

Norway: From Colonial to Computerized Censuses

Gunnar Thorvaldsen¹
Arne Solli²

Abstract

The censuses in Norway start their history in the 1660s, when the country was part of the Danish Kingdom. After these male censuses were repeated in 1701 full count censuses until 1855 were statistical only, with the exception of the nominative and complete count census in 1801 which covered the whole Kingdom of Denmark, including Iceland, Greenland and Norway. From 1866 population censuses were taken regularly, usually every ten years. The censuses of 1801, 1866, 1900 and 1910 are available for research and statistical use through the Internet, as is also the case for half of the census of 1876. In cooperation with the Minnesota Population Center these censuses were made part of the North Atlantic Population Project (cf nappdata.org). From 1960 anonymous census samples are available from Statistics Norway, while little has been scanned or transcribed from the censuses 1920 to 1950 due to the 100 year confidentiality rule. The last census was conducted in 1990 using sampling methods. In 2001 and 2011 censuses were produced by running computer programs combining variables from the Central Population Register and a number of other databases. The above-mentioned datasets have been used in several research projects, both contemporary and historical. In this article the focus is on historical household structure and migration studies. The Central Bureau of Statistics has a demographic research group, which has worked on such themes as e.g. fertility and cohabitation. The data file combining at the level of the individual the censuses from 1960, 1970 and 1980 is one of their key resources as is the Central Population Register starting in 1964, covering

1 University of Tromsø, Norway (gunnar.thorvaldsen@uit.no).

2 University of Bergen, Norway (Arne.solli@ahkr.uib).

almost the entire population of Norway. A Historical Population Register is being built, presently for the period 1801 to 1815.

Keywords: Demography, Norway, Census, Households, Migration, Population, Population registers, digitalization.

Noruega: de los Censos coloniales a las bases de datos censales informatizadas

Resumen

La historia de los censos en Noruega se remonta a la década de 1660, cuando el país formaba parte del Reino de Dinamarca. Tras estos primeros recuentos efectuados tan solo entre la población masculina, se realizarán otros cuya cobertura poblacional será ya universal y su finalidad exclusivamente estadística. Se trata de los ejecutados entre 1701 y 1855, con la excepción del levantado en 1801 de carácter nominativo y adscrito a todo el Reino de Dinamarca (Islandia, Groenlandia y Noruega). A partir del año 1866 los censos adoptarán ya una periodicidad regular de ejecución, por lo general cada diez años. Los realizados en 1801, 1866, 1900 y 1910 se encuentran disponibles para su explotación a través de Internet, así como la mitad del fechado en 1876. Ello ha sido posible, en cooperación con el Minnesota Population Center, gracias al North Atlantic Population Project (cf nappdata.org).

Por lo que respecta al censo de 1960, tan solo están disponibles algunas muestras anónimas en el Statistics Norway. En relación a los efectuados entre 1920 y 1950, poco se ha escaneado o transcrito debido a la normativa legal que obliga a mantener la confidencialidad de la información contenida durante 100 años. El último censo tradicional se realizó en 1990 utilizando métodos de muestreo, mientras que en la ejecución de los correspondientes a los años 2001 y 2011 se recurrió al programario informático que permitía combinar variables procedentes el registro de la población central con las procedentes de otras bases de datos administrativas.

Las bases de datos antes mencionadas se han utilizado en varios proyectos de investigación, tanto desde una dimensión contemporánea como histórica. El artículo que ahora se presenta focaliza su interés en la evolución de la estructura del hogar y en los estudios de migración. Central Bureau of Statistics cuenta con un grupo de demógrafos que ha trabajado en temas como la fertilidad y la convivencia, entre otros. El archivo estadístico utilizado combina datos individuales de los censos de 1960, 1970 y 1980 con el registro central de población que fue iniciado en 1964, cubriendo así la totalidad poblacional Noruega. Actualmente se está construyendo el registro histórico de la población noruega de 1801 a 1815.

Palabras clave: Demografía, Noruega, Censos, Hogares, Migración, Población, Registros de población, Digitalización.

Norwege: Des recensements coloniaux à la base de données des recensements informatisés

Résumé

Les recensements de Norvège commencent leur histoire dans les années 1660, lorsque le pays faisait partie du royaume danois. Après les recensements nominatifs masculins alors pris en 1701 et les recensements effectués jusqu'en 1855 étaient dénombrement complet et statistique seulement, à l'exception du dénombrement complet et nominatives du recensement 1801 qui couvrait tout le royaume du Danemark, y compris l'Islande, le Groenland et la Norvège. De 1866 recensements nominatifs ont été prises régulièrement, en règle générale à intervalles de dix ans. Les recensements de 1801, 1866, 1900 et 1910 sont disponibles pour la recherche et l'utilisation des statistiques par l'intermédiaire de l'Internet, alors que ce n'est le cas pour la moitié du recensement de 1876. En coopération avec le Minnesota Population Center de ces recensements ont été réalisés partie de la Projet de Population de l'Atlantique du Nord (nappdata.org). De 1960 échantillons anonymes de recensement sont disponibles auprès de Statistique Norvège, tandis que peu de choses ont été numérisées à partir des recensements de 1920 à 1950. Le dernier recensement sur la base questionnaire a été organisé en 1990 à l'aide de méthodes d'échantillonnage. En 2001 et 2011, les recensements ont été produits en exécutant des programmes informatiques combinant les variables du registre central de la population et un certain nombre d'autres registres.

Ces recensements ont été utilisés dans plusieurs projets de recherche, à la fois contemporaine et historique. Dans le quartier historique du type de la structure des ménages et études sur la migration décrite dans cet article sont au premier plan. Le Bureau Central de Statistique a un groupe de recherche sociodémographique, qui a par exemple travaillé sur la fertilité et la cohabitation. Le fichier de données liées au niveau individuel des recensements de 1960, 1970 et 1980 constitue l'un de leurs ressources clés ainsi que le registre central de la population qui remonte à 1964, pour pratiquement toute la population de la Norvège.

