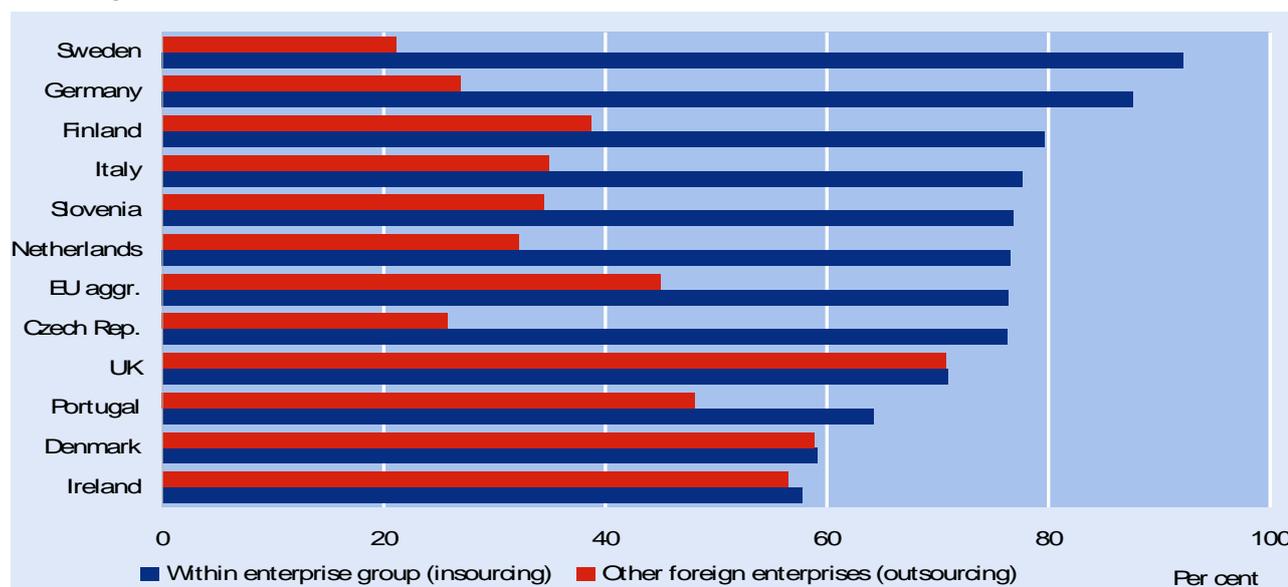
When enterprises that did not source internationally were asked about their plans in the near future (2007-2009), relatively few Irish (3.1 %) and UK enterprises (2.4 %) intended to do so, as these countries already had high sourcing levels. Conversely, 12.0 % of Swedish and 7.2 % of Danish and Finnish enterprises not currently sourcing certain business functions abroad were planning to do so. The remaining countries had shares ranging from 1.5 % to 5.5 %.

Figure 2. 1 International sourcing. Share of enterprises with 100 or more employees with international sourcing 2001–2006 or plans 2007-2009.



One of the main distinctions in the survey is that between international sourcing within the same enterprise group (insourcing) and to other, foreign enterprises (outsourcing). The survey results show that in most countries at least 75 per cent of the enterprises with international sourcing have carried out international sourcing within the enterprise group, i.e. insourcing. Generally, a significantly lower share has sourced internationally to other foreign enterprises, i.e. outsourcing. On aggregate, around half of the enterprises with international sourcing have outsourced, cf. figure 2.2.

Figure 2.2 International sourcing by business partner. Share of enterprises with international sourcing



Source: Eurostat, International sourcing statistics. Data for the EU aggr. are unreliable; data for the Czech Republic and Portugal are preliminary.

As a conclusion, the survey on international sourcing can be considered as being very successful. The survey has introduced new concepts in statistical surveys such as sourcing and business functions which have proven to be feasible to utilise in statistical surveys and the survey has produced new data in a field where only anecdotal data existed previously to the satisfaction of many users.

