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Census by Questionnaire – Census by Registers and Administrative Records: The Experience of Finland

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Abstract: The use of administrative records in Finnish population censuses began in 1970 and has been increasing ever since. The Population and Housing Census of 1990 was totally register-based, without using a single questionnaire. In 1980 and 1985, the size of the population was determined on the basis of Central Population Register data. However, information on the workplace and occupation of the population aged 15–74 years, whose names and addresses had been obtained from the Central Population Register, was gathered using questionnaires. Some data on economic activity relating to census day in 1980 and 1985 were also collected from various administrative records. The existence of questionnaire-based and register-based data sets on individuals allowed comparison of data at the level of the individual, giving a good idea of how things will change when the use of administrative records is adopted.

A system of register-based employment statistics was introduced into annual production in 1987. It was tested and developed further in 1988 and 1989 to ensure a satisfactory data quality in 1990.

Key words: Census of population; administrative registers; register-based census system; comparisons of collection methods.

1. Introduction

The aim of this paper is to discuss, in light of Finnish experience, the use of registers and administrative records as a source of basic data for population and housing censuses. First, an overview is given of the historical background of population censuses in Finland. Population censuses and the registration system have been interlinked for hundreds of years. As early as the 16th century, when Finland was a part of Sweden (until 1809), records of births and deaths were kept in church parishes for the purpose of collecting taxes and recruiting soldiers for the army. In the 17th century, everyone over the age of 12 was entered in the registers according to his or her parish. In 1748, a statistical office, or a bureau for compiling statistical tables, was founded for the purpose of conducting the first total population census. The census was carried out in 1749 by first combining the information in the parish registers by diocese and then the diocese tables by province, which were then combined to yield the total population in Sweden-Finland. In addition to the size of the population, the aggregation process provided information on age, sex,

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marital status and social class. At first, censuses were taken at irregular intervals, but soon they were carried out every ten years. When Finland was a part of Russia (1809–1917), the compilation of ten-year tables continued. The information they provided, however, was no longer sufficient for the largest towns, which began to conduct their own censuses. When Finland gained her independence in 1917, the practice of taking censuses on the basis of the local population registers continued. In 1938, a law was enacted stipulating that:

> "A general population census, including censuses of housing and buildings, is to be effected every ten years."

This law is still in force. The first direct census by questionnaires was planned for 1940, but could not be carried out because of the outbreak of the Winter War and the Second World War.

2. Population Censuses 1950–1985

The population register system in Finland consists of about 600 local registers that are updated with the help of vital events data (births, deaths, migrations, marriages, etc.). Registers are updated weekly. Local Registers are integrated into a computer-based Central Population Register (CPR). The Central Population Register consists of all permanent residents and their

- demographic data (age, sex, language, citizenship, religious affiliation),
- occupation or title,
- up-to-date address (time lag about 4–8 weeks), and
- family data.

Personal identification numbers were introduced in the Central Population Register in 1969–1970. The same identification number is used in all other official registers (Markelin 1980).

2.1. *Data content of censuses*

Besides the normal census data, Finnish population censuses gather extensive information on buildings, dwellings (e.g., summer cottages) and business premises (factories, offices, etc.). See Table 1.

Table 1. Finnish censuses 1950–1985: data content and use of registers and administrative records

Items	1950	1960	1970	1975	1980	1985
Demographic data						
Age (date of birth)	q	q	q	R	R	R
Sex	q	q	q	R	R	R
Marital status	q	q	q	R	R	R
Mother tongue	q	q	q	R	R	R
Citizenship	q	q	–	R	R	R
Religion	q	q	R	–	R	R
Usual place of residence	q	q	q	q	q	R
Economic data						
Main type of activity	q	q	q	q	q	qr
Status in employment	q	q	q	q	q	qr
Industry	q	q	q	q	q	qr
Occupation	q	q	q	q	q	qr
Employer, place of work	q	q	q	q	q	qr
Socio-economic group	q	q	q	q	q	qr
Income	–	–	R	R	R	R

Table 1. (Continued)

Items	1950	1960	1970	1975	1980	1985
Educational data						
Completed education	q	q	q	R	R	R
Household and family data						
Type and size of household (from 1980, household-dwelling unit)	q	q	q	q	R	R
Type and size of family	q	q	q	q	R	R
Dwelling data						
Size of dwelling unit	–	q	q	q	q	R
Number of rooms	q	q	q	q	q	R
Kitchen	q	q	q	q	q	R
Water, toilet, bathing facilities	q	q	q	q	q	R
Type of heating	q	q	q	q	q	R
Tenure status	q	q	q	q	q	R
Business premises data						
Floor area	–	q	q	–	q	–
Tenure basis	–	q	q	–	q	–
Use of floor area	–	q	q	–	q	–
Industry of occupant	–	q	q	–	q	–
Building data						
Type of building	q	q	q	q	q	R
Year of construction	q	q	q	–	q	R
Construction material	q	q	q	–	q	R
Main use of building	q	q	q	–	q	R
Number of dwelling units	q	q	q	–	q	R
Volume (in m^3)	–	–	q	–	–	–
Heating system	–	q	q	–	q	R
Floor area of building	–	q	q	–	q	R
Number of stories	q	q	q	–	q	R
Summer cottage data						
Own/rented lot	–	–	q	–	q	–
Joint ownership	–		q		q	–
Year of construction	q	–	q	–	q	–
Floor area	–	–	q	–	q	–
Inhabitability in winter	–	–	q	–	q	–
Fuel	–	–	–	–	q	–
Sauna	–	–	q	–	q	–
Original intended use	–	–	–	–	q	–
Map co-ordinates of building	–	–	q	R	R	R

q = data obtained by census questionnaires.
R = data obtained from registers or administrative records.
– = item not included in the census.
qr = data for non-respondents obtained from registers and administrative records.
(Laihonen and Myrskylä 1987).