Mots clés: Demography, Norway, Census, Households, Migration, Population, Population registers, digitalization.

INTRODUCTION

While the systematic taking of censuses at regular intervals started in the nineteenth century we must back to the 1660s to find the starting point for Nordic census taking. The first census-like material

was collected by the Danes in their Norwegian colony, just like the French enumerated their Canadian and the British their American subjects before counting people in the home country. Traditionally, people feared divine anger if they were counted, since no human should dare to verify God's creation (Glass, 1973, p. 19). In spite of this, the clergy in Norway took part in several censuses, including one of the world's first nominative enumerations in 1801. This article overviews the taking of numeric censuses until 1855 and nominative censuses at regular intervals from then on. More recent developments are the transcribed and encoded versions of the latter historic censuses made available via the Internet, and the replacement of canvassing with computer-generated censuses based on a combination of population registers.

1. CENSUSES 1660S TO 2011

In 1662, two years after the introduction of enlightened despotism in the Kingdom of Denmark, Norway and Iceland, Titus Bülche was appointed ecclesiastic commissar of Norway and went there to find information about the parishes. Initially, twenty-three year old Bülche may have lacked the authority to gather the data. After returning to Copenhagen he next year brought a letter of introduction from King Fredrik III (1648-70) which he presented to the clergy, telling them that revised population numbers would be the basis for the building of larger churches. Throughout 1664 Bülche assembled male censuses from most parishes which were checked against complementary lists from tax collectors. We may doubt that church building was the real motive behind census taking in the 1660s, but rather a stooge to secure the priests' cooperation. The King was bankrupt and steadily at war with Sweden, so the raising of taxes and the conscription of soldiers seem likely motives. In support of this, is the fact that the two censuses taken in the 1660s were male, even though a few widowed women were listed (Dyrvik, 1972; Gille, 1949, p. 16).

This start was followed by a male census in 1701. Unfortunately this has survived to a lesser degree than the censuses of the 1660s. The next demographic improvement from Copenhagen came in the area annual compilation of birth, death and eventually marital

aggregates based on reports from the clergy starting in 1721 (Backer, 1947, 1948; Gille, 1949). Only in 1769 did they return to censuses as main instrument for population statistics. This was in the heyday of mercantilism when administrators believed that the size of the population was *the* crucial factor behind the power of any nation. We may only speculate that the King's personal physician Struensee was involved in the decision about the next census, in 1769. After travelling with the mentally disturbed King in 1768, Struensee was appointed departmental counsellor in May 1769, increasing his influence as the Queen's lover. Thus, the first complete census of the Danish realm happened during Struensee's "revolutionary" rule, although was taken before he completely mastered the Kings' signature from 1770 until his execution in 1772. The magistrates in the towns and the vicars were appointed as census takers in the countryside. Aiming to investigate the social status of the population, the urban questionnaires were the most specific. Since it covered the entire Danish kingdom, costs were reduced by statistical enumeration only, although some nominative lists survive. Under-enumeration was serious, cf the lower number of married men than women – people had reason to fear new taxes (Gille, 1949, p. 17; Johansen, 2002; Johansen, 2004, p. 34; Momsen, 1974, pp. 73f; Palmström, 1929; Statistisk sentralbyrå, 1980b).

1.1. The 1801 Nominative Census

The 1787 nominative census in Denmark was instrumental in establishing the Danish-Norwegian Table-Office which was behind the nominative census of 1801 - the first of this kind to cover the entire Danish realm. In 1801 the text "or what they live from" was added to the head of the occupation column in order to make it more specific (Momsen, 1974, p. 113). It did not always help; like in 1787 the clergy was often more preoccupied with a person's status than with his temporal tasks. But the priests were the only local authority who could enumerate people. Probably the need for military recruits during troubled times again motivated the detailed and costly enumeration. The Royal rescript dated November 1800 simply says that a overview of the population would be "useful", "... since the population number in a country when it is known quite accurately is used in several ways for statistical, political and economic calculation..." (Momsen, 1974,

p. 109)³. Many men in Hallingdal valley suspected military use when large numbers reported their age as 36 – one year above the deadline for conscription (Drake, 1969, p. 4; Dyrvik, 1972; Ofstad, 1949).

Marital status information is particularly detailed with retrospective data about number of previous marriages. This was because of the introduction of insurance for widows, inspired by cameralism, a branch of mercantilism focusing on the physical and moral well-being of their subjects (Olsen 1993, 134ff). Another improvement in 1801 was defining households by drawing lines between them in the manuscripts. Although the practice was not followed universally, this makes the study of household structure more realistic. However, there is no birth place information in the 1801 census except for some foreigners. In addition to nominative coverage the creation of aggregates is the argument for considering the 1801 census as the first complete population census in the world. The transcribed versions of the manuscripts are today fully available to researchers, cf below.

1.2. 1814: Independence and a poor new state

The union between Sweden and Finland, and the union between Denmark and Norway, created different types of sources that continued to be kept within the respective twin countries after the unions were dissolved in 1808 and 1814 respectively. After the Napoleonic wars Denmark was again bankrupt and Norway was committed to paying its share of the debts from the disbanded union. Still, administrators feeling a pressing need to take stock of Norway's population, decided to take a census in 1815 after one year in union with Sweden. Again, the work was carried out by the clergy, the only social group with national coverage at the local level. Only in the towns containing one tenth of the population was the work carried out by the poor relief registrars. There were not resources to make the census nominative. Basic statistics of population numbers by gender, rough age groups and civil status were reported on the parish level. At least 2 % of the population was under-enumerated in 1815.

3 German: „da die Einwohnerzahl eines Landes, wenn man sie einigermaßen genau kennt, auf vielerlei Weise zu statistischen, politischen und ökonomischen Berechnungen benutzt werden kann“.