Even if the survey is characterized as relatively successful, the survey has not been capable of providing information about all the topics intended to shed light upon. Especially the issue of the possible loss of jobs within the European industries as a result of international sourcing cannot be satisfactorily analysed based on the survey results alone – due to the failing quality of the answers of the job-related questions in many countries. It was therefore decided to establish a follow-up project with the purpose of combining the survey information on sourcing activities with other existing statistical registers containing information about employment, personnel costs, value added and foreign trade in order to analyse the impacts of international sourcing in more details.

3. Micro-data linking project

This project involves 8 European countries and the main purpose is to develop and test a methodological set-up for micro-data linking of enterprise data involving several countries. This is a new type of exercise to be carried out at European level but is regarded a very important future tool for creating further knowledge and statistical evidence by utilising existing sources and thus not launching new surveys creating new burden on the enterprises. This project will test the data linking possibilities of two of the main business statistics; the Structural Business Statistics (SBS) and the foreign trade statistics, with the international sourcing survey.

The project will address the following research questions:

- What is the impact of international sourcing on domestic employment?
- Does international sourcing imply higher personnel costs per employee domestically assuming that mainly low-skilled jobs are being sourced internationally?
- Is it possible to identify any impact on the value creation by the enterprises carrying out international sourcing?
- Can an influence on the foreign trade patterns of the enterprises sourcing internationally be observed?

As the project is still work-in-progress, this paper will only address preliminary results related to the three first research questions.

3.1 Design of the project

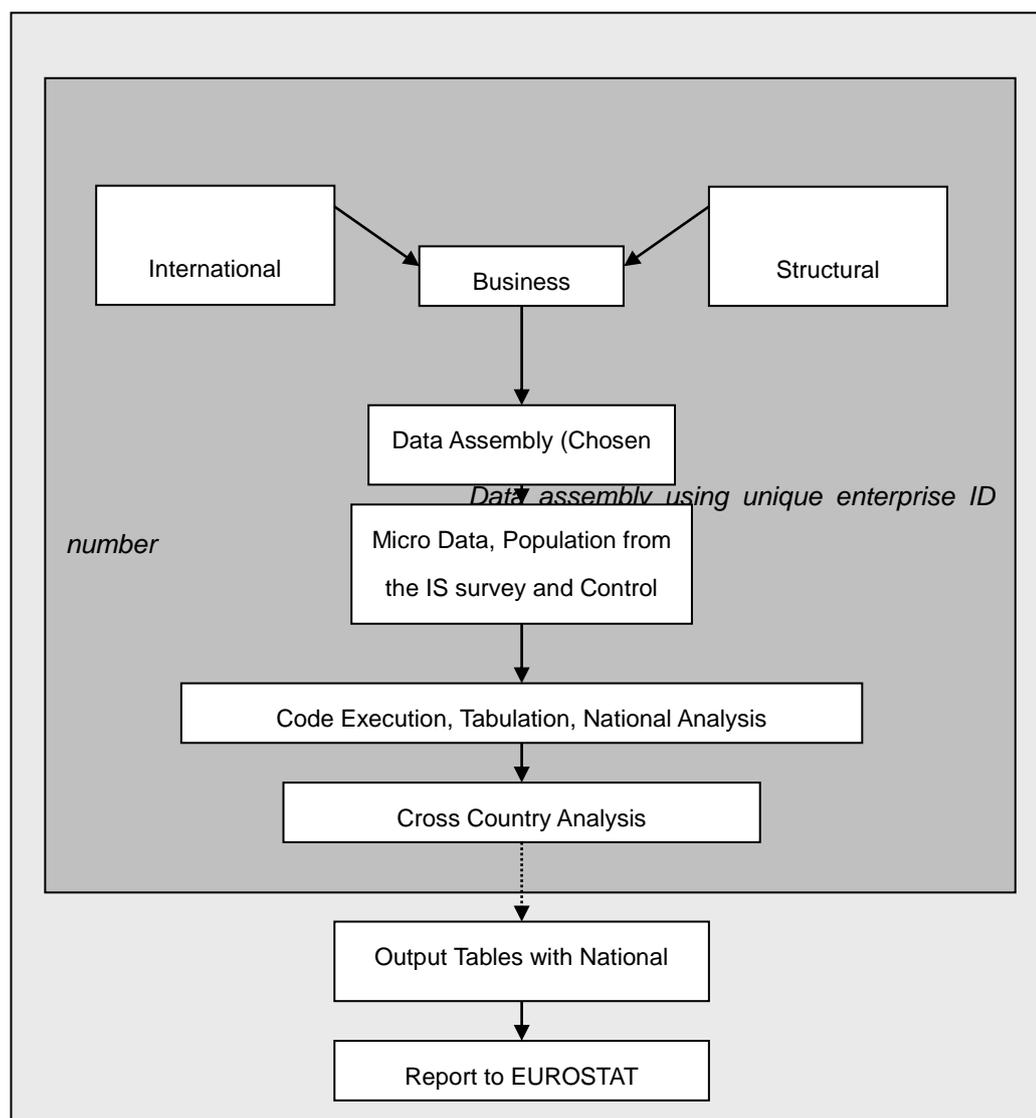
One important precondition of this project is that no micro data is transmitted to Eurostat as all data are kept within the national statistical institutes. Each institute has established a database with a harmonised set of variables and has been using standardised SAS coding developed for this project to extract the required data and produce a set of defined tables, cf. figure 3.1.