As to persons and dwellings, the data content corresponds to that of the other Scandinavian countries; as to buildings, business premises and summer cottages, it is considerably wider in scope (Nordisk statistisk sekretariat 1984; Markelin 1980).

2.2. *Data collection methods in censuses*

Censuses based only on direct questionnaires were carried out in 1950, when the census data were collected by enumerators, and in 1960, when the data were collected by local population commissions, one in each municipality.

Registers and questionnaires were used in the ten-year censuses of 1970 and 1980 and in the mid-decade censuses of 1975 and 1985. The use of registers in population censuses began in 1970, when the Central Population Register was used as a source of religious affiliation and citizenship information and the taxation register as a source of income data.

The identification number was used for the first time in the 1970 census when names and addresses and ID numbers were preprinted on the questionnaires before they were mailed out. The rest of the data were collected by the municipal population commissions.

The 1975 census was a small mid-decade census that collected data on persons, families and dwellings only. Data on age, sex, marital status and citizenship were obtained from the Central Population Register. Income data were matched for every individual from the taxation register and education data from the register on completed education (Markelin 1980).

Personal questionnaires were used only to gather information on place of work, hours worked and occupation. The name and address data obtained from the register made it possible to mail the questionnaire directly to the respondent. In addition, thanks to the register data, the respondents received the questionnaires in their mother tongues, (either Finnish or Swedish). The respondents returned the completed questionnaires by mail to the local offices the Central Statistical Office had set up in the municipalities (Nordisk statistisk sekretariat 1984).

In the 1980 census it was no longer necessary to calculate the total population figures or to collect family and household-dwelling data. The data for these purposes were obtained from the Central Population Register.

Register-keeping practices in Finland have advanced to such an extent that the 1985 census collected a wide range of data from various registers:

- Demographic data and addresses from the Central Population Register;
- Information on housing and buildings from the Register of Buildings and Dwellings;
- Income data from the Taxation Register of the National Board of Taxation;
- Data on educational qualifications from the Register of Completed Education and Degrees;
- Information about pensioners from the Register of Old Age Pensioners kept by the Social Insurance Institution.

In the 1985 census, only one simple personal questionnaire was used for gathering data on people's current activity, place of work, occupation and hours of work. All other data, with approximately the same content as in the 1980 census, were obtained from different registers and administrative records. In addition, register data were also used for an extensive preprinting of census questionnaires and for imputing data for non-respondents. In this way it was possible to reach a satisfactory 98.6% total coverage, and with fairly small regional variations

even though the census was carried out as a direct mail-out mail-back system without any local organizations. Register imputations of questionnaire data were tried for about 134 000 persons (2.7% of the total population), 84 000 of whom were non-respondents and the rest were persons whose responses were insufficient. There are some factors with a strong influence on coverage, e.g., internal migration. The rate of undercoverage among people who had moved during the census year was three times the rate of other people (Heinonen and Laihonen 1987; Hoffman 1988; Johansson 1987; Redfern 1987a).

2.3. The coverage of questionnaire-based censuses 1975–1995

The coverage of the Central Population Register is considered to be complete to all practical purposes. It can be claimed that all births and deaths are officially recorded. In Finland, the effect of emigration and immigration on the size of the population is insignificant. The registration of immigrants can be regarded as all inclusive, because in a country like Finland a person cannot earn income or receive educational, health and other similar services without being included in the Central Population Register. Persons who have emigrated are removed from the register when for two years, no data have been obtained on them in connection with the annual updates. The Central Population Register has been used for evaluating the coverage of questionnaire censuses, i.e., the number of questionnaires returned relative to the number of questionnaires sent out, by age and sex groups in 1975, 1980 and 1985 (Markelin 1978; Putkonen 1984; Starck 1989).

2.4. Registers set up on the basis of census data

The data gathered on education in the 1970 census were used in setting up the Central Statistical Office Register of Completed Education and Degrees. The register has

Table 2. Return of census questionnaires: percentages by age and sex group

	All	– 14	15–24	25–44	45–64	65–75	75 +
Census 1975							
Both sexes	97.3	97.1	96.4	97.2	98.3	98.2	96.4
Males	97.2	97.1	96.6	96.8	98.0	98.2	96.8
Females	97.4	97.1	96.2	97.7	98.6	98.2	96.2
(Markelin 1978)							
Census 1980							
Both sexes	98.3	98.2	97.9	97.9	98.9	99.0	97.7
Males	98.0	98.2	98.0	97.4	98.5	98.9	98.2
Females	98.5	98.3	97.8	98.5	99.3	99.1	97.4
(Putkonen 1984)							
Census 1985[1]							
Both sexes	96.8	–	96.7	95.6	96.8	97.2	–
Males	95.6	–	96.0	94.6	96.0	97.0	–
Females	96.7	–	96.7	96.6	97.6	97.3	–

[1] Questionnaire data were collected only on the population aged 15 to 74. Starck (1989).

since been updated with data obtained each year from 6 500 educational establishments.