The statistical censuses were continued for forty years. Only for a few parishes have draft nominative lists survived in the archives. The reason for this was also the Table-Office's low status as a preliminary arrangement as the need arose. From 1825 to 1855 minor reforms introduced more detailed variables such as occupation and ethnicity, and the statistics were reported by farm rather than parish. The Office published uncommented statistical summaries decade by decade. The publication of statistics based on the 1825 census had to be financed privately by university professor Frederik Holst in 1827. In 1845 the Table-office had 10 employees including a lower level civil servant (Bureachef) (Statistisk sentralbyrå, 1976, p. 51). In the 1855 census the occupations were classified without a "fisherman" category. Only when the Table-Office was staffed with new administrators in the 1860s could major reforms be made.

1.3. The Nominative Era Revived

Anders Nicolai Kiær (1838-1919) made it to the top of the Table-Office only 28 years old, and changed its name to the Central Office of Statistics. He held a degree in law studies and was the above-mentioned professor Holst's nephew. His mate from law studies, Jakob Neumann Mohn (1838-1882) became second in command in the Office from 1869, and was even more important in reforming census statistics. Especially, he produced occupational statistics showing the consequences of election reforms (Mohn, 1874). Their joint development of the representative method of investigation, systematically sampling non-random groups from the censuses for detailed studies, awoke international debate. The method is similar to stratified sampling, but while these are randomized after selecting groups to be studied, Mohn's and Kiær's samples were preselected with an eye to making the sample as similar to the universe as possible. The method was denounced by statistical expertise in the early 1900s.

"Population statistics and especially ... the censuses, is the most important part of statistics in general", Kiær wrote introducing the results of the 1876 census, the first where he was fully responsible both for the preparatory work and the analysis. He launched a program for statistical census taking, stressing the country's social and economic situation, both broadly and in great detail. This period has been characterized as the heyday of census taking since both economic

data about agriculture and illnesses were parts of the censuses Kiær only needed to take a look at the relative importance of vital statistics in Sweden, however, to see the census relegated to be a secondary instrument for population statistics (Lie, 2002b).

Kiær inspired the reforms already introduced in the 1866 census. The gains from nominative censuses elsewhere were obvious, in Denmark, Britain, the US and even in Sweden in 1860. Norway was lagging behind and the argument about increased costs was met with another daring reform: self-enumeration in towns, based on the British model. Both in 1866 and 1876 detailed questions about livestock and seeding on farms and cottar's places were included in the censuses. Production potential was measured because the alternative questions about production may have increased suspicions about taxation. In line with mercantilist thinking before the transport revolution of the mid 1800s, the idea had been to compute self-sufficiency rates in order to purchase enough grain to local deposits (Herstad, 2000). Mohn's perspective from liberal economics was rather to measure the *monetary value* of the agricultural production per inhabitant and per hectare land.

There was still a tendency to note status-related titles in the combined field for household status and occupations in 1866, a practice recognizable from the ministerial records. The clergy's conservatism may explain why the leaders in the Office of Statistics transferred control over rural census taking to the bailiffs in the 1876 census. Based on the 1876 return with separate occupations and household fields, Mohn grouped the male population in six categories: Independent business men, privately employed superior staff, the working class, civil servants appointed by the King, other officials and the unproductive. This was a conservative categorization based on who already had voting rights, and was now used to compute what weight the groups would get given that they were included among the voters. This system was basically kept for occupational categories in Norwegian censuses until 1960 when international standards were adopted, which provides a comparative statistical series about the development of the occupational structure from 1876 onwards. Mohn's sense of detail is seen in the 1876 aggregates, where the six main occupational categories were split into 96 groups and further subdivided into 759 different subgroups.

1.4. Extended Census Principles

On one hand, the liberal economic tradition of the 19th century meant the separation of the state from industry and commerce. On the other, it has been called the period of the watchman state because it still had roles as supervisor and organizer. The taking of more complete, nominative censuses in several countries, beginning around 1850, must be seen as fulfilling functions not only in the mapping of the population per se, but also in meeting the need for a denominator against which to measure other statistics such as mortality. Monitoring the mass migration was in itself important. Even if the goals behind census taking differed from country to country, the directors of the national statistical bureaus met regularly, trying to standardize questions, procedures, and the compilation of aggregates across borders and advocating the organization of censuses all over the world (Anderson, 1988; Körösi, 1885).

As early as 1835 the Norwegian censuses started to record disabilities and abnormalities, mental disorder, leprosy, blindness and deafness. The work was pioneered by Professor Fredrik Holst who had defended a doctoral thesis in 1817 on 'Radesyken' a disease similar to syphilis. In 1826, using the apparatus of the census but separately from the census, he managed a national enumeration on mental disorders ('Maniaci, Melancholici, Dementes or Idiotae'). Starting in 1835 and extended in 1845 the enumeration became a regular part of the censuses (Blomberg, 1997). The effort resulted in the first international scientific publication of data from the Norwegian censuses (Holst & Massey, 1852). Holst was a scholar of many talents. In 1827 he discussed what had caused the population growth since 1815, improvements in medicine by vaccination or in nutrition by introduction of potato crops. The question is still being debated (Drake, 1969; Dyrvik, 2004; K. F. Myhre, 2011; Thorvaldsen, 2002).

In the 20th century, the increased significance of social welfare demanded more detailed information using census taking as one of several methods. Introduced into Norwegian censuses in 1876, data on housing gained increased importance with special emphasis in the 1930 census. More detailed and specific data on occupations and unemployment (from 1910) provided vital information for the country's economic life. The retrospective information about returnee emigrants was collected in 1910 and 1920. After World War II, data needed to

be gleaned from censuses to make infrastructure decisions such as those about commuting⁴. Indeed, rapid changes in all fields of society demanded that data be updated more frequently than by decennial censuses.

