

Educational opportunity, formal education and practical learning in Scandinavia

A presentation of student biographies and their uses: 1820s-1975

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Abstract

In Scandinavia, universities and technical schools had the tradition, between the 1820s and the 1970s, of publishing biographies of graduates with detailed information about their life and work. This paper presents the investigation project 'educational opportunity, formal education and practical learning in Scandinavia', which includes making a database of these biographies to explore (1) the direct roles of formal education and practice for innovation and economic performance, and how this played out in different industries and (2) education attainment, educational opportunity and the historical impact of education on social mobility, and differences in this regard between genders, classes and regions. I propose a systematic empirical historical investigation of formal and practical education processes, travels and career paths of entire high- and technical school cohorts in a period when these 'catching-up' countries of the Industrial Revolution went through a radical transformation in terms of industrial and economic development.

Introduction

Much research has been done on the relationship between basic and technical education and economic growth, but there is not much empirical evidence on its specific functions and direct impact on innovation. We thus still know little about the limitations of formal education and its direct applications in daily work and innovation processes. This investigation aims to change this, however, through the use of unique sources available in Sweden, Norway and Denmark. In Scandinavia, universities and technical schools had the tradition, between the 1820s and the 1970s, of publishing detailed biographies of the family, background, life, work and travels of high school- and technical school graduates. This paper presents the project ‘Educational opportunity, formal education and practical learning in Scandinavia’ in which these so-called ‘yearbooks’ are used to provide a systematic historical analysis on the micro level of two key subjects, much debated in economic history, namely (1) the direct roles of formal education and practice for industrial development and economic performance over time, and how this played out in different industries in Sweden, Norway and Denmark and (2) educational opportunity and the historical impact of education on social mobility; moving from one social class to another, and differences in this regard between genders and regions in Denmark and Norway.¹ The paper presents the sources, the planned database and how it will be used for historical analyses.

A systematic historical analysis of the functions of education in Scandinavia is timely for several reasons. Sweden, Norway and Denmark are some of the countries in the world with less social differences, small economic inequality and high social mobility. They have developed and maintained unique welfare states, which covers health, education and social protection for the whole population and are ranked high at the Human Development Index. They are also ranked high in terms of women’s rights, education and work opportunities.² The history behind these processes is, however, still unclear and much debated and analyses on the role of education are scarce. Basic and technical education systems developed early in Scandinavia, but whether educational opportunity has been equal between gender, regions and social classes, and whether education has been an important historical driver of social mobility, is uncertain.

Moreover, today the Scandinavian countries are some of the richest countries in the world. Both basic and technical education systems are usually considered a significant reason for Scandinavia’s strong economic performance over the past two centuries.³ We know less, however, of the direct use of formal

¹ My post-doctoral contract at the Department of Economic History, Lund University, and this project, started 1 April 2018.

² United Nations Development Programme, Human Development Reports: <http://hdr.undp.org/en/data> [accessed 29th June 2018]

³ See for example: P. Sandberg, “The Case of the Impoverished Sophisticate: Human Capital and Swedish Economic Growth Before World War 1”, *Journal of Economic History*, vol. 49, No. 1 (1979); P. Sandberg, “Ignorance, Poverty and Economic Backwardness in the Early Stages of European Industrialization: Variations on Alexander Gerschenkron’s Grand Theme”, *Journal of economic history*, vol. 11 (1982); R. A. Easterlin, “Why

education, its practical functions for industrial development in these countries.

I propose a systematic empirical historical investigation of entire formal and practical education processes, travels and career paths of complete high- and technical school cohorts in Scandinavia from the mid-nineteenth century to 1940, a period when these ‘catching-up’ countries of the Industrial Revolution went through a radical transformation in terms of industrial and economic development. In this paper, I outline only two papers, although the database that is in the process of being produced, will lay the basis for multiple research papers. I present some examples and preliminary findings, which may provide some indications on (1) educational opportunity and (2) education and industrial performance and knowledge transfer from abroad in Norway.

Educational opportunity: a theoretical setting

Low ‘inequality of education opportunity’ or ‘equal educational opportunity’ may contribute to more equal societies, although other institutions, such as the legal system, inheritance and property transfer laws, may play a more important role in class mobility than education. On the one hand, it is stated that people with the same type of education not necessarily reach the same social status. Even if societies have a strong tendency toward granting the best social positions to those who are better educated, Boudon highlights that education not always influence mobility.⁴ More specifically, high inequality of educational opportunity is found to be insufficient to prevent the probability of social demotion being high, and education cannot necessarily explain social mobility alone.⁵

On the other hand, in some societies education is shown to have an effect on inequality. On a personal level, a goal of basic and high school education is access to higher education and thereafter access to highly paid and interesting jobs with more responsibilities, which would possibly lead to greater personal and professional mobility.⁶ By preparing individuals for employment, education may be a key determinant of the distribution of income and life opportunities and more equal societies. Increasing levels of formal schooling are found to contribute to raise standards of living and to eradicate extreme poverty worldwide. Glenn Loury highlights that education can reduce inequality, it can raise the intergenerational mobility of earnings and at the same time increase output by allowing a larger number

Isn't the Whole World Developed?", *Journal of Economic History*, Vol. 41, Issue 1 (1981); G. Ahlström, *Engineers and Industrial Growth* (London & Canberra, 1982); G. Stang, "The Dispersion of Scandinavian Engineers 1870-1930 and the Concept of an Atlantic System", STS-Working Paper No 3/89, 1992; H. Harnow, *Den danske ingeniørs historie* (Århus, 1998)

⁴ R. Boudon, *Education, opportunity and social inequality* (Canada, 1973), p. 14-15

⁵ R. Boudon, *Education, opportunity and social inequality* (Canada, 1973), p. 162

⁶ T. Piketty, "Theories of Persistent Inequality and Intergenerational Mobility," in A. B. Atkinson, and F. Bourguignon (eds.) *Handbook of Income Distribution*, vol. 1, (2000), pp. 429 – 476

of children and entrepreneurs to educate.⁷ A recent comparative study of intergenerational educational and occupational mobility in the United States and Italy blames the public school system for the lower mobility in Italy.⁸ Goldin and Katz analyse the basic educational system in the United States and find that the share of people with secondary level education in the twentieth century increased much more there than in European countries. They relate this dramatic increase to the lowering of inequality.⁹ This suggests that if inequality of educational opportunity is low, social mobility may be higher.

In addition to reducing inequality, education is shown to have many other positive effects on an individual level, and for the society as a whole. First, it is found that higher education levels correlate with health and wealth. The more education a person has, the healthier and wealthier he or she is likely to be.¹⁰ Second, education may prepare individuals for democratic citizenship. Studies show that societies benefit from skilled and knowledgeable workers as well as informed citizens.¹¹ Third, education may facilitate that jobs are filled with persons who are best qualified and not with people from the 'right social background'.¹² Education therefore seems beneficial both for the individual as well as for the society as a whole.

The importance of education, on an individual level and for social and economic reasons, has led to a general agreement that educational opportunities should be 'equal'. One way of defining 'educational opportunity', is that individuals should not meet any irrelevant obstacles, which would be characterised as impossible to overcome, such as gender, religion, race etc.¹³ Obstacles that can be overcome can vary. They can be for example tuition fees, school matriculation, test requirements etc. There is, however, no general consensus of what is meant by equal educational opportunities and how to ensure it.

Supporters of 'meritocratic equality' argue that no other obstacles besides merit should stand in the way of enrolling into the education systems, measured by entrance requirements, aptitude tests, grades or exams. The Rawlsian principle of 'fair equality of opportunity' aims to eliminate the effects of social background and economic class on education. The idea is that the achievement gap between the rich and

⁷ G. C. Loury, "Why Should We Care About Group Inequality", *Social Philosophy and Policy* 5, issue 1 (1987), pp. 249–271

⁸ See A. Ichino, D. Checchi and A. Rustichini, *More Equal but Less Mobile? Education Financing and Intergenerational Mobility in Italy and the U.S.* (Italy, 1997).

⁹ C. Goldin and L. Katz, *The Race between Education and Technology* (the United States, 2008)

¹⁰ L. A. Jacobs, *Pursuing Equal Opportunities: the Theory and Practice of Egalitarian Justice* (Cambridge, 2004).

¹¹ S. Verba, Sidney, K. L. Schlozman and H. E. Brady, *Voice and Equality: Civic Voluntarism in American Politics* (Cambridge, MA, 1995), pp. 432–437, 445

¹² Norway and Denmark have had small differences in income distribution according to UNDP Income Gini coefficient: Gini Coefficient. Retrieved from UNDP: <http://hdr.undp.org/en/content/income-gini-coefficient> [accessed 29th June 2018]. It measures the deviation of the distribution of income among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality, a value of 100 absolute inequality.

