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Session I – Invited paper

THE POPULATION CENSUS 2000 IN SWITZERLAND

Submitted by the Swiss Federal Statistical Office¹

I. INTRODUCTION

1. In Switzerland, population censuses have been conducted every ten years since 1850 as household surveys because, unlike the Nordic countries, there is no tradition of centralised population registers. However, the situation is changing, mainly as a result of fast developments in IT. In Switzerland too, citizens rightly expect the State to have modern data and information administration systems and to use information that is already registered before it subjects people to another survey. This was the starting point for the organisation and conduction of the Population Census 2000, presenting many innovations in respect of register use and creating the preconditions for a sweeping reform of survey methods after 2000.

2. The Census 2000, with the reference date of 5 December, was organised by Swiss Federal Statistical Office (SFSO) in close co-operation with the cantons and the communes. It consisted of two interlinked surveys,

- the building and dwelling survey, where house owners and property management agencies had to provide information, and
- the personal and household survey, directed at all residents of Switzerland.

3. The main features of the project were:

- the pre-printing of data from registers on the first page of the personal questionnaire and on the first and fourth page of the household questionnaire;
- the transition from using enumerators to postal dispatch and return, in conjunction with the development of an electronically controlled monitoring and reminder system;
- the use of the Internet for electronic completion of the questionnaires (e-census);
- the centralisation of technical survey tasks in a single national Service Centre, with however the possibility for cantons and communes to choose their preferred method.

¹ Paper prepared by Marco Buscher and Werner Haug.

4. The method was applied following two pilot censuses held in 1998 and in 1999/2000. Due to the change of method, efforts to communicate with and inform the general public become even more important, as respondents had to be ‘walked through’ the process of completing and returning the questionnaires and the “non-respondents” had to be gently reminded of their obligations. In fact, in the mailing process the communication campaign takes on the role of the enumerators who call at the door for the completed questionnaires in the traditional census. The massive campaign strongly used the media and the SFSO Internet site.

II. LEGISLATION

5. In 1998 the Parliament and the Federal Council created the necessary legal foundation for the survey with the revised Population Census Act and its Executive Ordinance, both of which came into force on 1 March 1999. The Act encourages the utilisation and harmonisation of registers and allows the communes to use, within 6 month time, the individual data from the personal questionnaire²) to correct the inhabitants’ registers. Answering to the questionnaire was compulsory.

6. Data confidentiality was regulated by both the federal law on data protection and the Census Act, with the ordinance providing the practical details. Among the main principles/aspects:

- data had to make anonymous at data processing stage;
- work secrecy for all staff participating to the survey;
- designation of data protection bodies by the Federal Council and the cantons;
- use of data for statistical purposes only (with the exception of the possible correction or creation of registers, see below).

7. According to the Population Census Act, the individual communes are responsible for conducting and financing the survey.

III. QUALITY PROBLEMS WITH REGISTER DATA AND ADDRESSES

8. Some difficulties in the implementation of the new method arrived from the need to produce standardised extracts from decentralised registers, and the available address lists used to ensure the correct dispatch of the pre-printed questionnaires.

9. Because of Switzerland's federal structure, there are many different cantonal – and even communal – approaches to keeping inhabitants' registers, resulting in an incredible variety of systems and software, as well as very different contents and codifications. However, for pre-printing the questionnaires, it is of prime importance for the characteristics on the inhabitants' registers to match those of the SFSO. To standardise the register extracts, the SFSO had to develop special software (LOCO 2000) which was distributed free to the communes. In addition, this software makes possible to supplement and coordinate the building addresses centrally supplied by the SFSO with the locally available inhabitants' addresses. This coordination is necessary to guarantee the link between the building and dwelling survey and the personal and household survey.

10. The 1999/2000 pilot survey showed that there were problems with address quality, both in the SFSO's Building Address Directory and the inhabitants' registers. These are due to the lack of a harmonised terminology, missing or unclear addresses in individual communes and addresses that are out of date. Consequently, major efforts had to be made to produce current, complete and correct lists of addresses for postal dispatch. If there was no apartment or household number, as is the case in most registers, correct assignment of individual inhabitants to a household required

² I.e. the data extracted from their same registers after the eventual correction from respondents.

special procedures. The solution of these problems was provided from the close co-operation of SFSO with Swiss Post, which has considerable experience in the field of address management and updating.