Population censuses also contain extensive information on buildings, dwellings and business premises. Although expensive and difficult, the collection of housing and building data is necessary for housing policy purposes. Therefore, a Register of Buildings and Dwellings was set up at the Population Registration Centre using data gathered in the 1980 census.

Since data collected under the Census Act may not be released to government authorities, the data on buildings and dwellings were collected under a separate law, using a questionnaire by another government agency, the Population Registration Centre. The Register of Buildings and Dwellings is maintained by the municipal construction authorities. With respect to new units, the register is continuously updated. Some data on dwellings (e.g., new bathing facilities, new heating systems) are checked every five years with forms sent to each building owner. This procedure has been employed to compile annual records of dwellings and buildings since 1985. The register data on buildings and dwellings can be linked with the register data on persons with the help of domicile codes.

In Denmark, a corresponding register of buildings and dwellings was already established in the 1970s (Jensen and Thygesen 1985; Redfern 1987b).

In the 1970 census, data were collected on the locations of buildings, e.g., map co-ordinates for every building containing dwellings or business premises. The map co-ordinates have been transferred to the Central Population Register, where they are maintained by register officials. Since the 1970 census, map co-ordinates have been used to define the exact place of residence of every person living in Finland and the location of every place of work.

3. Data Used in the Register-Based Census System

In 1981, the Central Statistical Office of Finland began to compile a comprehensive system of population and housing statistics based on registers and administrative records. It was anticipated that in the 1990 census all the required data were obtainable from the new system. A further aim was to provide users with annual sets of basic statistics on the population's economic activity; the first available set of such statistics are for the year 1987.

All the registers mentioned here make use of the personal identification codes which are in general use in Finland, making it possible to use computers to link data files.

The following census data were obtained from the following registers:

1. Demographic data

The most important register is the Central Population Register. It is continuously updated and provides information on every resident of Finland, including demographic details and address particulars.

2. Income data and the ID number of the employer

At the end of the 1960s, the income tax data collected by local tax authorities were gathered together into a taxation register covering all recipients of income. The National Board of Taxation annually compiles a Taxation Register which is based on the figures individuals state in their tax returns. Data on income, student deductions and whether husband-and-wife business teams had declared their earnings as joint incomes, were used in register statistics. In the future, the Taxation Register will also provide information on occupations.

Every year, as a control measure, Finnish employers provide the tax authorities with figures on how much employees have earned

and how much tax has been withheld on employee earnings. This enables the tax authorities to compare the employees' tax returns with the employers' accounts. The resulting data are then combined into a national Taxation Register, which makes it possible to determine the organization (identification) number of the employer of every employee.

3. Main type of activity

A. Employed labour force

Every Finnish employer is obliged to insure his or her staff for employment pensions with an insurance company. Similarly, every entrepreneur is required to provide himself or herself with entrepreneur pension insurance. The records kept by private insurance companies are gathered together into a Private Sector Employment Pension Register kept by the Central Pensions Security Institution. People employed in central and local government have their pensions registered in a slightly different form. All of these registers were drawn on for data on the number of persons insured in the census week, and the figures were used in register statistics. Information on whether individuals were insured as employees or entrepreneurs was also used in this way.

B. Unemployed

The Ministry of Labour keeps a Register of Unemployed Workers. All the data on persons unemployed during the census week were used in register statistics. In addition, this procedure provided information on the registered occupations of unemployed persons.

C. Pensioners

The records kept by the Social Insurance Institution provide figures for old age pensioners and persons on disability pension.

D. Students

Since there is no single register with data on students, the figures here have to be compiled from a variety of sources. The Central Statistical Office of Finland keeps records of persons attending the country's various universities, etc. University students who receive financial assistance from the Government – the majority of Finland's undergraduates – are entered in the records of the State Centre for Aid to Education. Young people studying at vocational education institutes are entered in annually updated records kept by the National Board of Vocational Education. Students with taxable income are entitled to a student allowance, which they declare on their income tax returns. Data from all these sources were compiled to give the count for students.

4. Industry and the location of workplace

A. Wage and salary earners

For the employed population, the industry and location data, along with data on the sector of employment, are obtained from the Register of Enterprises and Establishments of the Central Statistical Office. The organization number of employers is obtained from taxation data. The company register contains the same code, which can be used to transfer all information on the employing firm or its establishments contained in the register to the respective wage and salary earners. The register contains the employer's industry, sector of employment, and address, and the addresses of the company's different establishments, together with turnover and other balance sheet data (Hovi 1990).