¹³ P. Westen, "The Concept of Equal Opportunity", *Ethics*, 95, issue 4 (1985), pp. 837–850.

poor with the same talent potentials would be eliminated by assuming that talented children and youths can be identified.¹⁴ This theory, however, is heavily criticised. Critics find that ‘fear equality’ hardly can be achieved. Some scholars in fact state that schools can encourage, maintain and legitimise class divisions by officially presenting attainment as based on individual characteristics, while they in reality select students based on race, sex, age, social class, religion etc.; i.e. qualities beyond their control.¹⁵ Geography and social background are factors, which might affect school attendance. Robert D. Mare points out wealth, permanent income, personal characteristics; academic ability, motivation, educational aspirations, opportunity structures, such as the social and economic opportunities that people expect when they leave school, as important factors.¹⁶ Family background, in particular, has been recognized as a source of significant inequalities because inequality in wealth and differences in family priorities may influence a child’s prospects in education and labour market, in civic participation, and in overall well-being. It is shown, for example, that parents who read for their children give their children an educational advantage to families who do not.¹⁷ Family can therefore be a disadvantage and run contrary to equal opportunity. The aim here is to complement the literature with a historical analysis of educational opportunity in Denmark and Norway, and obstacles, or constraints, to education to learn more about the historical origins and background of the function of two countries’ education systems.

Technical education and industrial development: a theoretical setting

The economist Michael Spence suggests that there is no apparent relations between formal education and increased productivity. In Spence’s job-market signalling model the employer assumes that there is a correlation between the qualifications of the employee and having greater skills.¹⁸ Education is one way for the job applicant to give ‘signals’ to the employer of his or hers abilities. In this approach, education is understood as part of a selection process of capable workers into suitable positions and certain abilities indicate that the person is appropriate for a work or position:

“It is not an indicator that the individual thus educated has acquired cognitive knowledge that will raise his or her productivity when employed, but, rather, signals that the person is likely to be readily, hence less expensively, trainable.”¹⁹

¹⁴ J. Rawls, *A theory of Justice* (Harvard, 1972), pp. 83-108.

¹⁵ S. Bowles and H. Gintis, *Schooling in Capitalist America: Educational Reform and the Contradictions of Economic Life* (New York, 1976); P. Willis and S. Aronowitz, *Learning to Labour: How Working Class Kids Get Working Class Jobs* (US, 1977).

¹⁶ R. D. Mare, “Educational Stratification on Observed and Unobserved Components of Family Background” in Y. Shavit and H.-P. Blossfeld (eds.), *Persistent Inequality* (USA, 1993), p. 354

¹⁷ J. Hutton et al. “Home Reading Environment and Brain Activation in Preschool Children Listening to Stories”, *Pediatrics*, 136, issue 3 (2015), pp. 466–478.

¹⁸ M. Spence, “Job Market Signaling”, *The Quarterly Journal of Economics*, vol. 87, No 3 (1973), pp. 335-374

¹⁹ M. Abramovitz and P. David, “Technological change and the rise of intangible investments: the US economy’s growth-path in the twentieth century”, in OECD, *Employment and Growth in the Knowledge-based Economy* (Paris, 1996), p. 52

Peter Lundgren states that the need for higher education has been exaggerated and find that education contributes primarily to critical thinking.²⁰ Nobel Laureate in economics Gary Becker, on the other hand, sees schooling, along with on-the-job training and so on, as an investment in ‘human capital’ and understands education as a factor, which directly increases productivity. From a historical perspective, industrial performance has depended on different kinds of training:

“At least from the time of the Industrial Revolution, technologies (and their underlying knowledge bases) have become complex enough to require either high standards of literacy and numeracy or more specific training in relevant disciplines (such as basic sciences or technological disciplines such as electrical or chemical engineering) if they are to be operated successfully. From this perspective, education is seen as a key input to the advanced economy. More specifically, education is the investment process through which “human capital” is created, and this is increasingly seen as the central input to growth.”²¹

Becker makes a division between ‘specific’ and ‘general’ human capital. Specific human capital refers to skills that are useful only to a single firm, whereas general human capital can be useful across industries, such as literacy and numeracy, but also for example knowledge about mechanics or chemistry.²²

Formal education has significant benefits for the society in that it facilitates skilled workers, who are more productive and who in turn contribute to increase in GDP per capita. Golding and Katz use the increase of professional workers in the United States in the twentieth century as an explanation for why this country became the richest country in the world.²³ Technical education in particular, is shown in many studies to have played a significant part in technological change. From the late nineteenth century, several technical educational institutions were established with the aim of providing technicians, engineers and other specialists for industries, and there was an increasing conviction that technical education led to industrial development. In this regard, Peter Lundgreen affirms that:

“(d)uring the late nineteenth century a general belief in education as a key to international competition joined forces with a thorough transformation of the economy in providing new job markets for engineers graduating from colleges and universities.”²⁴

²⁰ P. Lundgreen “Engineering Education in Europe and the U.S.A, 1750-1930: The Rise to Dominance of School Culture and the Engineering Professions”, *Annals of Science*, 47, 1990, p. 34

²¹ K. Bruland, “Education” in *Oxford encyclopedia of economic history*, vol. II (Oxford, 2003), pp. 161-162

²² G. S. Becker, *Human Capital* (New York, 1975), pp. 19-37

²³ C. Goldin and L. Katz, “The decline of non-competing groups: changes in the premium to education, 1890 to 1940”, *NBER Working Paper* No. 5202 (1995)

²⁴ P. Lundgreen, “Engineering Education in Europe and the U.S.A, 1750-1930: The Rise to Dominance of School Culture and the Engineering Professions”, *Annals of Science*, vol. 47, Issue 1 (1990), pp. 33-75

The civil engineer Göran Ahlström stresses that: “engineers and technicians are seen as particularly important for industrial growth because they play a crucial role in applying science and inventions in productions.”²⁵ More broadly, he underlines that:

“(a) thorough theoretical and practical technical education is necessary and has been so at least from those nineteenth-century years when the science-based industries generally assumed a leading position in the industrial sector of the economies.”²⁶

A key point to be made here is that it is also important to consider other ways of learning outside a classroom setting. Becker emphasised that some types of knowledge can best be acquired in a practical working situation, while other types of knowledge require specialisations.²⁷ This point is related to the argument that innovation to a large degree depends on personal contact and transfer of knowledge from person to person because much knowledge is ‘tacit’, i.e. knowledge, which can hardly be described or explained. The scientist Michael Polanyi states that: “we can know more than we can tell”. In an economic setting, Mokyr refers to tacit knowledge as “... implicit skills such as dexterity, hand-eye coordination, and sense of ‘what worked’”. This type of knowledge is not learnt by reading or instruction; it is rather learnt through observing and ‘learning by doing’.²⁸ The argument that different types of knowledge can be acquired in a variety of ways, and that formal education has knowledge limitations, will be an important basis of this planned analysis.

Historiographical setting: social and economic effects of basic and technical education in Scandinavia

According to multiple studies, the Scandinavian population became literate early. Fritz Hodne indicates that in Denmark and Norway in 1873, around eighty-seven per cent were able to write and read and ninety-nine per cent were able to read.²⁹ Other sources show that by the 1890s the estimated literacy rate was near a hundred per cent.³⁰ According to Carlo Cipolla, more than seventy per cent of the adult population in Norway was literate by 1850, and the Scandinavian countries more widely was some of the countries with highest literacy in Europe by that time.³¹

²⁵ G. Ahlström, “Technical Competence and Industrial Growth”, *Lund Papers in Economic History*, No. 14, (1992), p. 1

²⁶ G. Ahlström, *Engineers and Industrial Growth* (London & Canberra, 1982), p. 94

²⁷ G. S. Becker, *Human Capital* (New York, 1975), p. 37

²⁸ M. Polanyi, *The Tacit Dimension* (Gloucester, 1983), p. 4; J. Mokyr, *Gifts of Athena*, (Princeton and Oxford, 2005), p. 73

²⁹ F. Hodne, *Norges økonomiske historie 1815-1970* (Oslo, 1981), p. 250

³⁰ O'Rourke and Williamsen, “Education, Globalization and Catch-Up: Scandinavia in the Swedish Mirror” in *Scandinavian Economic History Review*, 43, 1995, p. 299.