IV. THE NATIONAL SERVICE CENTRE

11. With the introduction of the new methods the communes were risking to reach their technical limits (e.g. needs of specific infrastructure to pre-print A3 format questionnaires or to manage the mailing of the questionnaires). Moreover, certain IT investments at communal level make no sense. That is why the SFSO set up a central Service Centre which took over many of the survey tasks on behalf of the communes and the cantons.

12. Depending from the variant, communes had the possibility to outsource to the Service Centre the following activities:

- the mail management only, i.e. pre-printing of questionnaires, automated enveloping, automated sorting by postal delivery round;
- in a so-called "Global Package", the questionnaire return monitoring, reminders and checking that the questionnaires have been fully completed, in addition to mail management.

13. The "Global Package" effectively relieved communes of manual checking work after the reference day. 1,600 of the 1,736 communes adopting the two variants opted for this outsourcing. Considering the return, 85% of all the questionnaires sent by post and expected back were spontaneously returned by post or the Internet by the first three weeks, 91.5% by the first two months. This percentage increased to 95.8% and 97.3 by March and mid-June 2001 – i.e. by the end of the first and second vague of reminders undertaken through letter and phone calling respectively. The remaining cases which the Service Centre could not clarify were returned to the communes for solution – carrying out another reminder or filling in the questionnaires for some basic data only, depending from the commune. The collection of the questionnaires was definitively ended in September 2001. Communes had the right to ask reimbursement from non-respondents for the supplementary reminder work.

14. For the tasks assigned to it, the SFSO commissioned the Service Centre with data capture and plausibility checks of the questionnaires. For the first time in Switzerland, hot and cold deck editing procedures were applied to the census data in the final stage of data editing by the SFSO.

15. The establishment of a Service Centre was also a precondition for e-census (central management of addresses, central issue of user-IDs and passwords specific to each household, use of an independent, firewall-protected system, see annex).

16. The Service Centre operated by a Consortium led by Data Care AG Luzern (a company controlled by Swiss Post). The different partners took care of specific tasks such the optical character reading technology, the hotline and call centre set up by in both French and German or the contracts with the communes.

V. DATA DISSEMINATION

17. The Census 2000 provided some 30 to 40 information components about each and every individual in various areas (demography, education, work, culture and transport), 15 components about dwellings and 10 about the building the respondent lives in. All data which are largely comparable with those of the three previous censuses (1970, 1980 and 1990) are being 'packaged' for specific target groups in terms of access, scope and presentation. The basic programme of tables is considerably reduced and structurally simplified. Priority is given to electronic data media with

user-friendly interfaces over traditional hard-copy dissemination methods, with more products based on visual and cartographic presentations, the Internet, online databases.

18. As in 1990, anonymous individual data are stored for the whole of the country, the individual cantons and cities. For selected customers, there is the possibility to provide individual datasets in the form of public-use microdata files on a random sample basis. For comparative historical analysis, a harmonised dataset of anonymous individual data will be prepared towards the mid of 2003 which links information from the last four censuses. Specific scientific analysis on selected topics such as households structure, gender issues, evolution of renting, urbanisation and the development of urban agglomerations, the professional and spatial mobility are planned for this and the next year.

VI. COSTS

19. The Swiss Parliament approved a disbursement for the Census 2000 of about 72 million EURO. In addition, some 30 million EURO are estimated for local expenditures by cantons and communes. This makes a total amount of some 102 million EURO in the 10 years period 1995-2005. This figure makes an average cost of 14 EURO per person, i.e. 1.4 EURO per year and per person.