1.5. From Census Taking to Population Register

Population registers came to Norway through the initiative of local authorities in 1905, the first being that of the capital in 1906. In the next instance, the 1910 census proved that the authorities in Bergen, Norway's second largest city with nearly 77000 inhabitants had lost track of their population numbers. They were also impressed by the success of the population register introduced in the capital, lowering expenses and levying taxation more efficiently. Bergen, like Oslo based their population register on municipal censuses using the national 1910 census and the updated 1912 census. During and between the First and the Second World Wars population registers spread to new cities (Drammen 1914, Stavanger 1916).

After Germany occupied Norway in 1940 the Nazi authorities controlled population mobility more closely. The national 1940 census was cancelled, the 1930 census was outdated and thus the deportation of Jews had to be based on other sources, particularly from the Mosaic congregation. Anti-Nazi administrators in Statistics Norway managed to retard the occupants' initiative to create a central, national population registry. Only after the war were the registers made national through the 1946 Law on Population Registers. The source material provided by the 1946 and 1950 censuses was used to up-date the population registers.

Norway held its last complete form-based census in 1980. To reduce costs Statistics Norway carried out the last form-based population census in 1990 based on a representative sample, supplemented from the population registers. In 2001 Statistics Norway again side-stepped the traditional census by using forms only about housing. All

4 For details about new variables introduced, cf our homepage about the history of Norwegian censuses, including instructions and references at <<http://www.rhd.uit.no/nhdc/census.html> accessed 13.12.2012>.

the individual-related variables were based on a bringing together of information from registers, linked by the mandatory personal id number. Norway built its registry of domiciles in 2001, with Finland and Denmark as role-models. A registry of all homes is crucial in order that a registry-based census can produce statistics on persons living together – more important than ever in a marriage-less society. The complimentary property register identified individual apartments in a house where previously all had the same address. This bringing together of different longitudinal registers is based upon internationally agreed standards.

A classification of the working population presupposes an expansion and updating of the employee register, with detailed information on employment in addition to place of employment. Unfortunately, in 2001 aggregates could be computed about where people worked, but not about what positions they held, rendering occupational statistics less complete. Some information is difficult to assess in the existing registers, e.g. education abroad. From a quality control point of view it would have been advantageous if, when the transition was being made to a register based census, to have also conducted a traditional form-based one. The complete count censuses of 1960, 1970 and 1980 have been linked at the level of the individual using the personal number as the linking device. This has formed the basis of life course statistics that have been difficult to obtain in many countries.

In Norway the cost of the fully automated 2011 census is estimated at less than half a Euro per inhabitant, which was one tenth of the cost of the 2001 census which used questionnaires for the information on housing. In comparison, the form based US census in 2010 cost 47 dollars per inhabitant (Statistisk sentralbyrå, 2010, 2011). All in all, 18 European countries used register data to take the 2011 census, but mostly in combination with other sources. Before the 2011 census round the employer register was updated allowing comprehensive occupational aggregates.

1.6. Ethical Aspects

Statistics Norway has strong restrictions on the use of these last-mentioned databases and such linked data sets are only used within Statistics Norway itself. So far as the individual censuses are concerned, they have adopted a more liberal approach, but are, careful to operate

within the spirit of the Statistics Laws of 1907 and 1980. These allow only the statistical use of the source material for the first 100 years. Since 1960 the censuses have been processed electronically, something which makes it easy to produce data-files with clearly defined parts of the source material at the individual level. In order to make sure that researchers are only able to use the material statistically, it is rendered unidentifiable. But even if the name and personal number are removed it is still possible in theory to access a number of individuals listed in the census; for instance, if one has an accurate address or where an individual or a family has a unique combination of characteristics. Such identification gets difficult by giving only the county as address and only the most general of occupational codes. If only a random sample of households is provided, moreover, it gets impossible to identify individuals by a process of elimination. Paradoxically, the protests against the 1990 round of censuses were more far-reaching in Sweden than in Norway – only the latter country was occupied in World War II. The explanation behind the relative lack of protests in Norway may be that the Nazi authorities' grip on population registration and statistics never became firm due to resistance. Also it may have helped that the Norwegian 1990 census was only taken from a random sample in the larger municipalities and cities.

2. ENUMERATION TECHNOLOGY

2.1. Tabulation

With the nominative census forms from 1866 it was possible to create tables combining the individual level information in more ways and the task of aggregating the results swelled. This was solved by employing more personnel, but they still had to count the results manually for each combination of variables. In 1876 the Statistical Bureau decided to use separate forms for each domicile. Then in 1891, rather than listing persons by family and households, the information about each person was filled into a separate form. These individual forms were put into different stacks for the relevant combinations of variables and counted. Still the task was time consuming, single sheets were easily misplaced and summing errors were made when combining partial results.

Therefore, the work could be rationalized further by renting the machinery which Hollerith had invented for the US 1890 census. This was done in 1900 and explains why now the Statistical Bureau again sent census questionnaires listing members of the same domicile on the same form, the individual's information was punched onto Hollerith cards. The equipment was used successfully both in the 1900 and in the 1910 round of censuses, was also used to tabulate vital statistics, was worn out and there was no funding to rent a replacement in 1920 (Aurbakken & Statistisk sentralbyrå, 1998). The Central Statistical Bureau had no alternative but to revert to the system with one census form for each individual, like in 1891. This makes the census information less available to researchers, since unlike the 1801, 1866, 1876 and 1900 censuses, it was not considered realistic to microfilm the 1891 census. Only now the 1891 census is being scanned by the National Archives in order to be made available on the Internet, eventually also in a transcribed format. A project to scan the 1920 double-sided sheets is prepared for its release from legal bindings in 2020. Prototype software has been implemented which can transfer the contents of simple fields such as gender, family status and ethnicity from the images to ASCII codes automatically (cf. <http://www.rhd.uit.no/nhdc/HBR_notat_okt-2010.pdf> accessed 13.12.2012).