³¹ C. M. Cipolla, *Literacy and Development in the West* (Baltimore, 1969), p. 113

The high literacy rates in Scandinavia were related to widespread and accessible education systems and early campaigns to improve reading and writing skills. Religious movements and the church played important roles in these processes. Subsequently, the state took over the responsibility and the role of the state here is key.³² In Denmark, the first real law of education was made in 1708. School districts were established in 1720 and compulsory education was established in 1739.³³ New school laws were introduced in 1806 and 1814.³⁴ Norway and Sweden seemed to be slower than Denmark in adopting general education. In Sweden, regulations were introduced in 1737, 1762 and 1809. In 1842, general schooling was adopted, and in 1882, basic education became mandatory.³⁵ In Norway, all children between seven and fourteen years old should receive teaching in reading, writing and some calculation for at least three months each year from 1827.³⁶ In 1837, 86.4 per cent of the children in the appropriate age received teaching.³⁷ In 1860, a law, which established a school system with regular school for all during seven years, was adopted.³⁸

High literacy in Scandinavia is used as an explanation for these countries' high economic growth during the last two centuries. Lars Sandberg shows that there is a correlation between countries with high literacy in 1850 - including the Scandinavian countries - and the ones with high income per capita in 1970, even if they were poor in 1850. His argument is that a literate population did not necessarily lead to immediate economic growth, but gradually changed and prepared people for a capitalist way of thinking.³⁹ Yet, this study has been criticised. The economic historians Kevin O'Rourke and Jeffrey Williamson downgrade schooling in their analysis of Sweden. Focusing on the period between 1870 and WWI, according to them it was only "modestly important" to the catching-up of Sweden and Scandinavia. They conclude that: "...while schooling certainly helped make the late nineteenth century Scandinavian catch up possible, it was not the central carrier implied by so much of the literature."⁴⁰ There are disagreements about the degree to which education was important for development in Scandinavia, which calls for further detailed analyses of the relationship between schooling and economic growth.

³² K. Bruland, "Kunnskapsinstitusjoner og skandinavisk industrialisering" in *Demokratisk konservatisme*, Engelstad, F and Sejersted, F (eds.) (Oslo, 2006), p. 271

³³ O. Feldbæk: "Den lange fred. 1700-1800", in O. Olsen (red.), *Gyldendal og Politikens Danmarkshistorie*, bind 9 (København, 1990), pp. 184-185

³⁴ O. Feldbæk: "Den lange fred. 1700-1800", in O. Olsen (red.), *Gyldendal og Politikens Danmarkshistorie*, bind 9 (København, 1990), p. 187

³⁵ G. Carlquist (red.), *Svensk uppslagsbok* (Malmö, 1932)

³⁶ F. Hodne, *Norges økonomiske historie 1815-1970* (Oslo, 1981), pp. 242-243

³⁷ F. Hodne, *Norges økonomiske historie 1815-1970* (Oslo, 1981), p. 244

³⁸ F. Hodne, *Norges økonomiske historie 1815-1970* (Oslo, 1981), pp. 242-243

³⁹ P. Sandberg, "Ignorance, Poverty and Economic Backwardness in the Early Stages of European Industrialization: Variations on Alexander Gerschenkron's Grand Theme", *Journal of European economic history*, vol. 11 (1982)

⁴⁰ K. O'Rourke and J. Williamson, "Education, Globalization and Catch-Up: Scandinavia in the Swedish Mirror", *Scandinavian Economic History Review*, XLIII, 3 (1995), p. 309

In particular, the literature about Scandinavian high schools - preparatory school for higher university and technical education - focus mainly on school reforms and institutional development. They are largely descriptions of the establishment and advance of schools as institutions.⁴¹ The first ‘gymnas’ in Scandinavia was established in Malmö in 1529, Lund in 1620 and 1621 in Odense. In Norway, after the independence from Denmark in 1814, there were 13 schools, which met the requirements of ‘complete schools’. Before 1914, youngsters living in the countryside were referred to the high schools in the cities, yet between 1916 and 1940, twelve private and public high schools in the countryside were founded.⁴² In Denmark and Norway, gymnas prepared students for ‘exam artium’, a system that was introduced in 1630, which was a requirement to enter university. Preparing students for higher and technical education, as well as work, high schools were in many ways ‘door openers’ for young people to higher social status and more interesting and better-paid jobs. High school graduates are in this way important in historical analyses of educational opportunity and mobility.

In general terms, comparative historical empirical studies indicate a high level of commonality and inertia of mobility rates, both over time and across countries.⁴³ Educational attainment of individuals from lower classes have increased, but individuals from higher classes have acquired even more education, which have kept societal divisions.⁴⁴ Furthermore, it is found that also nations with highly developed economies and educational systems, and a high demand of schooling, vary greatly in the extent to which later stages of the schooling process are open to large fractions of each birth cohort.⁴⁵ Norway and Sweden, in particular, are found in recent decades to have lower inequality of educational opportunity than other European countries. The reasons that are pointed out are the explicit policies of equality that have directed social action in these countries for many years.⁴⁶ It may not always have been this way. For example, women were excluded from the higher education system in Norway until 1882. From this year, seven years after Denmark, women were allowed to take the final high school exam, and thus enter university. By this time, high schools for women had already been introduced many places. For example, high schools for women was introduced in Russia already in 1786 and in 1826 in New York and Boston.⁴⁷ Although the Scandinavian countries are far ahead when it comes to women’s

⁴¹ G. Forr and H. Vold (red.), *Landsgymnas* (Oslo, 2007); T. Sirevåg, *Utsyn over norsk høgre skole* (Oslo, 1988); I. Bjørndal (2005), *Videregående opplæring i 800 år* (Norway, 2005); A. K. Gjerløff and A. Faye Jacobsen, *Da skolen blev sat i system 1850-1920* (Århus, 2014).

⁴² G. Forr and H. Vold (red.), *Landsgymnas* (Oslo, 2007), p. 7

⁴³ Y. Shavit and H.-P. Blossfeld (eds.), *Persistent Inequality* (USA, 1993); R. Boudon, *Education, opportunity and social inequality* (Canada, 1973)

⁴⁴ J. O. Jonsson “Persisten Inequalities in Sweden”, in Y. Shavit and H.-P. Blossfeld (eds.), *Persistent Inequality* (USA, 1993)

⁴⁵ R. D. Mare, “Educational Stratification on Observed and Unobserved Components of Family Background” in Y. Shavit and H.-P. Blossfeld (eds.), *Persistent Inequality* (USA, 1993), p. 352

⁴⁶ R. Boudon, *Education, opportunity and social inequality* (Canada, 1973), p. 46. See also Jan O. Jonsson “Persistent Inequalities in Sweden”, in Y. Shavit and H.-P. Blossfeld, *Persistent Inequality* (USA, 1993).

⁴⁷ Barbara Alpern Engel, *Women in Russia, 1700-2000*, Cambridge University Press, Cambridge, 2004, p. 65; Kirstin Olsen, *Chronology of women’s history*, Greenwood Press, USA, 1994, p. 113

rights today, they were not in the forefront in terms of women's access to higher education. Yet, more detailed analyses on the historical development of educational opportunity in Scandinavia, and the degree to which education has been a driver for social mobility, should be implemented.⁴⁸

Technical education also started early in Scandinavia. In the eighteenth and nineteenth centuries, a variety of mining, technical and engineering programs opened in the three countries. In Falun, Sweden, a mining school was established in 1822. The Laboratorium Mechanicum, which was the core of KTH Royal Institute of Technology, specialising in engineering and technology, was established in 1697. Chalmers Institute of Technology, located in Gothenburg, was established in 1829. Lund University, founded in 1666, is the oldest institution of higher education in Scandinavia. The Technical University of Denmark was founded in 1829 and the Royal Veterinary and Agricultural University focused on agricultural science and was founded in 1856. In Kongsberg, Norway, a mining engineering program was established in 1757. This was moved to the newly opened Royal Frederick University in Christiania in 1814.⁴⁹ Additionally, three intermediate technical schools in Bergen, Trondheim and Oslo were established in the 1870s and offered different technical programs and specialisations. Other technical schools and evening schools were founded in a number of towns and near industrial areas, notably Horten Technical School of 1855, Skienfjorden Technical School of 1887 and the School of Agriculture of 1854 (Higher School of Agriculture from 1897).⁵⁰ The Norwegian Institute of Technology (NIT), much based on the German Technische Hochschulen, was founded in 1910, and provided engineering programs on a tertiary level.⁵¹

The literature about Scandinavian technical education offers general descriptions of the supply of engineers. Analyses of technical education and industrial performance usually base their investigation on number of universities, schools and engineering graduates. Comparisons are often made on the assumption that “the more engineers the better”.⁵² Based on this hypothesis, there is a general agreement that engineers and technicians in Scandinavia were in abundance, or at least not scarce. In Norway, the historian Gudmund Stang finds that, in the beginning of the twentieth century, and especially after the

⁴⁸ For studies on social mobility in Denmark and Norway, see: T. Pekkarinen, K. G. Salvanes and M. Sarvimäki, “The evolution of social mobility: Norway over the 20th century”, *The Scandinavian Journal of Economics*, vol. 119, issue 1, January (2017); R. Landersø and J. J. Heckman, “The Scandinavian Fantasy: Sources of Intergenerational Mobility in Denmark and the US”, *The Scandinavian Journal of Economics*, vol. 119, issue 1, January (2017).