VII. CONCLUSION AND FUTURE PLANS

20. Considering all the technical and methodological innovations, the positive reaction and wide participation of the population, the respect of deadlines and the quality of data, the Census 2000 may certainly be considered successfully implemented. The centralised treatment of the registers' data has however showed some problems for which the SFSO is looking for a solution through the so-called E-administration initiative. With an eye to the future, and on the SFSO's input, a change has been made to the Swiss Constitution to give the Government general powers to regulate and harmonise registers for statistical purposes. In fact, with regard to the use of registers, some of the solutions adopted will merely be temporary stopgaps. A sustainable change in survey methods calls for long-term measures and investments in the harmonization of addresses, register content and links between registers.

21. Harmonization covers four aspects:

- i) The registers must refer to the same basic units (persons, households, buildings, dwellings, etc.) and – a factor of vital importance – it must be possible to link these basic units by means of unified nationwide keys and identifiers.
- ii). They must use the same definitions (What is a household? How is a building defined? How is the place of residence defined?).
- iii) Coding of the characteristics has to be based on standardized methods (e.g. codes for foreign countries, marital status or professions).
- iv) The registers must be based on identical quality standards and be updated at similar intervals.

22. The SFSO has used the data from the Population Census 2000 to develop a Federal Building and Dwelling Register. It contains basic information about building and housing stocks as well as appropriate identifiers and is continually updated after the Population Census 2000 on the basis of information, especially from construction statistics. For that reason, this Register will also replace the current Building Address Directory. Cantons and communes are now able to hook up to it and use it for performing their statutory functions. The key aspect of the harmonization is that building and dwelling identifiers are to be built into communal inhabitants' registers.

23. In addition to the Federal Building and Dwelling Register, the SFSO will have the communal and cantonal population registers harmonization embodied in legislation on the basis of

article 65 of the new Federal Constitution. The plan (with a time horizon of 2005/2006) is for a Federal Law on Registers of Persons to come into force, regulating nationwide coordination and harmonization of such registers, registration and changes of address as well as the provision of data for statistics. This would lay the foundation for a new, consolidated survey methodology which links register censuses and direct surveys, thus concluding the transitional phase initiated with the Population Census 2000. The information requested direct from the general public in future will depend on the development and interlinking of Swiss registers as well as on the information mandate of future population censuses.

ANNEX:

e-census - the 2000 Census on the Internet

I. E-CENSUS – A GROUND-BREAKING ACHIEVEMENT

1. Under the title "e-census", the Swiss Federal Statistical Office developed an Internet application for the 2000 Census which enabled a large proportion of the population to submit their Census questionnaires electronically, via the Internet, instead of using the conventional written method. Names, addresses and the population's basic demographic data were extracted from local registers and stored on a central database. They were printed on paper forms, completed with a unique identification number and a password for the Internet and mailed to all households. The same data were copied to a special e-census server. After the log-in procedure, a person could find his/her data online, change or confirm them and complete the 21 questions for each member of the household. This report is outlining the background to the e-census concept and goes on to provide a brief overview of experiences with operating the e-census.

2. The use of electronic survey techniques was considered very early on with a view to the 2000 Census, but the first concepts were frustrated by Switzerland's decentralized structure which appeared to make efficient data management and survey control impossible. So ultimately, it was the establishment of a Service Centre for routine tasks such as address management, data entry and checking that tipped the balance in favour of the idea of an Internet solution.

3. When the decision about the e-census was taken, it was however clear that, for organizational reasons and due to current Internet coverage, this electronic entry option could not replace the written postal questionnaire but merely complement it.