2.2. Computerization

Electronic, digital processing in the 1950 round of census taking shows how the Census Bureau in Washington was at the helm of technological developments. In other countries, such as Norway, the encoded 1950 census was transferred to standard 80 columns Hollerith cards, sorted and aggregated with *electromechanical* equipment rather than digital computers. Nationally, Statistics Norway proved to be pioneers since in 1958 they were the first state agency to acquire a digital computer (Elgsaas, Hegna, Impagliazzo, Järvi, & Paju, 2009; Statistisk sentralbyrå, 1976, pp. 39–42). It was too bulky to be brought through doors, so a hole was chopped through the wall of the office building in Oslo. This “Deuce” was not outfitted with magnetic tape stations and could only handle punch cards, which were run twice in order to check for machine failures. Still, it replaced a number of devices because several procedures could be integrated in a digital machine. It had limited sorting abilities, however, and could not print the tables there was room to produce in its internal memory – now in hours rather than days. The magnetic tape stations

procured in 1962 increased the computer's ability to handle much data, and made possible the Central Population Register which was based on the 1960 census and launched in 1964 (Statistisk sentralbyrå, 1976, pp. 117–121). A more reliable machine with several magnetic input and output devices was the IBM 360/40 from 1967.

2.3. Major Historical Data Base Projects

As we describe how the variables from the sources have been encoded in different ways, it will be important to relate the methodological distinctions to the research purposes for which the encoding was done. It is naturally beyond the scope of this article to cover all research where the encoding of historical nominative records played some role. However, a large part of this research was done as part of or with the assistance of major projects that created infrastructure for social historical studies by computerizing and encoding historical micro data. The Norwegian Historical Data Centre has catered mostly for researchers, while The Digital Archive of the National and Regional Archives has catered more for genealogists.

2.4. The 1801 Project

The road towards a computerized version of the 1801 census was also pioneer work, started by historian Knut Mykland at the University of Bergen, in 1968. He hired history student Jan Oldervoll as a research assistant since his unique background in mathematics seemed suitable for computer work. Because they found it difficult to construct a coding scheme for a pre-industrial census, it was decided to rather enter the whole contents of the census verbatim by punching it onto some 300 kilometres of paper tapes – a more modern procedure than could really be expected at the time. After transcription the census was encoded with a proprietary computer program developed by Oldervoll and on this basis Statistics Norway published new aggregates in 1980 (Oldervoll 1978⁵). This intended main product was soon overshadowed by the

5 Available with an introduction in English at <http://www.ssb.no/histstat/nos/nos_b134.pdf>.

textually transcribed micro data which became the basis for specially designed aggregates, performing prosopographical studies or tracing ancestries. The latter purpose was served with a microfiche version and paper listings equipped with indexes on first and last names. In 1995 the 1801 census again spearheaded computerized census history by being the first full-count nominative census on the Internet (Thorvaldsen, 1998). As of 2011 an encoded version forms the oldest part of the North Atlantic Population Project. Here simple aggregates from the census can be produced on line, or after downloading produce the desired statistics with software allowing more flexible variable transformation, filtering and sophisticated statistical measures.

The new edition of the 1801 census has been employed in a number of local history studies. It also was the central source material for a couple of theses written by graduate students at the Historical Institute of the University of Bergen. They linked the census records with information on baptisms, marriages and burials from the church books for 48 randomly chosen parishes spread across Norway. The most notable results pertain to the background and destiny of unwed mothers on the one hand, and social mortality differentials on the other. (Engelsen, 1982; Haavet, 1982).

As an extension of the 1801 project, the Historical Institute at the University of Bergen also computerized parts of other censuses, emigration records and ministerial records in co-operation with the Regional Archive.

2.5. The NHDC Centre

Likewise the Historical Institute at the University of Oslo dealt with similar materials from the capital and its surroundings, within the framework of a project producing more than thirty master theses on social science history and demography (Langholm, 1976). The setting up of the Norwegian Historical Data Centre (NHDC) at the University of Tromsø from 1978 onwards is serving researchers, teachers, students and genealogists nation-wide. The Digital Archive run by the National and Regional Archives also work on transcribing the censuses and vital records. The long-time aim is a national population registry for the 18th and 19th centuries, primarily for research purposes. (Thorvaldsen, 2009, 2011b; Thorvaldsen & Eide, 2011) During the last years it has become usual to distribute the material in digital format, following a

national standard for data entry and data distribution. Retrieval of census and ministerial records can be done on line with several web interfaces (Thorvaldsen, 2011b; Vick & Huynh, 2011).

By joining the parts of the 1866, 1900 and 1910 censuses entered by these institutions, these are now available in electronic formats covering the whole country. In addition, half of the 1876 census is transcribed, while the rest of Norway is covered with a two percent sample. The NHDC maintains a database with information on historical, nominative sources that have been machine readable in Norway.

The first stage in the treatment consists of a direct transcript of originals or scanned online copies from the National Archives or the Regional Archives. The personnel perform a word - by - word transcript, using PCs. After the transcripts undergo proof-reading, any errors found are corrected. For extra safety, spot tests are carried out, and if the result is unsatisfactory, repeated proof-reading will be undertaken. The guiding principle is to be true to the source material. Most information is written down exactly as it appears, with a few minor exceptions in order to enhance the information value and user-friendliness of the material. Even so, all users must be aware that the resulting database will contain errors and inconsistencies, most of which also can be found in the original sources. A case in point was the linkage project undertaken by historian Eli Fure of the National Archives in Oslo, which involves a number of censuses and church registers. She has shown how most inconsistencies were made in the original source; only a fraction was introduced during data processing. Since all records are related to addresses, it is possible to construct consistent geographical entities that may be compared over time. Both municipalities and the higher administrative unit of the province have been made comparable in this manner.