⁴⁹ Christiania is an old name for Oslo

⁵⁰ T. Bergh et al. *Norge fra u-land til i-land: vekst og utviklingslinjer 1830-1980*, (Oslo, 1983), p. 52

⁵¹ T. J. Hanisch and E. Lange, *Vitenskap for industrien NTH – En høyskole i utvikling gjennom 75 år* (Oslo, 1985), p. 23

⁵² R. Fox, A. Guagnini, *Education, technology, and industrial performance in Europe, 1850-1939* (Cambridge, 1993); G. W. Roderick and M. D. Stephens, *Scientific and Technical Education in Nineteenth-Century England*, (Newton Aboot, 1972); Valencia Caicedo, Felipe; Maloney, William F. 2014. “Engineers, Innovative Capacity and Development in the Americas”. Policy Research working paper; no. WPS 6814. Washington, DC: World Bank Group.

creation of the Norwegian Institute of Technology in 1910, the industries had a hard time absorbing the large number of technician and engineer graduates.⁵³ The ongoing debate in newspapers and technical journals also suggests that there was an abundance of technicians and engineers. Scandinavian countries seemed to have less engineers than Germany - the leader of technical education from the late nineteenth century – yet the discussion was not about a shortage of professionals and specialists, but instead about whether the educational institutions supplied too many.⁵⁴

It is important to consider the number of technicians and engineers – which in many countries increased during the nineteenth century – yet there is a lack of empirical studies on how technicians and engineers used their knowledge directly, why they would be important for certain working positions, companies and industries, and their effect on productivity and economic growth. Scandinavian technical school graduate biographies, published by most technical, engineering, mining and agricultural schools in Sweden, Norway and Denmark, are highly useful for empirical analyses on the relationship between technical education and industrial development and economic growth. They would help us to further our understanding of the historical role of technical education and trained workers in the economic performance of Scandinavian countries’ in particular, and the function of technical education in economic growth more widely.

The large supplies of technicians and engineers in Scandinavia are seen in connection with the fact that many of them went abroad to work. For centuries, it was highly common for graduates from technical and engineering schools and universities in Sweden, Finland, Denmark and Norway to go abroad; either to study, do practice, to visit working sites and exhibitions or to work.⁵⁵ It seems like Nordic countries had a particular ‘outward-looking’ and ‘open’ attitude. In Norway, after the creation of the three technical schools in Christiania, Bergen and Trondheim in the 1870s, at least half of the cohorts each year left the country.⁵⁶ Gudmund Stang found that between 1870 and 1930 there was a gradual increase in the number of engineering graduates leaving Norway. The peak year was 1924 when more than 150 engineers went abroad.⁵⁷ Seventy-five percent of the mining engineer graduates from Norway between 1789 and 1940

⁵³ G. Stang, “Ble det for mange ingeniører?” in *Trondheim Ingeniørhøgskole 1912-1987 Festskrift til jubileumsfeiringen 31. oktober 1987* (Trondheim, 1987); G. Stang, “The Dispersion of Scandinavian Engineers 1870-1930 and the Concept of an Atlantic System”, STS-Working Paper No 3/89, 1992.

⁵⁴ G. Ahlström, “Technical education, engineering, and industrial growth: Sweden in the nineteenth and early twentieth centuries” in R. Fox, A. Guagnini, *Education, technology, and industrial performance in Europe, 1850-1939* (Cambridge, 1993); G. Ahlström, *Engineers and Industrial Growth* (London & Canberra, 1982),

⁵⁵ See P.-O. Grönberg, “To study or to work? A comparative perspective on Nordic engineer migration to German-speaking Europe, 1880-1930”, in KG Hammarlund & Tomas Nilson (eds.) *Technology in Time, Space and Mind, Högstad i Halmstad 13* (Halmstad, 2008); P-O. Grönberg, *Learning and Returning. Return Migration of Swedish Engineers from the United States, 1880-1940* (Sweden, 2003); G. Stang, “The Dispersion of Scandinavian Engineers 1870-1930 and the Concept of an Atlantic System”, STS-Working Paper No 3/89, 1992

⁵⁶ G. Stang, “Ble det for mange ingeniører?” in *Trondheim Ingeniørhøgskole 1912-1987 Festskrift til jubileumsfeiringen 31. oktober 1987* (Trondheim, 1987), p. 34

⁵⁷ Stang, “The Dispersion of Scandinavian Engineers 1870-1930 and the Concept of an Atlantic System”, STS-Working Paper No 3/89, 1992, p. 26

went abroad.⁵⁸ The emigrating engineers was part of a larger trend of Nordic people going abroad, first and foremost to the United States, which started in the early nineteenth century. Yet, this outward looking attitude seemed to start much earlier. There are traces, for example, of Norwegian miners going on study trips abroad in the seventeenth century.⁵⁹

Some of the travelling Scandinavian engineers and technicians stayed abroad, but many of them came back and then seemed to use their experience and networks from other countries. Per-Olof Grönberg analyse Nordic engineers and technicians in the late nineteenth and early twentieth centuries and shows how knowledge was transferred to Sweden, Norway, Denmark and Finland.⁶⁰ Of the mining engineers who went abroad before 1940, most returned to Norway after a couple of years. After their return, they acquired managing and strategic technical working positions and they used their theoretical and practical learning experiences from abroad extensively in innovation processes.⁶¹ There is strong evidence that this massive travelling abroad led to knowledge transfer and innovation in the Nordic countries, but more systematic and detailed comparative historical analyses are needed of whether, and how, this affected industrial development in Scandinavia. We do not know in detail what the engineers and technicians did and how they might have influenced different industries directly, over time.

Sources: Scandinavian student biographies

Scandinavian student yearbooks are complete collections of biographies of high school and engineering graduates for given years. The biographies were normally written by the graduates themselves, based on questionnaires, but editors contacted the graduates and collected and organised the information. They include detailed information about their lives, work and social background; where they were born, date of birth, their parents, their fathers' occupation, scholarships, which school they went to, higher and technical education, travels, study and work abroad, trainee positions, work positions at companies in their own country during their career. The aim of the yearbooks was simply to collect and publish information about the lives and work of all the people who took the final high, and technical, school exam.⁶² The total number of biographies in the Norwegian and Danish high school yearbooks and the

⁵⁸ K. Ranestad, *Knowledge-based growth in natural resource intensive economies* (Britain, forthcoming)

⁵⁹ A. K. Børresen and J. T. Kobberrød (red.), *Bergingeniørutdanning i Norge gjennom 250 år* (Trondheim, 2007), p. 18

⁶⁰ P-O. Grönberg, *Learning and Returning. Return Migration of Swedish Engineers from the United States, 1880–1940* (Sweden, 2003); P.-O. Grönberg, “To study or to work? A comparative perspective on Nordic engineer migration to German-speaking Europe, 1880-1930” in *Technology in Time, Space and Mind Aspects of Technology Transfer and Diffusion*, KG Hammarlund and T. Nilson (eds.) (Sweden, 2018)

⁶¹ K. Ranestad, Doctorate thesis “The mining sectors in Chile and Norway from approximately 1870 to 1940: the development of a knowledge gap” (Geneva, 2015); K. Ranestad; “The mining sectors in Chile and Norway from approximately 1870 to 1940: the development of a knowledge gap” *Innovation and Development*, vol. 8, issue 1 (2018); K. Ranestad, “Multinational mining companies, employment and knowledge transfer: Chile and Norway from ca. 1870 to 1940”. *Business History* (2017).

⁶² *Studenterne fra 1892* (Kristiania, 1917), p. 19

Norwegian, Danish and Swedish technical yearbooks - the first one of the Danish high school cohort from 1820 and the last one of a Norwegian technical school cohort from 1975 - is estimated to be well over 200 000.⁶³

Norway and Denmark published yearbooks with biographies of high school graduate cohorts during most of the nineteenth and the early twentieth centuries (from 1820s to 1843). These yearbooks include wide-ranging information about the lives and work of high schools graduates. The publications were normally made 25 years and/or 50 years after graduation, which allows for detailed analyses of the whole working career of people who graduated high school. They also include information about parents, spouses and children, which makes intergenerational educational mobility studies possible. The biographies of high school graduates include information about:

- 1) name
- 2) birthplace
- 3) high school
- 4) parents' names
- 5) father's occupation
- 6) Spouse (name and family)
- 7) Children (names, sometimes birthplace)
- 8) study travels (countries, organisations and purpose of travels)
- 9) work abroad (countries, organisations and work positions)
- 10) work in home country (organisations and work positions)
- 11) memberships (associations, organisations etc.)