In the census statistics, only data on industry, sector of employment, and address are included. The procedure varies somewhat depending on whether the wage or salary earner is employed in a company (or institution) with a single establishment

(place of business) or in one with several establishments. Enterprises with two or more establishments supply information on the basis of where each employee actually works. In 1987, enterprises with two or more establishments numbered about 6 200 and employed a total of approximately 820 000 persons in aggregate. With the aid of reminders from interviewers, the response rate of companies could be raised to 99%. The industry and workplace location data on persons employed in companies and institutions with a single establishment are obtained by combining these data from the Register of Enterprises and Establishments using the organization number.

B. Entrepreneurs

In the case of entrepreneurs and self-employed workers, the industry and the location of the establishment is obtained from the Register of Enterprises and Establishments if the enterprise is required to pay turn-over tax. But if the enterprise is a farm, for example, the industry is deduced from pension insurance data and from the type of income.

In cases like these, the location of the establishment is defined as being the domicile of the entrepreneur.

5. Occupation

In 1990, occupational data were combined with register statistics data. The data were combined from the following sources in plain text form:

- the wage and salary registers of central and local government;
- the job-seeker register of the Ministry of Labour; and
- tax return data (including titles and educational qualifications, etc.).

As far as possible, occupational data are coded using the automated coding system developed by the CSO, otherwise manually.

6. No fixed place of work

The location of the place of work of persons performing mobile work is primarily defined as being the establishment from which the work begins or from which it is directed. Information on occupational title, status in employment, and industry makes it possible to determine those workers who are not actually working in the establishment in question (e.g., loggers, drivers, cleaners).

7. Education, household, and family data

After deducing of main type of activity, industry, occupation, etc., data on educational qualifications are linked to the population from the CSO's Register of Completed Education and Degrees (Laihonen and Myrskylä 1989).

3.1. Estimation procedure for main type of activity

Data on main type of activity and status in employment were assessed in the following sequence:

1. Unemployed,
2. Entrepreneurs,
3. Wage and salary earners,
4. Students and pupils,
5. Pensioners, and
6. Other persons.

The *unemployed* labour force was calculated on the basis of the number of persons who, according to records related to unemployment benefits, had been jobless for the census week.

The number of *entrepreneurs* was estimated on the basis of private-sector employment pension records and declared taxable income. The following population groups were classified as entrepreneurs:

- Entrepreneurs who were insured as entrepreneurs during the census week and had taxable incomes;

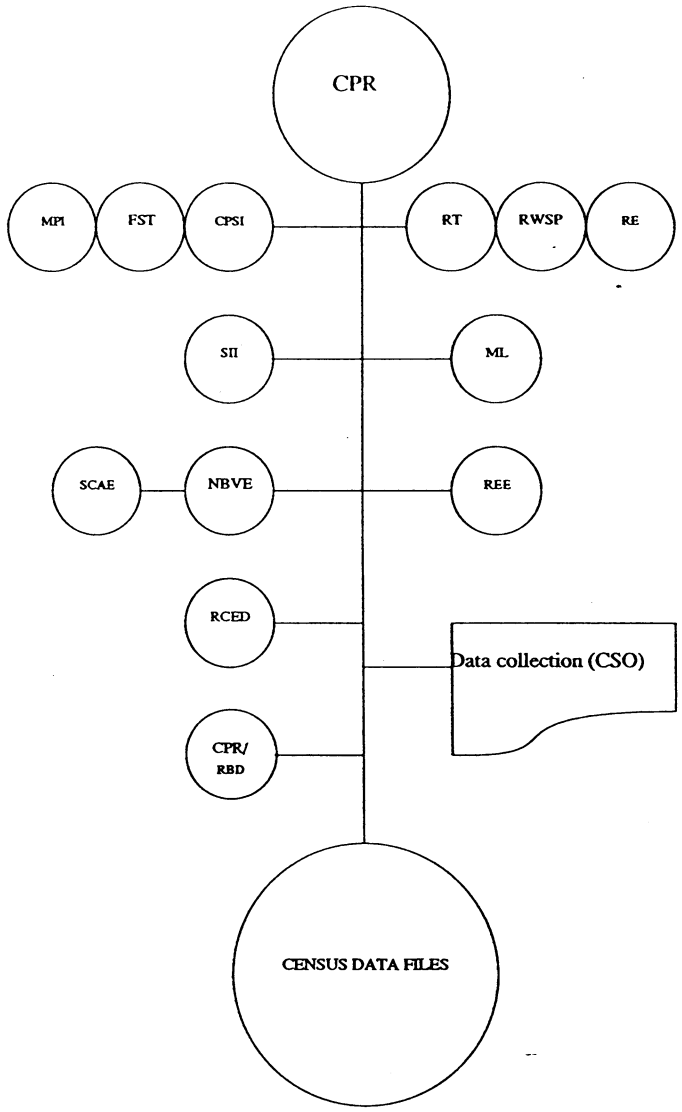

Fig. 1. Use of registers and administrative records in the 1990 census

CPR = Central Population Register
RT = Taxation Register
RWSP = Register on Wages, Salaries and Pensions
RE = Register on Employers
MPI = Municipal Pension Institute
FST = Finnish State Treasury
ML = Ministry of Labour
SII = Social Insurance Institution
REE = Register of Enterprises and Establishments
SCAE = State Centre for Aid to Education
NBVE = National Board of Vocational Education
RCED = Register of Completed Education and Degrees
RBD = Register of Buildings and Dwellings

- Individuals who were insured as both wage or salary earners and entrepreneurs during the census week but who earned more as entrepreneurs.