The approach taken in this exercise has been to establish two panels; one being the enterprises having sourced internationally in the period 2001 – 2006 and a control group of enterprises not having sourced, cf. figure 3.2. The control group for the internationally sourcing enterprises was extracted with simple random sampling using two criteria; belonging to an enterprise group, activity (manufacturing vs. services) and exports of goods as a third supplementary criteria for manufacturing enterprises, due to the inclusion of foreign trade data.

Economic activity is assumed to be the most significant factor for carrying out international sourcing, as empirical evidence from the IS survey showed that enterprises in some activities (mainly manufacturing) are more prone to do international sourcing than enterprises in other activities (e.g. construction, retail trade or hotels and restaurants). Economic activities are also affected by business cycles differently, which necessitates the usage of activity as a factor in composing a control group. Furthermore, the results of the survey as mentioned above indicate that being part of an enterprise group is of significant influence on the probability of carrying out international sourcing.

The overall impression is that the micro data linking exercise has a good setting, as all the participating countries conduct the SBS survey for enterprises with 100+ employees as a census. This implies that all the enterprises included in the IS survey should be present in the SBS population for the reference year. As a consequence, it should be possible to establish a longitudinal panel and follow the enterprises present in the IS-survey throughout the period 2000-2007. This period is chosen to have the status in the year prior to the observation period and the status in the year following the observation period allowing for analysis of the impact of sourcing carried out in the period in-between.