Technical and engineering schools in Sweden, Norway and Denmark published student yearbooks, which included biographies of technician and engineer graduates. They were typically published as anniversary books (50, 100, 150 years after establishment). These biographies are similar to the high school biographies, and include date of birth, place of birth, information about parents, attended schools, work and travels. The picture below shows a typical biography:

⁶³ The high school yearbooks for Norway include in total around 76 000 biographies from 1831 to 1943; in 1831, there were only 117 high school graduates, the number increased to 242 in 1895 and in 1943 there were 3500 graduates. Adding the yearbooks for Denmark and Sweden the total number of biographies probably surpass well over 200 000.

ANDERSEN, BERNHARD HAAVE,



underdirektor, Oslo, bor Jar. F. i Skåtøy 8/7 1898. Sønn av gårdbruker Jacob Andersen, f. s.st. 10/3 1860, d. s.st. 14/10 1941, og Birthe Marie Haave, f. i Bamble, d. i Skåtøy 12/5 1922. Gift i Skien 27/10 1931 med Margot Nilssen, f. s.st. 13/8 1902. Datter av kjøpmann Thv. Nilssen, f. s.st. 4/9 1878, og Anna Juul, f. s.st. 17/6 1878. Barn: Anne Haave, f. i Philadelphia, Pennsylvania, U.S.A., 14/8 1935. *Skien, real.* Eksamen fra N.T.H., skipsingeniør-linjen, 1924. Utenriksfart 1925–27, opphold i U.S.A. 1927–39. Ansatt som dieselmaskinkonstruktør ved Cooper-Bessemer Corp., Grove City, Pennsylvania, 1927–31, som research engineer for dieselmotorer ved Baldwin-Southwark Corp., Philadelphia, 1931–39, ved dieselmotoravd. ved Nylands Verksted, Oslo, 1939–46. assistent for adm. direktor s.st. 1946–48. Fra febr. 1948 underdirektor s.st. Var i U.S.A. oppnevnt som medlem av teknisk komité nedsatt av Diesel Engine Manufacturers Association og National Electrical Mfg. Association. Div. tekniske publikasjoner i norske tidsskrifter. Viseformann i skipsingeniørenes gruppe av Den Norske Ingeniørforening, Osloavd.

Source: Inger Bergset (ed.), *Studentene fra 1918* (Oslo, 1950).

The percentage of graduates who provided information – or family members (of ceased graduates) on their behalf – of each cohort were normally very high, yet the number varied from year to year. For example, in 1923, 450 of 2130 high school graduates from Norway did not provide information, i.e. around 21 percent, which means a response rate of around 80 percent.⁶⁴ Some years the response rate was much higher. The yearbook of 1909 includes information of 99 percent of the graduates.⁶⁵ The key point here is that the biographies can be used to analyse a variety of subjects related to education from a historical perspective. In particular, these sources can be used to analyse education and technical education on municipal, regional and country level, and they can be combined with other sources, notably census data and industrial and company records. Here, only a couple of research possibilities are outlined.

Some general statistics of the number of graduates, their background and education, are found in the introduction of the Norwegian high school yearbooks, which are presented here as a first step into a detailed comparative historical analysis of educational opportunity. A simple analysis of the introductions show that the number of high school graduates in Norway increased during the nineteenth and twentieth centuries. Comparing the number of high school graduates to the whole population, there are also indications that the share of individuals who took high school increased, especially from 1910s, which may be due to more high schools being opened from then on (see appendix 2). In general terms,

⁶⁴ R. H. Bang, *Studentene fra 1924* (Oslo, 1952)

⁶⁵ *Studentene fra 1909* (Oslo, 1934)

in 1854 six of 10 000 graduated high school. In 1900, 19 out of 10 000 graduated, in 1930, 54, and in 1950, 1.4.

There was a gender constraint until 1882; the year when women were allowed to take higher education. From 1882, the number of women graduating from high school increased gradually. There seemed to be a demand in Norway among women, as the share of women graduating augmented, especially from the turn of the century (see appendix 3). In 1940, around 35 percent of the high school graduates were women. We see from the general statistics in the introductions of the yearbooks that a large share of the women did not use the high school exam to take further higher education, however. In fact, except in the early 1890s, forty-fifty percent of women with high school exam became housewives (see appendix 7). Further detailed systematisation and analysis of the high school yearbooks in Norway and Denmark will help us to gain knowledge of the women who graduated from high school and how they fit into the general understanding of educational opportunity in Scandinavia.

In addition to this restriction for women, a general analysis of the social and geographical background of the graduates from Norway suggests that there were also other constraints. Some of the yearbooks summarise information about the birthplace of the graduates (see appendix 5 between 1892 and 1925), which suggests some disparities between different parts of the country. The proportion of high school graduates from the 'countryside' and from 'cities' seemed to remain equal; around forty percent were normally from the countryside and around sixty percent came from cities, yet a more detailed analysis of the high school yearbook from 1851 indicates that most of the high school graduates came from the Southern part of the country. Only nine percent was born north of Trondheim, which may be due to a much higher concentration of schools in the south (appendix 6).

Appendix 4 shows the occupation of the fathers of the individuals who took high school between 1831 and 1925 according to 'high class occupations', 'workers', 'farmers' and 'artisans'. It seemed like graduating from high school in Norway was rather exclusive and something that was much more common among children of men with high class, and highly paid jobs; notably doctors, businessmen, civil servants etc. An important reason for this inequality was probably the fact that many of the high schools were private, which meant many youths would be excluded due to lack of funding. There were, however, some changes over time. In 1831, less than ten percent of the graduates had fathers who were artisans or farmers; occupations that can be considered 'lower class'. In 1868, this had changed to almost twenty percent. Moreover, in 1888, a few of the graduates were sons of 'workers'. Inequality of opportunity may have declined, although slightly.

This general overview may indicate that educational opportunity in the nineteenth and early twentieth centuries in Norway was relatively unequal, yet the plan is to make more detailed analysis. I propose to

make a detailed comparative historical analysis of educational opportunity, and changes from one generation to another, by using biographies of graduates for Norway and Denmark, with information in an individual level, and linking them to censuses for the two countries. The following aspects of educational opportunity, and obstacles or constraints, will be analysed: (1) the share of youngsters, in the corresponding age group, who graduated high school; (2) the geographical background of the graduates (whether they came from municipalities and cities versus countryside, regions and countries); (3) the family background of the graduates (father's occupation); (4) the use of high school for the graduates; education and work *after* graduation. Appendix 8 and 9 provide a general overview of higher education after high school, and it seems like, over time, a larger and larger share of the high school cohorts did not use their high school degree to enter the University. In the 1870s, and then in 1910, technical schools opened, and some of these required high school exam, which may explain this gradual reduction in shares. More detailed mapping is needed, however, of the higher education and work of the graduates to learn about the use of high school for social climbing. Some biographies include longer descriptions by the graduates about thoughts of the school system. These descriptions can be used as complementary qualitative sources, and makes it possible to acquire an idea of (5) the graduates' motivations to study. How can we characterise the high school opportunities in Denmark and Norway in the nineteenth and early twentieth centuries? Can we define the educational opportunity over time as 'equal'? Who had access to formal education? Were there geographical and social constraints to enter high school? Was education a driver for social mobility? If so, how, and for who?

According to studies about technical education, there is a correlation between a large supply of technicians and engineers and industrial development and economic growth. However, despite much research on basic and technical education and industrial development, there is not much evidence of a direct causal link to innovation. The argument made by Wolfgang König is relevant here:

“So long as we lack research on the careers of the technical intelligentsia or on the selection processes and recruitment of industrial engineers, the question regarding the relations between technical education and economic performance cannot be answered properly”.⁶⁶

In this line of argument, it is important to consider the number of technicians and engineers – which in many countries increased during the nineteenth century -, but I propose to combine such studies with analyses on how technicians and engineers used their knowledge, their practical experience, travels and knowledge transfer from other countries, to further our understanding of whether they have affected industrial and economic growth, and if so, how.