Wage and salary earners were estimated after entrepreneurs. The category was composed of:

- Individuals who during the census week were covered by employment-pension policies and were entered in the tax register as receiving salary or wage incomes;
- Individuals who were covered by both employment and entrepreneurial pensions but whose wage and salary incomes were higher than their entrepreneurial incomes.

The sector (private business, central government, local government) in which an individual was judged to be employed depended on which register he or she was entered in. Individuals who appeared in more than one register were placed in the category in which, according to tax records, they had the highest income. The same procedure was followed for persons who, on the basis of their incomes, were judged to be wage or salary earners.

Students were estimated after the labour force had been assessed. If not a member of the labour force, an individual was classified as a student if he or she:

- was enrolled in a university, polytechnic, etc.;
- had received financial assistance from the government;
- had commenced a course of studies at a vocational education institute; or
- had received a student's tax allowance.

Pensioners were defined as:

- persons who, according to the records of the Social Insurance Institution, were on old-age pension or on disability pension; and
- persons whose main incomes were composed of pensions.

Individuals were not classified as pensioners until after it became evident that they could not be classified as entrepreneurs, wage or salary earners, out of work, or students.

The above sequence of estimation is identical to the procedure used by census observers – being in paid employment, for instance, takes precedence over studying or being a pensioner.

Combining the afore-mentioned data sets produces a file which covers the total population and includes the following items:

- Main type of activity
- Status in employment
- Earned income and source of income (wages and salaries, entrepreneurial incomes)
- Organization number of the individual's employer (an individual may have more than one employer)
- Sector of employment (private sector, central government, local government).

The result is a description of economic activity which is as comprehensive as the description furnished by usual census figures. The final result is a register which, though gleaned from different sources, contains the same amount of information as an individual-oriented population census. A further benefit derived from register-based systems is that they can be complemented annually. Finnish policy-makers and other data users have desired annual figures for a good many years (Laihonen and Myrskylä 1989).

The Danish system of registers is in principle very similar to the Finnish system, the greatest difference being that in Denmark establishments and occupations are defined

only on the basis of taxation data (Redfern 1987b; Thygesen 1983).

4. Comparison of the Register-Based Information for 1985 as Obtained from the Census Questionnaires for 1985

Since a total transition to register-based statistics might result in interrupted time series, Finland decided to combine the register-based data available in 1985 and then compare the figures with the questionnaire-based census findings. The register figures were similarly compared with the results of the monthly Labour Force Survey.

The register-based data made it possible to assess the population's main type of activity. Industry and occupation could not be assessed on the basis of registers before 1987. However, register-based figures were compared with the Labour Force Survey's findings in March 1985, and again in 1987 and 1988 (Korpi 1989).

The comparisons used all the various registers which will eventually be employed in the register-based census system. In addition, the data were subjected to the same processes as are applied in the register-based census system. The register-based data were compared with the questionnaire findings on a nation-wide level, for the country's twelve provinces and 460 municipalities.

Table 3 compares the 1985 census returns and the register-based estimation data with regard to main type of activity and status in employment. The comparisons adhere to the labour force concept, the main foundation of the register-based system.

As Table 3 shows, the net difference ranged from 0.2 to 10%. Similarly, the proportion of the Finnish population (i.e., the proportion of individuals classified in the same group in register-based figures and in questionnaire-based figures) included in the same figures ranged from 71 to 95% (except the residual class: unknown 52%).

The proportion of the population classified in the same group is not larger when the figures are compared with the quality evaluation for 1985, for instance, Starck (1989).

All in all, the register-based labour force estimation exceeded the census-based figure by 1.5%. The classifications of the register-based estimation, on the one hand, and the census-based assessment, on the other, were virtually identical: 95% of the persons covered by the figures were placed in the same group in each. There was also a high degree of correspondence between the register-based labour force estimation and the findings of the Labour Force Survey (Korpi 1989).

The number of unemployed persons was some 0.8% higher in the register-based estimation than in the census-based assessment. The number of individuals who were placed in the same categories in each set of figures was approximately 71%. Some 10% of the individuals who on their census forms reported that they were unemployed had actually been at work according to the register-based estimation; most of them had worked as wage or salary earners. In addition, some 19% of all the individuals who in the census described themselves as unemployed were in the register-based data described as economically inactive (Korpi 1989).

Some 300 000 individuals were classified as entrepreneurs on grounds of being insured as entrepreneurs; they represented approximately 92% of the total. Some 20 000 individuals (8%) were classified as entrepreneurs on the basis of their incomes.