Figure 3.1 Overview of the Micro Linking Exercise

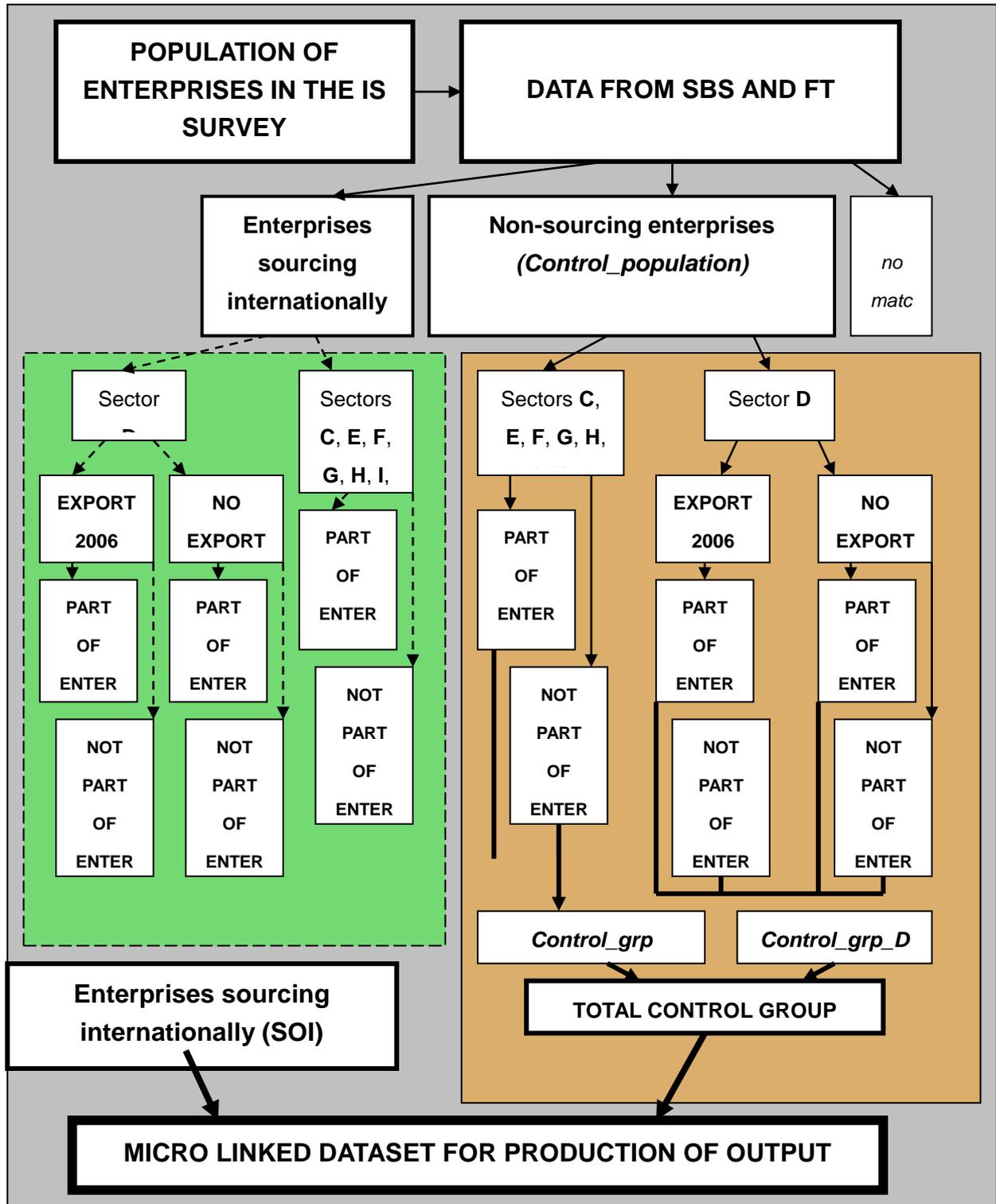


The exercise matching the population from the international sourcing survey with the population from the SBS registers 2000 – 2007 has been relatively successful as all participating countries, except for the Netherlands, report overall matching shares in the years 2000-2007 to be rather high (around 75 per cent or more)². Furthermore, the matching frequencies are equally good in all the sectors, indicating the feasibility of economy wide analysis.

In this exercise, we have been operating with panels consisting of the enterprises being present in the SBS data for the years in the period 2000 - 2007. The longitudinal panel sizes vary between 426 enterprises out of 525 enterprises in the total population with international sourcing in Denmark and 46 enterprises out of 79 enterprises in the total population with international sourcing in Czech Republic. The remaining countries showed panels sizes of between 100 to 180 enterprises.

Figure 3.2 Micro linking and extraction of population for benchmarking

² The data source for the Portuguese SBS was changed in 2004 so the results prior to this period are not directly comparable with the results published in 2004, 2006 and 2007.



3.2 Development in employment

The possible job losses as a consequence of sourcing abroad are a major concern for European policy makers. The survey on international sourcing had the purpose of providing the needed information to shape future policy making in this area but the survey results showed that it was not feasible for a large number of countries to collect the required information about job losses. Therefore the main objective of the micro data linking project is to utilise the existing employment information collected in the context of the annual Structural Business Statistics framework at micro level to establish new evidence about the job losses of enterprises having

sourced internationally.

As the definition of sourcing includes a movement of functions previously being carried out by the enterprise, the hypothesis is that the micro data should reflect a decline in the employment at enterprise level – at least in the period immediately after the sourcing event.

As the project is still on-going, only preliminary results can be shown. The exercise shows no immediate support for this hypothesis, cf. table 3.1. For most countries we find an increase in the employment both for the ones having sourced and the ones not having sourced internationally. Only for three countries, Denmark, the Netherlands and Norway, the data shows a decline relative to 2000.