⁶⁶ W. König, “Technical education and industrial performance in Germany: a triumph of heterogeneity”, *Education, Technology and Industrial Performance in Europe, 1850-1939*, in R. Fox and A. Guagnini (eds) (Cambridge, 1993), p. 81

The technical school biographies include information about work experience, travels and career of engineers and technician graduates, which makes it possible to analyse the relationship between education, practical experience (abroad and in their home country) and industrial and economic growth in Scandinavia during more than hundred years. The plan here is to (1) explore travel and work patterns abroad and return to Sweden, Norway and Denmark; (2) combine the biographies with company records (focusing on certain industries in the three countries) to analyse and compare engineers and technicians' career paths, travels, work positions and daily tasks; (3) relate the use of technicians and engineers to changes in labour productivity on a company level in the three countries; (3) compare the share of formally technicians and engineers of total workforce in given industries in the three countries. The overall purpose is to make a historical empirical comparative analysis of the functions of different types of technicians and engineers, with different types of experience, and their influence over time on different industries in Scandinavia. Did technical education have an effect on Scandinavian industries? Was technical and engineering education and work experience useful for industries? If so, how?

The biographies will be used to make a database, which in turn will be linked to censuses, national accounts, company records, and other relevant sources. The purpose of the database is to facilitate historical comparative analyses of education. Appendix 1 is an example of how the database looks like. As many aspects of the graduates' education and work as possible are included. Some of the columns are often left blank, especially the ones about travels and work abroad, because travels abroad varied extensively from graduate to graduate. Some graduates went to many countries, some studied abroad and others worked.

Concluding remarks

The main aim of this paper has been to present key sources which will be used in the research project 'Educational opportunity, formal education and practical learning in Scandinavia'. The sources, which seems to be unique for Scandinavia, are graduate biographies of entire graduate cohorts of high schools and technical schools, which include detailed information about family and geographical background, work and travels throughout their careers. The first yearbook includes biographies of the Danish high school graduates from Denmark and the last one includes biographies of a Norwegian technical school cohort from 1875. Up to 300 000 biographies from Scandinavia form the basis of a database, which is at its current date in construction. The completion of the database will take time, as detailed information about several hundred thousand people needs to be included.

The database can be used to analyse a variety of subjects related to education from a historical perspective. The main purpose is to make a systematic empirical historical investigation of entire formal

and practical education processes, travels and career paths of complete high- and technical school cohorts in Scandinavia from the mid-nineteenth century to 1975. Two research subjects are outlined here, but the applications are many, and they can be combined with numerous other sources. Some preliminary analyses have been presented to illustrate the use of the sources.

Graduate yearbooks will be used here to provide a systematic historical analysis on the micro level of two key subjects, namely (1) the direct roles of formal education and practice for industrial development and economic performance over time, and how this played out in different industries and (2) educational opportunity and the historical impact of education on social mobility; moving from one social class to another, and differences in this regard between genders and regions.

The first analysis seeks to complement the literature with an investigation of changes in educational opportunity (high school) over generations in two Scandinavian countries, a potential opener for both higher education, job opportunities and upward mobility. The student biographies (entire cohorts) can be used to map the social, gender and geographical background of people who took high school in Denmark and Norway during more than hundred years. The biographies can be linked to historical census data on an individual level.

Analyses of high school opportunity in Scandinavia are timely for at least two reasons. First, the Scandinavian countries developed basic school systems and literate populations early, yet less is known of the role of high school, which has been a requirement to enter university and often technical school level study programs. We know little about high school attainment and opportunity in Norway and Denmark, which may be an indicator of social mobility. Second, education generally is understood as a door opener to move up the social ladder. How accessible was high school for people in Norway and Denmark? Did the graduates use the high school exam to take higher education? To work? Scandinavian countries are known for having small social differences and high social mobility, much due the education system, which is accessible for the broader spectrum of the population. How can we characterise the educational opportunity in Scandinavia historically? A key aim here is to analyse variations in the effects of parents' socioeconomic characteristics on the probability that their children go to high school, as well as birthplace and gender of the people entering high school. How common was it for children of farmers, artisans, workers etc. to finish high school and to take higher education? The point of departure here is that social climbing, and high social status, might be one achievement from school, while there are several other achievements, which might be beneficial on a personal level as well as for the society as a whole. The aim is to further our understanding of the role of education in Denmark and Norway's social progress. The next step will be to explore underlying reasons for the results of the analyses of educational opportunity.

Also, there is a lack of knowledge of the direct link between technical education and technological change. How was technical and engineering education used? Which functions did formally trained technicians and engineers have for daily work and innovation in industries? Were there any differences between the countries, and were there any changes over time? Did engineers, technicians and architects from Sweden, Denmark and Norway go abroad? What did they learn, and did they transfer knowledge back to Scandinavia? Was this knowledge used in innovation? The functions of formally trained technicians and engineers on technological change and growth in the nineteenth and twentieth centuries will be compared across sectors in Sweden, Norway and Denmark over time by examining their careers and travels. Industrial statistics and company records will be used in combination with the student biographies to examine the direct effect of technical education in productivity and growth.

Appendix

Appendix 1

Examples from the database:

Family number		Family number	1	1	1	1	1	1	2	2	
Person		Person (nr.)	1	2	3	4	5	6	7	8	
		Name	Nils						Jens		
		Middle name	Anton								
		Surname	Aall						Aars		
		Gender	M						M		
Born		Date of birth	6/ nov.						5/ des.		
		Birthyear	1833						1833		
Birthplace		Birthplace	Sandefjord						Lier		
Family	Father	Name father		Hans							
		Middle name fater		Cato						Julius	
		Surname father		Aall							Aars
		Occupation father		Provst, sogneprest i Brunlanes							Provst, sogneprest i Lom
	Mother	Name mother			Karen						
		Middle name mother			Nikoline						

		Surname mother			Harris					
Spouse		Name spuse				Mathilde				
		Middle name spouse				Susanne				
		Surname spouse				Dahl				
		Birthplace spouse				Tromsø				
		Date of birth spouse				12/ mai				
		Birthyear spouse				1842				
Family spouse		Name father spouse					Baard			
		Middle name father spouse					Nikolaj			
		Surname father spouse					Dahl			
		Occupation father spouse					Sykehusøkonom, kjøpmann			
		Name mother spouse						Maren		
		Middle name mother spouse						Anna		
		Surname mother spouse						Klæbø		
Child nr 1		Name child 1								
		Middle name child 1								
		Surname child 1								
		Birthplace child 1								
		Date of birth birth 1								

		Birthyear child 1								
	Child nr 2	Name child 2								
		Middle name child 2								
		Surname child 2								
		Birthplace child 2								
		Date of birth child 2								
		Birthyear child 2								
	Child nr 3	Name child 3								
		Middle name child 3								
		Sirname child 3								
		Birthplace child 3								
		Date of birth child 3								
		Birthyear child 3								
	Child nr 4	Name child 4								
		Middle name child 4								
		Sirname child 4								
		Birthplace child 4								

		Date of birth child 4								
		Birthyear child 4								
	Child nr. 5	Name child 5								
		Middle name child 5								
		Surname child 5								
		Birthplace child 5								
		Date of birth child 5								
		Birthyear child 5								
		Child nr 6	Name child 6							
	Middle name child 6									
	Surname child 6									
	Birthplace child 6									
	Date of birth child 6									

		Birthyear child 6								
	Child nr 7	Name child 7								
		Middle name child 7								
		Surname child 7								
		Birthplace child 7								
		Date of birth child 7								
		Birthyear child 7								
		Child nr 8	Name child 8							
	Middle name child 8									
	Surname child 8									
	Birthplace child 8									
	Date of birth child 8									
	Birthyear child 8									

High school	Name high school	Nissen						Kristiana Katedralsskole	
	Place (high school)	Kristiania						Kristiania	
	Year high school exam	1851						1851	
Higher education	High education (type)	teologi							
	Middle technical education (yes/no)	nei						nei	
	Engineering education (yes/no)	nei						nei	
	Study country 1	Norge							
	Educational institution (name)	Universitetet i Oslo							
	Study country 2								
	Educational institution (name)								
	Study name 3								
	Educational institution (name)								
	Year higher education (exam)	1858							
	Highest achieved degree (cand. Mag., Cand.philol, Dr. etc.)	teologisk embedseksamen							
Study travels abroad	Study trip (yes/no)	nei							
	Scholarship (if yes: name)								
	Travel country 1								