The machine readable censuses exist in a verbatim full text transcript as well as an encoded format. To the latter end, the next step is to standardize variables with a view to statistical treatment. The numeric codes for occupation, family status and county of birth, were originally made to standardize the information in the sources for the production of statistics. The codes are, however, also useful for record retrieval and record linkage, because the information on family status and birth place can be employed in a uniform way. A semi-automatic encoding procedure enables operators to complement

the textual variables with numeric codes, creating input files for statistical software packages. Again, consistency across time and space is stressed so that results from cross-sectional analysis of several censuses may be comparable (Thorvaldsen, 1995). Personal names and farm names are only standardized, so inconsistencies in name spelling can be dealt with by researchers who want to identify people in several sources. Users are warned that there is an arbitrary element in all coding procedures, so researchers ought to check the coded version against the original.

2.6. The Digital Archive of Norway

In the mid 1990s there were four large digital data archives in Norway: The 1801-project, the NHDC, Norwegian TeleCom and the digital County Archive of Sogn and Fjordane Province⁶. The National Archivist saw the reorganizing as a possibility to create a National Digital Archive of Norway. The infrastructure and the service of the 1801-project headed by Jan Oldervoll was chosen as the platform for the Digital Archive of Norway. The Digital Archive was launched in January 1998 and all census and census like data previously hosted by different archives became available in a single homogeneous Internet application (WWW). The Digital Archive had a unified search system and tools for data selection, extraction and basic online quantitative analysis with descriptive statistics. The Internet site attracted both genealogists and students of history –also internationally (Bosquet, 2007). More than 50 master theses, or 10%, of the master thesis at the University of Bergen 1998-2008 were based on data extracted from the Digital Archive (Solli, 2008).

In 2012 a new technological platform was implemented for the Digital Archive of Norway and besides several millions of data records the Digital Archive also host millions of scanned images of various types of source material, censuses, parish records, real estate records (legal and fiscal cadastres), probate registers, emigrant lists and court records (<http://www.arkivverket.no/eng/Digitalarkivet> accessed 12.12.2012).

6 <<http://www.sffarkiv.no/sffbasar/default.asp?lang=eng>> now hosted by <<http://www.fylkesarkiv.no/> accessed 13.12.2012>.

3. CODING CATEGORIZATION OF CENSUS VARIABLES

3.1. Occupations

When standardizing census information, the most demanding task is usually the coding of a diversity of occupations. E.g. the 1900 census for Norway contained 2.1 million individuals with 375,000 different occupational strings.

In connection with the North Atlantic Population Project (NAPP), a somewhat modified or contextualized version of HISCO was developed. Because of the enormous number of occupation strings, it has been necessary to reduce the level of detail by removing many HISCO categories, while adding new categories found in the censuses and more general categories that are not specific to any category found in HISCO (ref *Historical Methods* 2/2003, 4/2205 and 2/2005). Both the 1801, 1866, 1876, 1900 and 1910 censuses for Norway have been encoded into HISCO and made available also via the North Atlantic Population Project at the Minnesota Population Center, cf <<http://nappdata.org> accessed 12.13.2012>.

3.2. Ethnicity

Census takers have experienced that this is one of the trickiest variables to record. Ethnicity is a multi-faceted characteristic, and not easily definable. From 1845 to 1910 the census instructions asked for “Nationalitet” and in 1920 and 1930 for “Race” where modern questionnaires would rather use the ethnicity concept. Enumerating the ethnic minorities is to “enumerate the others”, but by what criteria? At the international statistical conferences this was a recurring theme. Using ancestry was a natural point of departure. However, in the late 19th century the goal was to homogenize the population within the framework of the national state. The Kvens who immigrated to Norway from Finland were thought of as a potential fifth column since they could feel allegiance with co-ethnics in neighbouring states. In order to find out to what degree the minorities identified with internal or external national ideals, other criteria than ancestry became central: whether people spoke the national vernacular or their own language became a marker of ethnicity. This was especially so for the group of mixed ancestry, resulting from the many ethnically mixed marriages.

In northern Norway marriages between the Finnish, the Sami and the ethnic Norwegians resulted in offspring which were categorized ethnically by language according to a set of ten rules. Thus, the child of a Finnish mother and a Norwegian husband would be noted as Norwegian unless it was taught to speak only Finnish. Furthermore, the ethnic groups were placed in a hierarchy with Norwegians as the most valuable and the Sami in the inferior position. (Lie, 2002a; Thorvaldsen, 2011a).

4. HISTORICAL RESEARCH BASED ON THE CENSUS

4.1. The Great “Moulting” of Norway

By 1994 the complete digital version of the 1801 census of Norway had been available for about 15 years, however few studies had used the complete census on the individual or household level. Most studies had still been carried out on single parish data extracts, printouts of the transcribed census, or the new and updated printed report of census aggregates (Dyrvik, 1993; Higley, 1976; Lee & Gjerde, 1986; Sogner, 1979, 2009; Tysdal, 1990). There were a few exemptions. Marianne Erikstad had used the census for the three northernmost counties and Jan Oldervoll had done a small comparative study on age leaving home based on the complete census (Erikstad, 1979; Oldervoll, 1980). These and the studies on single parishes documented that in 1801 there was regional variation in household size, household structure and life-course events like leaving home and age at first marriage. The social and geographic differences in household size had also been described in Michal Drakes pre-digital population study (Drake, 1969). Drake used the 19th century printed reports since this was the only rational format in the 1950s and 1960s.

The regional demographic differences have puzzled Norwegian social scientist, statisticians and historians since mid 19th century. The idea of “Ecotypes” materialised when both Statistics Norway and Statistics Sweden tried to explain regional patterns in emigration in the second half of the 19th century. In the 1860s Statistics Norway divided the ca. 500 municipalities into ecotypes in order to analyse economic, demographic and social change. These ecotypes were also

used in 1969 by Michael Drake in his *Population and Society in Norway, 1735-1865* (Drake, 1969; Strøm, 1959). The main ecotypes for 19th century Norway are:

1. Urban.
2. Mountains (agriculture): Inner fiords and mountain areas in mid inland Norway.
3. Plains (agriculture): Main agricultural districts in the south-east (Oslo) and around Trondheim.
4. Timber: Inland districts in eastern Norway and mid-Norway, especially toward the Swedish border.
5. Industrial: Rural municipalities with mills, mining (iron/copper), iron- or copper works.
6. Maritime: Coastal municipalities in the south-east and southernmost part of Norway.
7. Fishing: Coastal districts from the southernmost tip of Norway to the Russian border.