Table 3.1 Development in total employment in sourcing and non-sourcing enterprises 2000-2007

	CZ		DK		FI		NO		NL		PT		SI	
	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS
	—————2000 = 100													
2000	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2001	110	105	103	102	103	106	106	107	99	96	102	108	102	102
2002	103	120	105	101	114	114	112	110	101	95	97	107	112	105
2003	107	122	103	98	111	121	108	103	100	96	106	106	111	104
2004	110	114	105	95	121	119	110	95	96	90	109	109	109	103
2005	103	115	111	98	129	127	117	96	97	90	105	114	109	106
2006	110	111	119	99	131	125	122	95	101	91	111	111	110	101
2007	119	123	125	105	128	126	131	99	109	90	110	104	112	103

No IS= enterprises with no international sourcing IS=enterprises with International sourcing

There can be several reasons for these results; the main ones being that we do not know the exact year of sourcing and the period of observation, especially the latest years of observation (from 2005 to 2007) is a period of substantial employment growth in general. This can imply that the actual number of employees may still increase in absolute terms also in the enterprises carrying out sourcing. But the results support the hypothesis in the way that even if an employment increase can be observed, the increase is as mentioned relatively smaller for the enterprises having sourced compared to the ones not having sourced internationally. This finding is observed for all countries, except the Czech Republic.

Furthermore, the methodological issue of the longitudinal identity of enterprises is also of huge importance when interpreting the results. Even if the enterprises from a technical point is identical over time, demographic incidents such as mergers or acquisitions can take place and they will not always be registered and consequently it is not possible to distinguish this type of growth from organic growth. This issue needs to be addressed in the future business statistics in order to develop a consistent methodology for micro data linking and better understand the performance of the enterprises. Especially as the panels in this micro data linking exercise are relative small, the aggregated results can be influenced by such incidents.

If we only look at the population of manufacturing enterprises sourcing, 5 out of 7 countries show a development where the employment in sourcing enterprises decrease compared to 2000 in one or more years, cf.

Table 3.2. The reason is probably that manufacturing enterprises to a large extent source their core production involving relatively many jobs and the production is not substituted by new production in the resident country.

Table 3.2 Development in total employment in sourcing and non-sourcing enterprises in manufacturing 2000-2007

	CZ		DK		FI		NO		NL		PT		SI	
	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS
	—2000 = 100													
2000	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2001	104	96	100	99	106	103	101	102	102	97	104	104	103	101
2002	104	114	101	99	111	111	108	102	99	95	98	95	109	101
2003	104	113	100	98	104	113	105	101	102	92	100	92	111	100
2004	110	108	100	91	111	117	108	92	94	86	99	88	108	100
2005	109	110	106	97	115	118	107	91	96	85	97	91	110	102
2006	115	115	118	96	123	116	110	85	97	81	106	87	112	98
2007	120	121	119	102	112	117	123	89	101	81	104	76	111	100

No IS= enterprises with no international sourcing IS=enterprises with International sourcing

The information collected about type of business function sourced (core or support functions) can be used to test the above mentioned statement. Currently this exercise has only been carried out for Denmark.

The results of the Danish exercise shows that the enterprises sourcing their core functions have a considerable decline in their employment – down to index 93 in 2007 – compared to the ones only sourcing their support functions (index 108) or the ones not having sourced (index 125), cf. table 3.3. Compared to the overall average employment development for all Danish enterprises having sourced in the period (index 105), the use of the information about type of business function sourced deepens our understanding of the impacts of international sourcing on employment.

If we look only at manufacturing enterprises, the above pattern is further confirmed as the manufacturing enterprises only sourcing core activities have lost most employees (index 86) of all groups analysed while the ones having source only their support functions experience a small increase in employment (index 106) and the ones not having sourced internationally have experienced a considerable employment growth (index 122).