		Year arrival country 1								
		Purpose of travel (practice, study, exhibition, research etc.)								
		Name organisation 1								
		Travel country 2								
		Year arrival country 2								
		Purpose of travel country 2 (practice, study, exhibition, research etc.)								
		Name organisation 2								
		Travel country 3								
		Year arrival country 3								
		Purpose of travel 3 (practice, study, exhibition, research etc.)								
		Name organisation 3								
		Travel country 4								
		Year arrival country 4								
		Purpose of travel 4 (practice, study,								

		exhibition, research etc.)								
		Name organisation 4								
Work abroad		Country work 1								
		Year employed work 1								
		Work position 1								
		Name organisation 1								
		Country work 2								
		Year employed work 2								
		Work position 2								
		Name organisation 2								
		Country work 3								
		Year employed 3								
		Work position 3								
		Name organisation 3								
		Country year 4								
		Year employed 4								
		Work position 4								

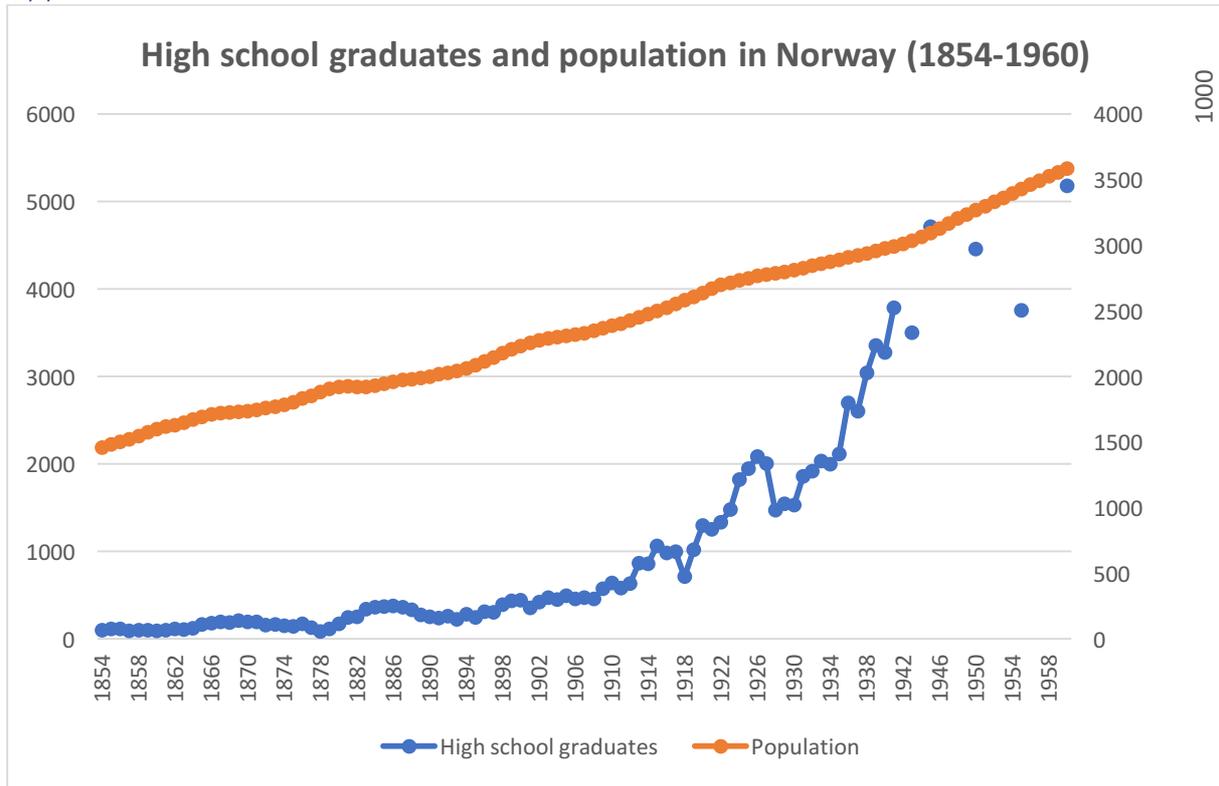
		Name organisation 4								
		Country work 5								
		Year employed work 5								
		Employment 5								
		Name organisation 5								
		Country work 6								
		Year employed work 6								
		Employment 6								
		Name organisation 6								
		Country work 7								
		Year employed 7								
		Employment 7								
		Name organisation 7								
Profession		Profession specialisation sector/industry (medicine, mining, education, infrastructure etc.)	Kirke							
Work in Norway versus abroad		Stayed abroad? Yes/no								
Work in Norway		Year employed work 1	?							

		Work position 1	Huslærer							
		Name organisation 1	?							
		Year employed work 2	1862							
		Work position 2	Stiftskapellan							
		Name organisation 2	Tromsø Stift							
		Year employed work 3	1862							
		Work position 3	Bestyrende							
		Name organisation 3	Tromsø Stift							
		Year employed work 4	1863							
		Work position 4	Bestyrer							
		Name organisation 4	Næssby sognekald i Varanger							
		Year employed work 5	1864							
		Work position 5	Sogneprest							
		Name organisation 5	Næssby sognekald i Varanger							
		Year employed work 6	1875							

		Work position 6	Resisterende kapellan						
		Name organisation 6	Førde i Søndefjord						
		Year employed work 7	1877						
		Work position 7	Sogneprest						
		Name organisation 7	Øksnes i Vesteraalen						
		Year employed 8	1882						
		Work position 8	Sogneprest						
		Name organisation 8	Sveen i søndre Søndhordland						
Publications		yes/no	nei					nei	
Duties									
		Date							
		Year							
Dead		Date						17/ april	

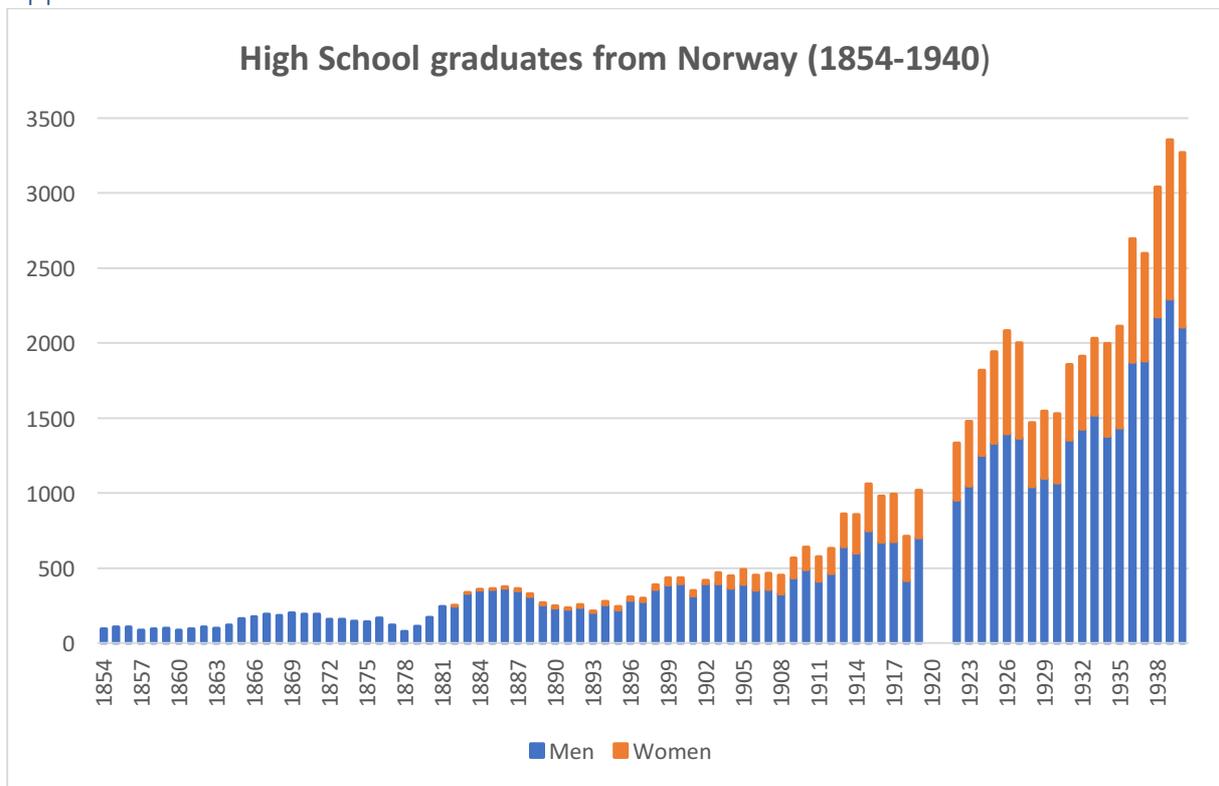
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Appendix 2