4. Despite this limitation, the e-census was a promising project for several reasons:

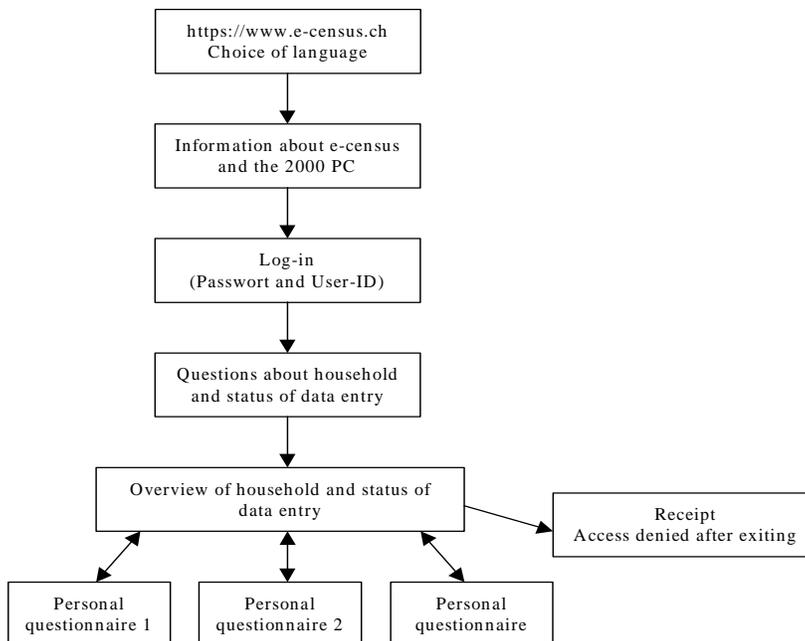
- Image promotion and public relations: the rather conservative image of the Census was to be upgraded by the use of state-of-the-art communication technologies. In addition, it seemed likely that the PR and advertising impact of an Internet solution would be highly beneficial for the Census.
- Demand and expectations of the general public: even though only a minority of the Swiss population currently have Internet access, electronic communication options are increasingly expected by potential users. Acceptance of the data survey among the groups concerned increases, depending on the extent to which account is taken of these expectations. And in the final analysis, this too could well have a positive influence on the return rate.
- Gleaning of experience: the aim of the e-census pilot project was to acquire experience of using new technologies with a view to conducting other statistical surveys and eGovernment projects.
- Fast availability of results through simplification of the time-consuming data entry and checking stages.
- Better data quality and more reliable information thanks to interactive control of the survey (online checking of completeness, plausibility and validity, flashing up of warnings and correction prompts, automatic data transfer).
- More user-friendly than the written questionnaire:
 - o no need to confine questions to a double A3 page
 - o incorporation of interactive aids and explanations
 - o interactive user guidance and automatic filtering of irrelevant questions (eg. gainful employment, which is not applicable to children).

II. CHALLENGES: THE E-CENSUS CONCEPT

5. Besides these obvious advantages, the e-census also raised new challenges and problems that had to be solved within the context of the project, in particular:

- Survey sequence: for methodological reasons, care had to be taken not to deviate too much from the written questionnaire. However, as working on computers is subject to other conventions than filling out questionnaires by hand, a compromise between "replication" and "innovation" had to be found. By way of a solution, the structure of the original questionnaire and the distinction between the household and the personal level were retained, as was the wording of the questions. In this general survey sequence, which is illustrated in Fig. 1, the specific resources of electronic communication were, however, used as comprehensively as possible (filter structures, plausibility checks, automatic data transfer, etc.).
- Identification of questionnaires, response checks and coordination: coordination with the written survey involved various problems which resulted in some limitations:
 - o use of the e-census was confined to communes which had opted to use Service Centre services (approx. 90% of the population) in order to ensure efficient password assignment and monitoring of returns.
 - o all questionnaires for a single household had to be submitted either by post or via the Internet. Nevertheless, checking mechanisms had to be developed to identify "duplicates" (ie questionnaires submitted electronically and in writing).
 - o disabling of access on completion of data entry (see Fig. 1)

Fig. 1: e-census survey sequence



- Rights of privacy and data security:
 - o Issue of User IDs and passwords specific to each household
 - o Use of an independent, firewall-protected system
 - o 128bit encryption

- Requirements and limitations of the Internet: the Internet is still a comparatively unstable working environment, so arrangements had to be made to ensure that, if the session was interrupted, the data were reliably and automatically stored and made available to the user again later.
- Deciding the dimensions of the system: in contrast to other surveys, the Population Census has a precise reference day. Because considerable interest was expected from the general public, the system therefore had to be designed to cope with peak user frequencies over a brief period (30 000 users accessing it simultaneously).
- Software: the e-census had to run on different systems (PC/Mac) and support different browser programs (Internet Explorer/Netscape).