The regional variation of household structure and age of marriage documented by several studies on the 1801 census and the lack of comparative studies using the complete digital census motivated Solli's master thesis in history (Solli, 1995a, 1995b). The focus on household formation and first marriage was based on an assumption that economic, ecologic and social factors could more easily be traced or revealed by the young and newlywed rather than the whole population.

The main hypothesis was that a large and fairly unlimited resource, North Sea fishing, and an expanding European market in the 18th century fostered a nuclear household structure and a relatively low age of first marriage within the range of the West European marriage pattern. And contrarily, in a mainly agricultural inland economy with small possibilities for expansion, complex household structure and high age at first marriage prevailed.

In order to test the hypothesis the digital and encoded 1801 census had to be aggregated to household level and parish level. The 876 303 individual data records into 162 811 household records and 356 parish records and at each level there was a new set of aggregated variables. To create new variables on the household level, e.g. household type (nuclear, extended, multiple), and aggregate variables special purpose software was developed. In addition the parish level records were matched with the regional statistical database held by the NSD (Norwegian Social

Science Data Service, 2001-2012). This data merge also provided for simple mapping of data variables at the aggregate parish level.

The main results and conclusions put forward in the thesis were:

a) The mountain district (agriculture) had a higher proportion of large and complex households. More than 70% of the households had between 5-9 members and the mean household size was 6.33. In the coastal fishing district 72% of the household had 3-6 members and the MHS was 4.78.

b) In the mountain district 18% of all household were multiple family households (stem), and for the heads at age 30 (28-32) about 65% of the households were multiple or extended. In the coastal districts only 4% of the households were multiple and less than 20% were extended or multiple for heads of household at age 30 (28-32).

c) In the mountain district the age of first marriage (SMAM) for women was 32 years and 34 years for men. In the coastal district the SMAM was 27 for women and 28 for men.

Several factors caused these differences. The fish resources gave possibilities for young unmarried men and women in the coastal region. However the profits from these resources and their export varied over time, especially for herring. In times of large catches and export, farms were divided into smaller and smaller plots. The occupational structure showed that the coastal region had more livelihoods fully or partly in transportation and accommodation, in government jobs as pilots and in postal service and in trade as local representatives for merchants from nearby towns. This created a more dynamic market of livelihoods, so that a son was not dependent on his father's retirement for a livelihood. A young man and woman in the coastal district could marry in their mid 20s, set up an independent household, and later consider taking over their parents' farm holding. In the mountain region a young couple had to wait for their parents to retire or die in order to marry. Therefore, a higher proportion of males and especially females were never married in the mountain/fjord region. The seemingly easy access to livelihoods in the coastal regions had also to do with the capital cost to set up a new household. Even a young boy could participate and get a minor part of the income from the catch. This provided the capital for establishing a household based on a small plot of land or a cottage. The households in the coastal region were therefore also more dependent on supplementing their subsistence by buying imported grain from the major towns.

The strength of the study was the comparative aspect, using geographic differences and variations to explain differences in family structure. However, a weakness of the 1801 study was that it was not possible to study changes over time. During the 1990s the 1865 and 1900 censuses were transcribed and published by the Digital Archive and the Norwegian Historical Data Centre.

The availability of this rich amount of new census data came into use in Solli's second study (1998-2003). This Phd-project could take advantage of the newly transcribed data sets. This was a huge task since the 1801, 1865 and 1900 census all together consisted of more than 4.5 million person data records.

A main metaphor in Norwegian 19th century historiography is "*hamskifte*" (in English *Moulting*, is the manner in which reptiles change their skin.). Moulting is a metaphor for the major economic, technological and cultural changes of rural Norway from about 1840 and onwards. As part of the "great moulting" there was a social change, of social structures and the kin and family relations of "the old society", a dissolution of "the social *Ancien Régime*" (Danielsen, 1995, pp. 230-254; Sogner, 2009).

A major theme in many social and demographic studies was to discuss the validity of the history based on this metaphor. Therefore, several studies of social and demographic changes were based on contrasting the 1801 census and a later census, either 1865, 1875 or 1900 (Bull, 2006; Dyrvik, 1983; Higley, 1976). These studies typically analysed one rural parish at two points in time. They were followed by studies on family change and industrialization or urbanization (Bjørndal, 1999; Eliassen, 1979; J. E. Myhre, 1976).

Based on these studies five major changes had been detected in the family system of Norway in the 19th century:

1. Change in age at leaving home, children left their parental home at a higher age.
2. Earlier family formation, lower age at first marriage.
3. Domestic and farm service, fewer male servants.
4. Decrease in household size (MHS).
5. Increase in proportion of single persons' households.

These changes had to a varying degree been detected, described and analysed earlier, so Solli decided to do a full scale comparative study of these five characteristics using the complete and digital 1801,

1865 and 1900 censuses (Solli, 2003). Furthermore, aggregating census data to parish (1801) and municipality (1865, 1900) levels allowed the combination of the data with the NSD regional database (cf above) on economy, demography, politics and social variables. The Norwegian Historical Data Centre had digitised the rural fiscal cadastre of 1886 containing information on every rural cadastral units of Norway evaluating farm values. Both the NSD and NHDC data thus gave extra information on the economy and political preferences on the aggregated municipality level.