Table 3.3 Development in total employment. Broken down by type of function sourced. Denmark 2000-2007

	Core and Support functions				Core and Support functions				Core and Support functions			
	Core functions	Support functions	Support functions	No IS	Core functions	Support functions	Support functions	No IS	Core functions	Support functions	Support functions	No IS
	—2000 = 100—											
	All enterprises				Manufacturing				Services			
2000	100	100	100	100	100	100	100	100	100	100	100	100
2001	94	112	98	103	95	105	100	103	124	158	94	103
2002	85	101	108	105	85	106	108	102	152	122	112	100
2003	92	97	104	103	89	101	106	102	179	119	111	105
2004	91	100	106	105	87	109	108	103	184	138	106	114
2005	91	101	108	111	88	107	115	109	180	124	109	128
2006	96	101	118	119	92	106	119	119	196	107	112	129
2007	93	102	108	125	86	98	106	122	216	102	116	140

Source: Statistics Denmark: International Sourcing Survey data

For service enterprises, no clear pattern can be found. This is probably caused by the relatively few observations of service enterprises having sourced their core functions. In addition, the potential for sourcing jobs abroad is rather limited in several labour intensive operational services activities.

In order to test the significance of the results of the micro data linking exercise, regression analysis have been carried out for two countries, Denmark and the Netherlands, controlling for enterprise status (member of enterprise group or not), sector and size, as described in box 3.1. The results are significant for both countries as the results of the linear regression analysis show that the average yearly growth in domestic employment is affected negatively by international sourcing.. In this regression analysis, the variance is controlled for

Box 3.1 Linear Regression Analysis on Linked Micro Data

The linear regression analysis presented in this paper is performed on the whole micro linked dataset, i.e. containing all enterprises from the International Sourcing Survey linked with data from SBS 2000-2007 and Foreign Trade in Goods 2000, 2006 and 2008.

The **independent variable** in the analysis is the variable indicating international sourcing during the period 2001-2006, while the **dependent variables** are: yearly totals of turnover, employees, personnel costs, value added, gross operating surplus and purchases of goods and services and the derived variables: turnover per employee, personnel costs per employee, value added per employee, gross operating surplus per employee and purchases of goods and services per employee.

The **control variables** are enterprise status (belonging to an enterprise group or not), NACE sector (1-letter level) and size (based on turnover).

As the independent variable does not indicate the actual year(s) of international sourcing (only whether an enterprise has sourced functions internationally during the period 2001-2006), the average annual growth of the dependent variables in the period of 2001-2007 is used as a proxy.

3.3 Development of personnel costs per employee

The survey also addressed the issue of which types of jobs were sourced. Most countries were faced with difficulties in getting valid information on this question. In the micro data linking exercise the personnel costs available in the SBS statistics were used as an indicator for types of jobs. The working hypothesis has been that mainly non-skilled jobs, especially within the manufacturing sector, have been sourced internationally; also being the jobs with the lowest personnel costs. Consequently, the personnel costs per employee should be expected to grow relatively more for enterprises having sourced and thus moved the low wage jobs abroad compared to non-sourcing enterprises.

Even if personnel costs only can be used as a proxy for the type of jobs sourced, the results relatively unambiguous as 5 out of 6 countries show a higher growth in personnel costs per employee in the manufacturing enterprises sourcing internationally than for the ones not carrying out international sourcing in the period 2001 – 2006, cf. table 3.4. These finding supports the hypothesis of mainly low wage jobs being sourced abroad.

Table 3.4 Development in personnel costs per employee in sourcing and non sourcing enterprises Manufacturing 2000-2007

	CZ		DK		FI		NO		NL		PT		SI	
	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS
	2000 = 100													
2000	n.a.	n.a.	100	100	100	100	100	100	100	100	100	100	100	100
2001	n.a.	n.a.	105	104	105	104	105	111	109	106	107	111	102	104
2002	n.a.	n.a.	111	111	109	106	110	113	110	110	114	116	108	113
2003	n.a.	n.a.	116	118	107	107	110	114	113	117	116	120	113	117
2004	n.a.	n.a.	122	123	115	113	120	123	122	123	123	132	120	120
2005	n.a.	n.a.	121	126	118	117	125	130	122	130	128	122	123	128
2006	n.a.	n.a.	126	129	122	120	135	140	125	128	130	140	130	131
2007	n.a.	n.a.	133	135	127	127	141	143	127	135	134	144	135	136