The overall total reached in the register-based estimate was virtually identical to the census-based total for entrepreneurs. Approximately 79% of entrepreneurs were

Table 3. Main type of activity, status in employment, and legal form of employer

Main type of activity, status in employment data	Census 1985	Register figures 1985	Same class. %	Net diff. %	RES 1987	RES 1988
Total population	4785	4785	–	–	4939	4954
Labour force	2416	2452	95.4	1.5	2468	2483
Employed labour force	2277	2312	95.2	1.5	2320	2353
Unemployed	139	140	70.9	0.8	149	130
Wage and salary earners	1956	1991	94.6	1.8	1990	2022
Central government	230	234	88.1	1.8	–	235
Local government	400	438	91.4	9.3	–	446
Private sector	1326	1319	91.5	−0.5	–	1336
Entrepreneurs	321	321	79.3	0.2	330	331
Economically inactive	1543	1507	90.4	−2.4	2470	2472
Students, pupils	370	338	82.9	−8.6	310	309
Pensioners	938	957	96.4	2.0	1001	1012
Others, unknown persons	235	212	51.6	−9.8	206	191
0–14 years	915	951	–	–	953	960

RES = Register-based employment statistics in 1987 and 1988.

placed in the same category in the register-based estimate and in the census-based data. Some 10% of those who described themselves as entrepreneurs in the census were not entered as such in the registers used, and a further 8% appeared in the registers as wage or salary earners.

Approximately 96% of Finland's private-sector wage and salary earners were traced with the help of employment pension data. Roughly 4% of the individuals who in the census described themselves as wage or salary earners could not be found in any employment pension register. Nevertheless, it proved possible to classify them as wage or salary earners on the basis of taxation registers.

The register-based estimations and the census-based totals for wage and salary earners employed in central government were virtually identical. The register-based estimate for local government employees was slightly higher than the census-based estimate. The discrepancy was due to the fact that registers of local government employees are extremely accurate and also cover persons working only for short periods of time.

The overall register-based figure for students was almost 9% lower than the corresponding census-based figure. Approximately 83% of those who were classified as students in the register-based assessment had described themselves as students in the census. This discrepancy is chiefly attributable to the fact that some students are not entered in any register. Some 96% of students enrolled at university or corresponding educational institutions had described themselves as students in the census. The total of students in the available registers is 32 000 lower than the corresponding census-based figure. Some 50 000 persons who had described themselves as students in the census were in paid employment according to the registers.

Approximately 96% of the men and women who described themselves as pensioners in the 1985 census were found to be entered as pensioners in one of the registers

used. Some 2.4% were found to be in paid employment and less than 1% were classified as not being in the labour force.

4.1. Comparing the register statistics with the Labour Force Survey

The register statistics data were compared with the November 1985 Labour Force Survey. The number of respondents in the survey who were also in the register statistics was 11 311, the comparative assessment thus having a "sample" of 2.9%. Approximately 94% of the individuals involved were designated as being in paid employment in each data set; the corresponding figure for unemployment was 77%. Some 94.3% of the men and women who according to the survey were wage or salary earners were also found to be entered as such in one of the registers used, while the corresponding figure for entrepreneurs was 77%.

Labour Force Survey data have also been compared with the results of the census by questionnaire. The comparison shows that the results of the two questionnaire surveys taken at the same time are no closer to each other than the results obtained using registers. In the census and in the Labour Force Survey, 93% of the employed were classified in the same way, while the figure for wage and salary earners was 94%, for entrepreneurs 80%, and for unemployed persons 82%. For the groups not in the labour force, the correlation was higher between the data of the two questionnaires than between register data and questionnaire data.

The general conformity between the survey and the register-based estimates was not very different from the conformity of the estimates and the census-based figures. Yet there were some discrepancies:

- The register-based unemployment figures corresponded more closely to the survey results than to the census-based data;
- The register-based figures for wage and salary earners employed in central government corresponded more closely to the survey results than to the census-based data; but
- The register-based figures for wage and salary earners employed in local government corresponded more closely to the census-based data than to the survey results.

Register statistics data for 1987 and 1988 have been compared with Labour Force Survey data for the same years. The register system appears to produce a slightly lower labour force figure (2.6 percentage points lower in 1987 and 1.4 percentage points lower in 1988), for all minor unpaid and untaxed work performed in family enterprises falls outside the registers used. Part of construction work may also fall outside the registers. For the same reason, the register system gives a slightly too high unemployment figure, for registered unemployed persons may perform odd jobs without reporting them to the authorities. The number of students again is slightly lower, because some senior secondary school students are not covered by any student registers and some others, being employed, are counted as being in the labour force. About one-third of Finnish students are employed. In questionnaire surveys, many of them report they are students though holding a job. According to Table 4, the difference between the Labour Force Survey and the register system appears to be narrowing.

Since 1987, the register system has enabled the production of statistics by branch of economic activity. The results obtained appear to fit in very well with questionnaire census time series. Unfortunately, the Finnish industrial classification was revised in 1988, causing a break in the series. For

Table 4. Population aged 15–74 years by main type of activity: data from register-based employment statistics for 1987 and from Labour Force Survey for 1987 (1000 persons)

Main type of activity	LFS 1987	RES 1987	Differ. %	LFS 1988	RES 1988	Differ. %
Labour force	2507	2469	−1.6	2491	2483	−0.3
Employed labour force	2383	2320	−2.6	2386	2353	−1.4
Unemployed	124	149	20.2	105	130	23.7
Economically inactive	1216	1250	2.9	1230	1238	0.7
Students, pupils	345	310	−10.1	348	308	11.2
Pensioners	722	734	1.7	734	739	0.6
Others, unknown	149	206	-	148	191	-
Total (15–74)	3723	3719	-	3721	3721	-

LFS = Labour Force Survey.
RES = Register-based employment statistics.

the benefit of users of time series data, the data for 1987 have been produced using both the revised and the unrevised classification. The differences in the new classification are greatest with respect to major divisions 8 and 9. Major division 6 also grows to some extent at the expense of division 9.