III. E-CENSUS IN PRACTICE: INTENSITY OF USE AND EXPERIENCES

III.1 Key data

6. The e-census was launched on the Net on 27 November 2000, approximately one week before the 2000 Population Census reference day (5 December 2000), and operated continuously until 25 March 2001.

7. Apart from two minor down-times during the first few days of operations, due to high visitor numbers and a server configuration which had not yet been optimized, the e-census ran smoothly, with no security problems throughout the four-month operating period.

8. As was expected, the e-census triggered considerable interest among the general public. While in operation, it registered just under 300 000 visitors who spent an average of roughly 18 minutes on the site and consulted/worked through an average of 46 pages.

9. In the majority of cases (93%), Windows operating systems were used, while other e-census visitors accessed the site using the Apple Macintosh system. In over three quarters of cases (77%), Internet Explorer software was used, and 23% of visitors used a Netscape browser.

III.2 Utilization

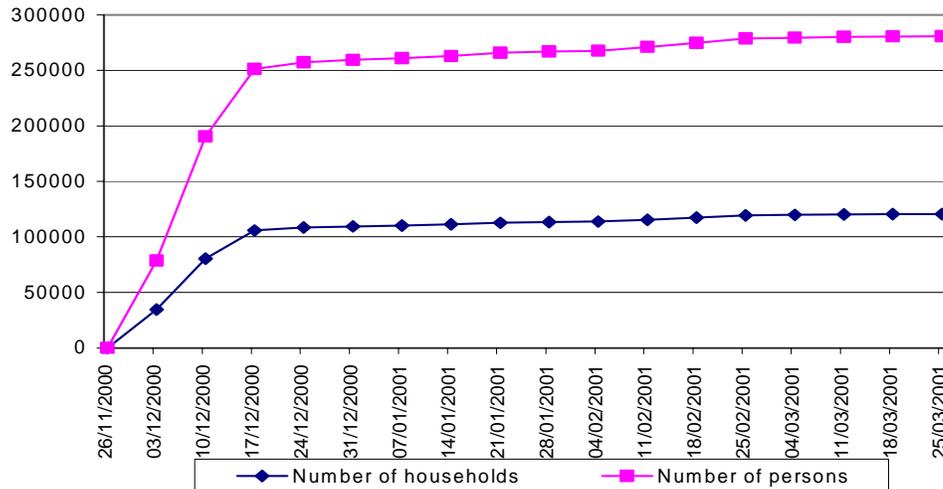
10. Not everybody visited the site with the intention of completing his/her questionnaire via the Internet. About 20 percent of the visitors could be described as "tourists" who just wanted to have a quick look at the e-census without attempting to enter their data. Roughly 10% of visitors did not master the log-in procedure hurdle, either because they had no password or because they had problems with logging in (see below). The other 70% progressed as far as data entry, but not all visitors managed to successfully complete this step.

11. By the end of March 2001, information about 281 000 persons from 121 000 households had been fully submitted via the Internet. About 10 percent of the data entries (14 000 households with roughly 30 000 people) were not completed. As Fig. 2 shows, use of the e-census was unevenly distributed over time. By the 2000 Population Census reference date, about one third of all questionnaires had already been completed, and after a mere three weeks in operation, just under 90 percent of all the questionnaires that were ultimately submitted had been sent off.

12. On the whole, user feedback was gratifying. Naturally, there were criticisms but also a surprisingly high percentage of praise. The large number of calls to the Hotline was striking. Apart from a few "bugs" in the application that were eliminated within the first few days, it transpired that the users often had very basic problems with operating their computers and using the Internet

that had little to do with the e-census. A substantial number of users failed to get past the log-in procedure which, while it guaranteed maximum security, was also fairly complicated. As a general rule, the comments about the user guidance tools and the built-in on-line plausibility checks were positive.

Fig. 2: Utilization of the e-census over time (completed household and personal questionnaires)



IV. USER CHARACTERISTICS

13. The approximately 281 000 personal questionnaires submitted correspond to a return rate of 4.2% of the population who had the possibility of using the e-census. In more than 98% of all communes where the e-census could be deployed, at least one household used it for data entry.