No IS= enterprises with no international sourcing IS=enterprises with International sourcing

If the results are further broken down by type of function sourced, the results for Denmark are difficult to interpret, cf. table 3.5. For manufacturing enterprises the enterprises sourcing only support functions have experienced the largest growth in personnel costs per employee while the manufacturing enterprises only sourcing their core functions surprisingly show a smaller increase in personnel costs, leveling the ones without sourcing activities. For services enterprises a different pattern can be observed as they are characterized by clearly the fastest in personnel costs per employee by the enterprises sourcing both core and support functions. Furthermore, for services enterprises all type of sourcing enterprises experience a higher growth in personnel costs than the ones not sourcing internationally in the period of observation.

Table 3.5 *Development in personnel costs per employee. Broken down by type of function sourced. Denmark 2000-2007*

	Core and Support functions				Core and Support functions				Core and Support functions			
	Core functions	Support functions	Support functions	No IS functions	Core functions	Support functions	Support functions	No IS functions	Core functions	Support functions	Support functions	No IS functions
	2000 = 100											
	All enterprises				Manufacturing				Services			
2000	100	100	100	100	100	100	100	100	100	100	100	100
2001	107	108	103	106	106	104	103	106	112	112	108	106
2002	112	115	111	111	110	113	113	111	126	114	114	115
2003	118	118	120	118	117	119	122	116	125	123	122	124
2004	122	122	124	123	122	122	126	122	124	121	120	123
2005	124	126	128	122	122	126	131	122	121	127	126	124
2006	132	128	129	126	131	127	134	126	131	133	133	128
2007	134	138	134	134	133	137	139	133	131	143	133	130

Source: Statistics Denmark: International Sourcing Survey data

In spite of the above, the regression analysis on Danish and Dutch data shows a somewhat different pattern, as the results are significant and negative for both countries implying lower yearly growth in total personnel costs in enterprises with international sourcing than other enterprises. The patterns described above must therefore be interpreted as a result of variance caused by other factors than international sourcing. If we look at personnel costs per employee, the regression analysis shows no significant effect of international sourcing in both the Danish and Dutch data.

3.4 Development of value added per employee

The analysis shows that it is not possible to draw any conclusions about the impact on value added creation by the enterprises carrying out international sourcing compared to the ones not carrying out international sourcing, cf. table 3.6. The results show that 3 countries show a value added creation highest in the sourcing enterprises and 3 countries show the opposite pattern.

Table 3.6 Development in value added per employee in sourcing and non-sourcing enterprises. Manufacturing 2000-2007

	CZ		DK		FI		NO		NL		PT		SI	
	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS	NO IS	IS
2000 = 100														
2000	n.a.	n.a.	100	100	100	100	100	100	100	100	100	100	100	100
2001	n.a.	n.a.	102	103	96	97	109	103	106	109	105	103	100	92
2002	n.a.	n.a.	109	109	100	93	105	99	105	103	118	107	111	99
2003	n.a.	n.a.	110	114	98	93	110	102	108	121	113	106	110	99
2004	n.a.	n.a.	118	120	104	106	119	115	115	129	118	123	120	106
2005	n.a.	n.a.	120	119	107	104	125	121	114	132	118	123	122	104
2006	n.a.	n.a.	122	126	115	113	135	128	115	130	121	123	131	119
2007	n.a.	n.a.	127	133	119	117	154	147	124	138	123	134	138	117

No IS= enterprises with no international sourcing IS=enterprises with International sourcing

For Denmark, where the results showed a higher growth in value added for the sourcing enterprises within manufacturing, this is especially caused by the enterprises sourcing both core and support or only support functions, cf. table 3.7. For services enterprises, the highest growth in value added can be found in the enterprises only sourcing their core functions. Again, no unambiguous conclusions about the type of functions sourced and the economic performance in terms of value added can be drawn.