As far as employment, unemployment and pensioners are concerned, the register statistics corresponded reasonably well with the 1985 census-based figures. With the exception of the category of students, the register-based estimates were generally a little higher. It was not possible to distinguish between entrepreneurs, employers and entrepreneurs' unpaid family workers in the register system. There is, however, a sufficiently high degree of comparability between the two data sets with regard to employment, wage and salary earners, entrepreneurs and unemployment by industry. This is also true of comparisons between provinces and municipalities (Korpi 1989).

Table 5. Employed labour force (1000 persons) by industry: data from 1980 and 1985 censuses and from 1987 and 1988 register-based employment statistics

Industry	Census 1980	Census 1985	RES 1987A	RES 1987B	RES 1988B
1 Agriculture, forestry	279	242	205	199	207
2–4 Manufacturing, mining	586	554	549	551	538
5 Construction	150	168	150	149	168
6 Trade, restaurants, hotels	313	329	344	358	361
7 Transport and communications	177	173	157	154	160
8 Finance, insurance, etc.	125	154	176	217	233
9 Services	561	649	670	616	620
0 Unknown	6	8	69	74	68
Total	2197	2277	2320	2320	2353

RES A = Register-based employment statistics by the old industrial classification.
RES B = Register-based employment statistics by the new industrial classification.

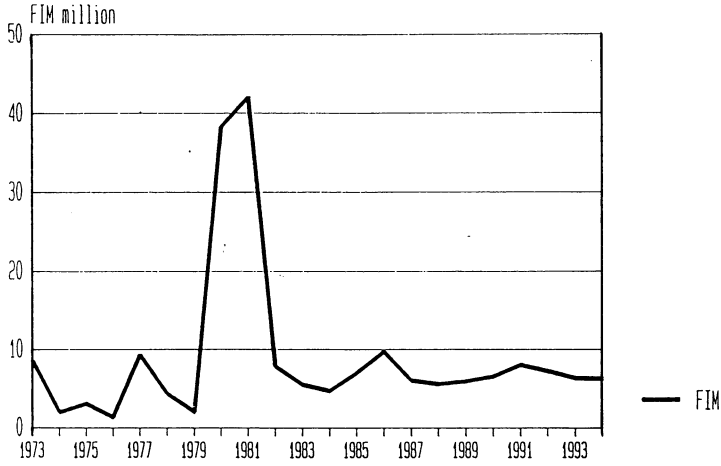

Fig. 2. Expenditures on population and housing censuses in 1973–1994

5. The 1990 Census to Be Based on Registers

There are three main reasons for basing the census system on registers:

1. It was desired to avoid the high cost of censuses.
2. Users of data felt that the most essential data are needed annually.
3. It was desired to make efficient use of the data in existing registers.

Thanks to the use of registers, the cost of the census system will have fallen from FIM 42 million in 1981 (1 FIM is usually about 0.25 US$) to an estimated approximate annual cost of FIM 7–8 million for the next census (see Figure 2). The total costs of the 1980 census were about 100 million marks and the total costs of the 1990 census were about 15 million marks.

Along with advances in the use of registers and computer technology, the number of staff needed in population and housing censuses has fallen considerably, from 650