14. Closer analysis revealed only slight differences between urban (4.4%) and rural areas (3.8%) and between the language regions (German-speaking Switzerland: 4.2%, French-speaking Switzerland: 4.3%).

15. However, compared with the population as a whole, there were substantial differences in the socio-demographic and socio-economic profiles of responding households and persons:

- Size of households: with an average of 2 persons, the households covered by the e-census are much smaller than the average Swiss household nationwide (approximately 3 persons). Single-person households accounted for a particularly high percentage (37%) in the e-census, although 36% of all households covered using the e-census consisted of three or more persons.
- Nationality and language: at 15%, foreigners are slightly under-represented (total population: 19%). Compared information from the 1990 Population Census, people whose main language was not one of the languages in which the e-census was offered were slightly over-represented. Thus the flexible choice of language seems to have lowered the entry barriers even for people with another main language.

- Gender distribution: men (55%) were clearly over-represented in the e-census compared with women (45%). At the level of single-person households, the ratio of men to women is 2:1.
- Age distribution: the average age of the people covered by the e-census is 33. At 41%, the age group of 20 – 39 year-olds is clearly over-represented (average for the population as a whole: 30%).
- Socio-economic characteristics: better-educated groups are over-represented in the e-census (approximately 35% have a higher-education qualification, compared with 23% of the overall population). The economically active, and especially people in middle-grade management, also account for above-average percentages.

16. Although the e-census was used particularly frequently by "younger middle-class males", the differences tend to be smaller than expected. A large number of women and older people also participated in the e-census, so it cannot be said that there is a major "digital divide" in Swiss society.

V. CONCLUSIONS AND PROSPECTS

17. The e-census can be termed a success. It provided the proof that major surveys can be carried out securely and reliably. The e-census attracted a lot of extra attention to the Population Census (PR, enhanced image) and was used to the extent originally expected. On the whole, acceptance of the e-census among the general public can be described as good. Moreover, analysis of data has revealed an improvement in data quality as a result of use of the Internet.

18. Nevertheless, mention should be made of a few critical points which also need to be taken into account when planning future eGovernment applications.

- Cost: the investment and operating cost of Internet applications are high, especially when – as for the e-census – a great deal of time and effort has to be devoted to security and data protection. On the basis of the specific characteristics of electronic communication, it is not enough to merely transpose existing procedures into an electronic format. Successful Internet applications call for new ideas, but it is important to be aware that they quickly become dated, given the fast-changing electronic communication environment.
- Dimensions: the generous dimensioning of the system was a fundamental factor in costs, even though it kicked in for only a fraction of the total operating time. Internet applications are likely to be particularly promising in situations where there is a fairly constant flow of data over a longer period of time. Surveys with a reference date (such as elections and votes, for instance) always raise the problem of coping with a large volume over a short period. Such applications will probably not be cost-effective until a permanent infrastructure can be created for use by various providers.
- Utilization: compared with Internet coverage in Switzerland, an e-census return rate of slightly over four percent seems fairly low. However, it should be remembered that the use of the Internet for "official purposes" still involves numerous obstacles. Widespread reservations about the security and stability of Internet communication are compounded by the general public's existing comparative lack of expertise when it comes to dealing with computer applications. Internet applications must be as user-friendly as possible and provide maximum support – if necessary in the form of written comments or hotlines.
- Incentives: in comparison with traditional communication channels, this method has only slight (or even fewer) additional advantages for users. Because people received a written

questionnaire in any event, there was little incentive for them to boot the computer and incur telephone charges in order to enter their data on-line. For future applications, it should be considered whether and to what extent additional incentives for using the Internet should be created. However, care should be taken to ensure that such incentives do not help to accentuate existing differences.²⁾

- In any event, traditional communication channels will remain indispensable for some time to come. In the immediate future, multi-modal systems that use various channels (direct communication, post, telephone, Internet, use of administrative registers) will probably prevail.