Table 3.7 Development of value added per employee. Broken down by type of function sourced. Denmark 2000-2007

	Core and Support functions			No IS	Core and Support functions			No IS	Core and Support functions			No IS	
	Core functions	Support functions	Support functions		Core functions	Support functions	Support functions		Core functions	Support functions	Support functions		
2000 = 100													
	All enterprises				Manufacturing				Services				
2000	100	100	100	100	100	100	100	100	100	100	100	100	
2001	103	106	102	102	102	102	102	107	103	127	111	104	98
2002	108	109	111	110	106	107	115	109	134	125	109	110	
2003	111	115	120	114	108	113	125	111	144	120	115	115	
2004	118	125	120	119	116	119	127	118	163	121	114	117	
2005	119	121	130	119	116	119	130	120	144	123	127	120	
2006	125	130	127	121	123	127	129	122	143	131	132	118	
2007	129	143	134	128	126	138	137	127	169	150	138	124	

Source: Statistics Denmark: International Sourcing Survey data

The linear regression analysis of Danish and Dutch data shows no effect of sourcing internationally on value added creation in the Danish enterprises, whilst there is a significant and negative impact of international sourcing on total of value added in the Dutch enterprises. Furthermore, analysis of value added per employee shows significantly positive effect of international sourcing in the Danish enterprises, whilst there is no significant relation between international sourcing and value added per employee in the Dutch enterprises.

4. Conclusion

The project on linking of micro data of the International Sourcing survey has been a successful learning experience and has contributed with new knowledge about the behavior of sourcing and non-sourcing enterprises.

The most important result of this project is, nevertheless, the methodological experiences which will constitute input to the future development of guidelines for European projects on micro linking guidelines.

The approach chosen, establishing longitudinal panels for both the IS population and the established control group was very successful. In this way, it is possible to produce statistics reflecting the behaviour of the two types of enterprises. For future actions, we propose to enlarge the analysis with a further step carrying out regression analysis in order to prove the significance of the results based on the panel data.

The exercise showed that demographic events are a challenge for micro data analysis as these events can be difficult/impossible to track in the registers and therefore hamper the analysis. An example is the analysis of the employment growth in the two types of population which can be influenced by demographic events such as mergers and acquisitions which with the current information in the structural business statistics data and the underlying business register data cannot be identified in the data used in the analysis. Especially as micro data linking can be expected to be more frequent in the future, this will an important issue to address.

In the project, the problem was addressed in a pragmatic way by using the median instead of the mean which gave more robust results. Finally, the usefulness of the micro data linking highlights the issue of co-ordination of survey samples. In order to maximize the value of the information collected by micro data linking, it can be argued that it is important so secure a panel of enterprises to be present in all the major business surveys. This approach can conflict with the interest of minimizing the respondent burden by having a negative coordination by exempting enterprises by purpose of taking part in many surveys or by frequent rotation of the panels.

Abstract

The national statistical institutes experience the dilemma of being confronted with on the one hand the political demand for reducing the respondent burden and on the other hand the increasing need for exploring emerging issues such as the consequences of globalization. One way of meeting this challenge is by utilizing existing statistical registers and linking the relevant information at micro level.

This paper presents experiences from an on-going EUROSTAT project on linking micro data on international sourcing involving statistical institutes from Czech Republic, Denmark, Finland, Ireland, the Netherlands, Norway, Portugal and Slovenia.

The aim of the project is to build a data base with data from the International Sourcing survey, the Structural Business Statistics Register and the International Trade in Goods Register using the unique enterprise identification number from the national Business Registers to link data from the period of 2000-2009 on micro level.

By combining data from the mentioned sources, four main research questions will be addressed;

- *What is the impact of international sourcing on domestic employment?*
- *Does international sourcing imply higher personnel costs per employee domestically assuming that mainly low-skilled jobs are being sourced internationally?*
- *Is it possible to identify any impact on the value creation by the enterprises carrying out international sourcing?*
- *Can an influence on the foreign trade patterns of the enterprises sourcing internationally be observed?*

In order to illustrate the behavior of enterprises having performed international sourcing during 2001-2006, a control group with same characteristics (sector, part of enterprise group and exporting or not) was established. The performance of the two panels was compared using variables such as number of employees, personnel costs per employee, value added per employee and amount (value) of foreign trade in goods.

The paper addresses the methodological experiences learned from carrying out a micro data linking project involving several countries with (partly) different statistical production system and presents the main statistical findings of the project.