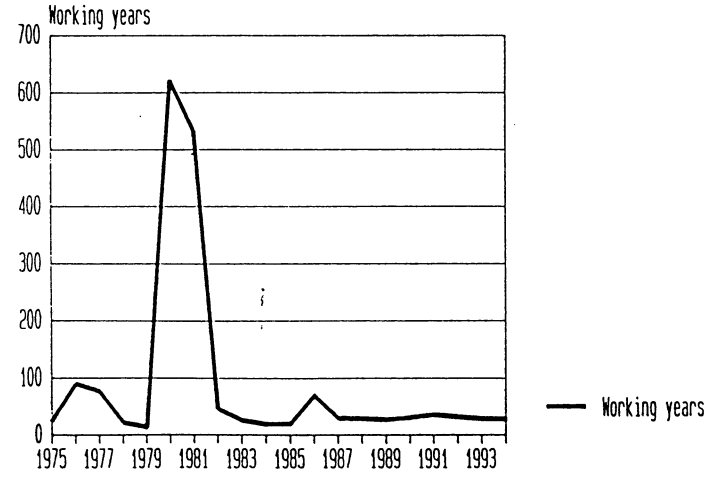

Fig. 3. Person years in population and housing censuses 1975–1994

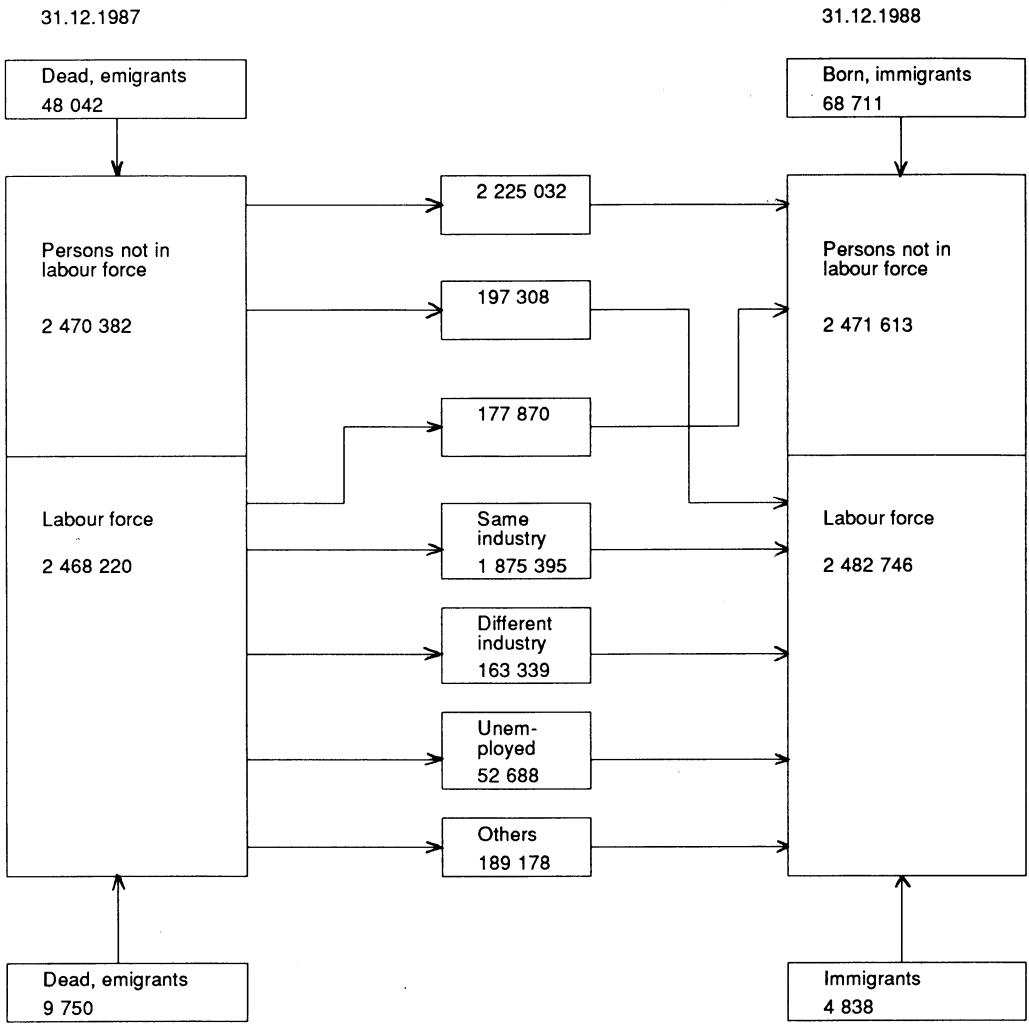

Fig. 4. Changes in main type of the activity of the population in 1988

person years in the 1980 census to about 30 person years in 1990 (see Figure 3).

The person years for 1989–1994 have been estimated in the action plan of the Central Statistical Office, so that some changes may occur. The annual production of census type data has been increasing continuously along with advances in registers. Since 1971, statistics on population and population structure and on the educational structure of the population have been available annually. Income statistics have also been produced yearly. The Register of Buildings and Dwellings based on data from the 1980 census was ready for use in 1985 (the starting point for the production of building, dwelling and housing statistics on an annual basis). Annual data on the employment and industry of the population have been available since 1987 and were supplemented with occupational data in 1990. The 1990 Population and Housing Census was carried out entirely on the basis of registers by automated combination of:

- population data;
- employment data;
- data on incomes, education and families; and
- building and dwelling data.

The data content of the 1990 Population and Housing Census is as extensive as the 1980 census, which was carried out using questionnaires. There is no noticeable deterioration in data quality. It was not necessary to send any questionnaires to the population. In order to determine the exact quality of the census data obtained from the different registers, an extensive sample survey (concerning 2% of the population) was also carried out in connection with the 1990 census. The survey made it possible to examine the reliability and the coverage of register data at the individual level.

6. New Opportunities for Statistics Produced by the Register System

Since 1987, on an annual basis, the Central Statistical Office has been compiling a data base containing the entire population and its census data. With the aid of the data base, it is possible to monitor, for all residents: changes in occupation, changes in the place of work and, for instance, possible unemployment or disability pensions. The data base also makes it possible to determine how various age groups are placed in the labour market, how persons with educational qualifications find work and whether the work obtained corresponds to their education, etc. We have prepared statistics on, for example, the placement in the labour market of persons who completed their education in the years 1981–1987. Flow statistics, describing changes in the place of work, will be produced using data from 1988 and on.

Finally it may be noted that a similar register-based system has been adopted in Denmark (Jensen 1983). In Sweden, the bulk of the data are obtained from registers; in the 1990 census, only data on occupations and dwellings were collected using questionnaires.

The Norwegian census combines register data with questionnaire data. In local districts with less than 6 000 residents, a 100% census is taken, i.e., every resident receives a questionnaire, whereas in larger local districts, the questionnaire survey covers only 10% of the residents (Johansen 1987; Redfern 1987a).

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