While Norwegian historians had focused on economic differences, political scientists worked on models for party systems and state building where cultural and religious values were central. These studies were to a greater degree based on a cultural diffusions theory and a theory of a cleavage or the periphery's resistance to the political and cultural centre. (Rokkan, 1967; Rokkan & Urwin, 1982). In analysing the political system of Norway from 1814 political and cultural regions were defined (Nilson, 1972). Similarly to Norwegian historians and statisticians defining abstract regions using economic criteria, political scientist had defined regions using political and cultural criteria.

The political-cultural "ecotypes" of late 19th and early 20th century Norway were:

1. Political centre, the capital Oslo and its neighbourhood area.
2. Semi-centre, towns along the coast of Southern Norway.
3. Coastal areas.
4. The great valleys, inner fiord and mountain areas.
5. Northern Norway.

Two competing hypotheses could be tested using the two ecotypes (economic and political-cultural):

a) Economic change caused the social change (cf. five social aspects above). The changes in household structure and life course would be stronger and earlier in urban, industrial and maritime ecotypes than in the mainly agricultural municipalities.

b) Cultural change caused the social change, spreading from the political and cultural centre towards the periphery and there would be a time lag partially due to the periphery resisting change and opposite cultural values from the urban centre in South-east Norway.

Solli's thesis gave several new insights about the social change in 19th century Norway. The rise of age at leaving home was general, national and uniform suggesting that neither the economic nor cultural differentials influenced this major change. The nationwide synchronous change rather implicates the legal changes in the school system (esp. 1861) and the regulations of child work (1892). Earlier family formation and lower age at first marriage were typical for industrial and urban communities. In domestic and farm service there were fewer male servants. The absolute number of male servants in 1801 and 1900 were the same, however the population and number of households nearly tripled, i.e. relatively the proportion of male servants dropped by 2/3. There was a decrease in mean household size (MHS). The decrease in MHS mainly followed the economic model, declining in areas with a larger and increasing secondary sector, but also in the remote inland mountain areas, cf. next paragraph. There was an increase in single person households. The proportion of single person households did not follow any of the models. The biggest increase happened in the remote mountain areas and in urban and industrial areas. Both the decrease in MHS and the proportion of single person households in the remote inland areas were caused by young people moving out; i.e. emigration to the US and migration to urban centres along the coast. In the 19th century many of the inland communities experienced population decrease because of emigration/migration.

In general neither the economic nor cultural models were fully confirmed. However, part of the social changes seemed to follow the economic changes, especially the increase in the proportion of the work force in the secondary sector. But both nationwide changes in the school system and labour force participation changed the life course of children. Secondly, migration changed the household structure in inland agricultural areas, causing a gentrification of those areas.

From a methodological perspective on how to work on digitalised census material the two studies raise several general points. First how highly important it is to have a common set of rules for data entry (Thorvaldsen, 1996). Secondly that the data models, data design and implementation selected must be appropriate to deal with millions of census records. (Oldervoll, 1978; Statistisk sentralbyrå, 1980a). Thirdly that planning and designing for aggregation of census data from individual to household and community level must be prepared at an early stage of digitalisation. This is important to avoid the

ecological fallacy. Within the data system the records at all levels are logically linked and it is, therefore, possible to check results on the aggregate level directly on the individual level, either manually or by sampling. To achieve goals of coding, categorisation and aggregation automatically, algorithmic coding on the census data is highly recommendable because of the limited semantics involved (Solli, 1996, 1998). Through algorithms and special software small scale methods for censuses can be implemented for large scale data.

4.2. A Study of Migration in the Province of Troms 1865-1900

Thorvaldsen's dissertation mapped migration in the province of Troms in Northern Norway during the second half of the nineteenth century, the period when net in-migration turned into net out-migration (Thorvaldsen, 1995). With the censuses as the main source material, the amount of migration both in and out of the province, between its constituent communes and within the communes was estimated. Then it described to what extent the in- and out-migrants differed from other people with reference to characteristics like sex, civil status, occupations etc. The empirical aim was to explain the relative amount of migration compared to other parts of Norway, and what made the different types of migrants move, while other people stayed put in the same place (Sogner & Thorvaldsen, 2002; Thorvaldsen, 1995). Much effort was put into the development of new methodology, as the dissertation was the first entirely dedicated to the study of historical migration in Norway. It is also the first attempt to study the development of an entire province ("fylke") with statistics based on individual level data. In this connection, out-migrants from the municipalities were traced to their new domiciles. Moreover, for the first time in Scandinavia, programs for automatic record linkage were used in historical research.

The amount of migration into Troms was reduced during the period 1865-1900, while internal migration seems to have stayed at the same level and out-migration from the province was increasing. There was a crisis in agriculture in the late 1860's and an urban trade crisis around 1880 that ended Troms' position as a frontier attracting mass in-migration from other parts of the Nordic countries. From now on the province exported more of its surplus population. Migration was small because several barriers to migration were at work. One was the

barrier of the peasant economy, where the combination of fishing and farming could absorb the growing population into the family production units. A similar explanation, based on the vigorous class of farmers, has been launched for the low emigration rates of France⁷. Another barrier was that between countryside and town, where the crisis of 1880 incepted the re-export of urban in-migrants to the countryside. A third barrier was ethnic; there was a tendency for the Sami group to stay within the areas they dominated, even when they migrated. A fourth barrier was social. The farmers and peasants mostly stayed, but some emigrated if they had the means and the social contacts in the US. These were mostly the inland farmers who did not fish and had too few relationships with the rest of the population to make them follow. The multiplier effect on emigration inherent in contiguous social networks (Åkerman, Johansen & Gaunt, 1978) only here and there showed its full potential in thinly populated, topographically divided and ethnically mixed Northern Norway .

For the fishing peasants of Troms it was difficult to keep up this combination of trades if they moved to town. Agriculture was marginal on the coast of Finnmark, there was little room for new farms to the south and small chances to fish on the American prairie. The ways the population of Troms migrated and the reasons why they stayed were to a high degree related to the economy. The social network only comes in as a secondary determinant, helping people decide exactly where to go.

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