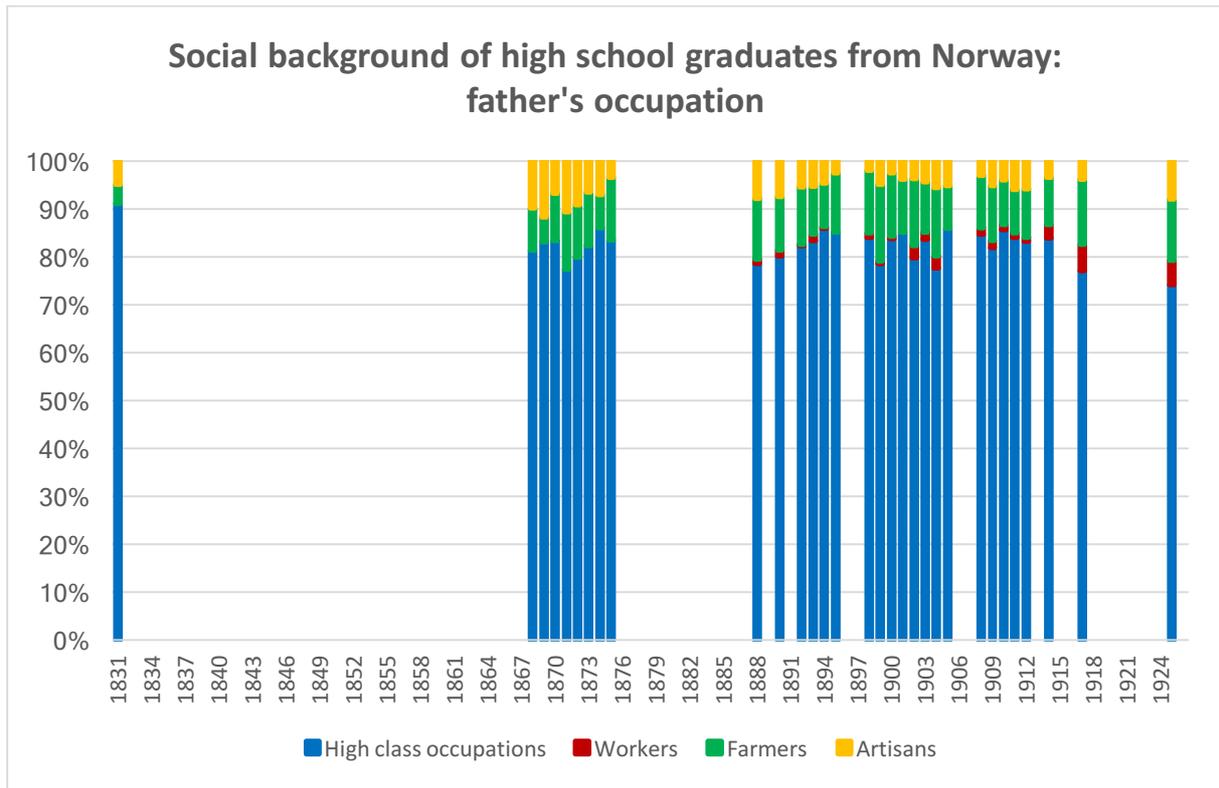
Sources: *studentene* (1854-1940)

Appendix 3



Sources: *studentene* (1854-1940)

Appendix 4



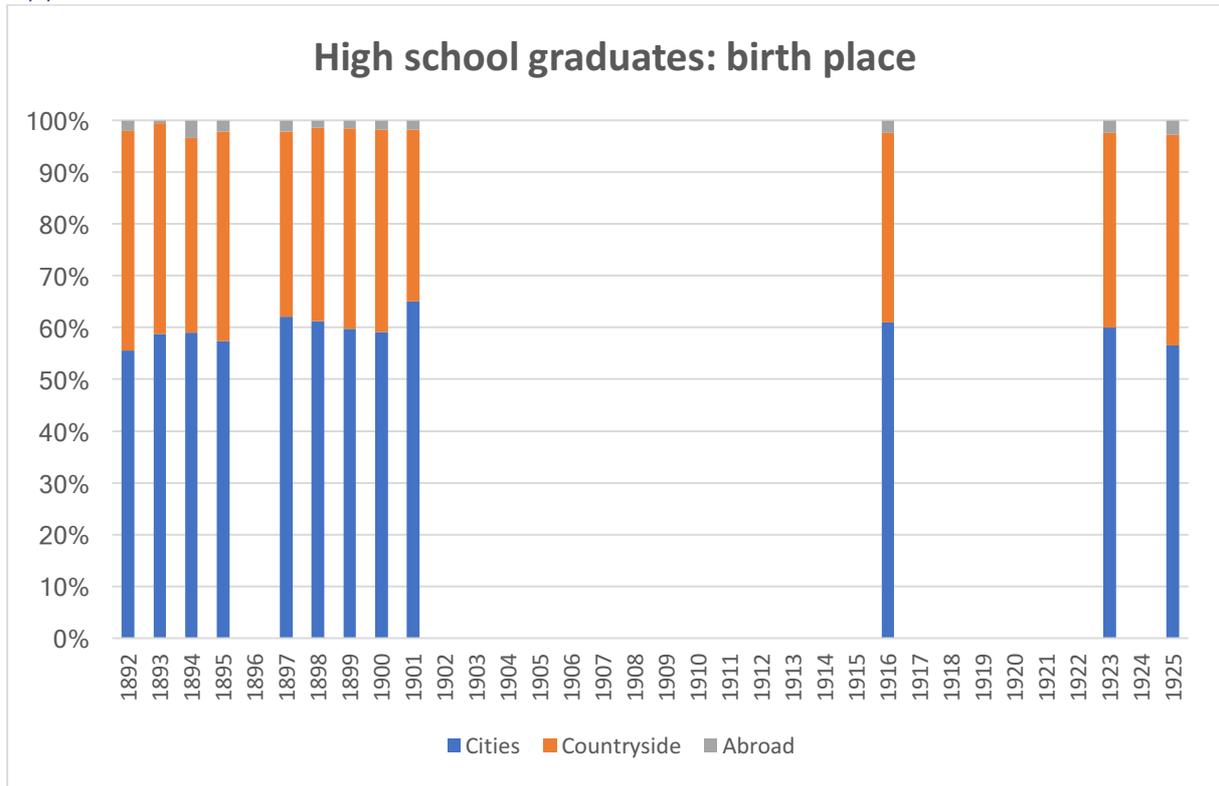
Sources: *studentene* (1854-1940)

* "High class occupations" include doctors, pharmacists, public and military officers, businessmen, managers, teachers, sailors etc.

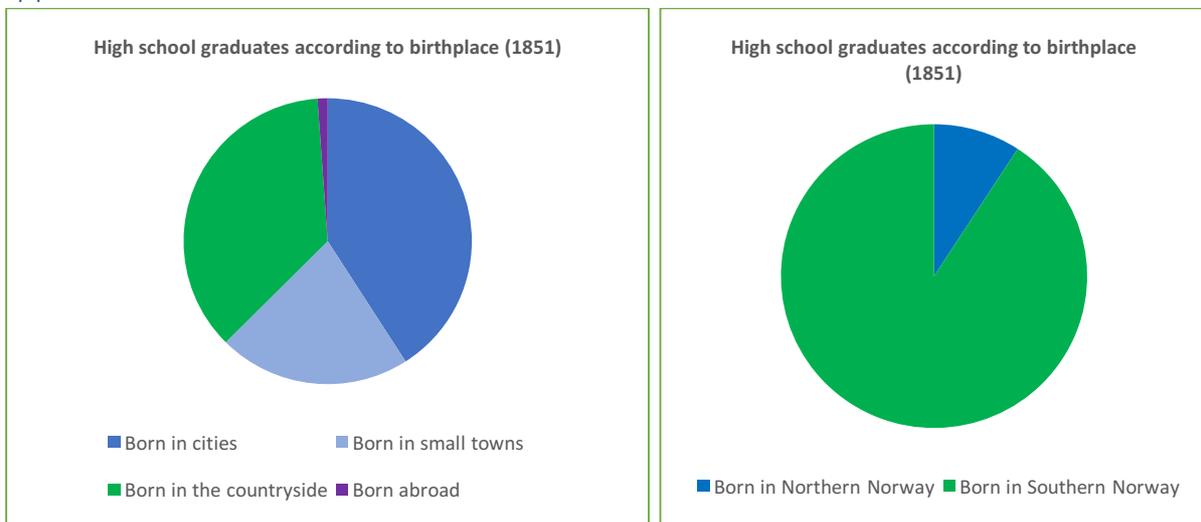
**1890: artisans include "manufacturers"

*** 1912, 1914 and 1917: farmers include "forest owners"

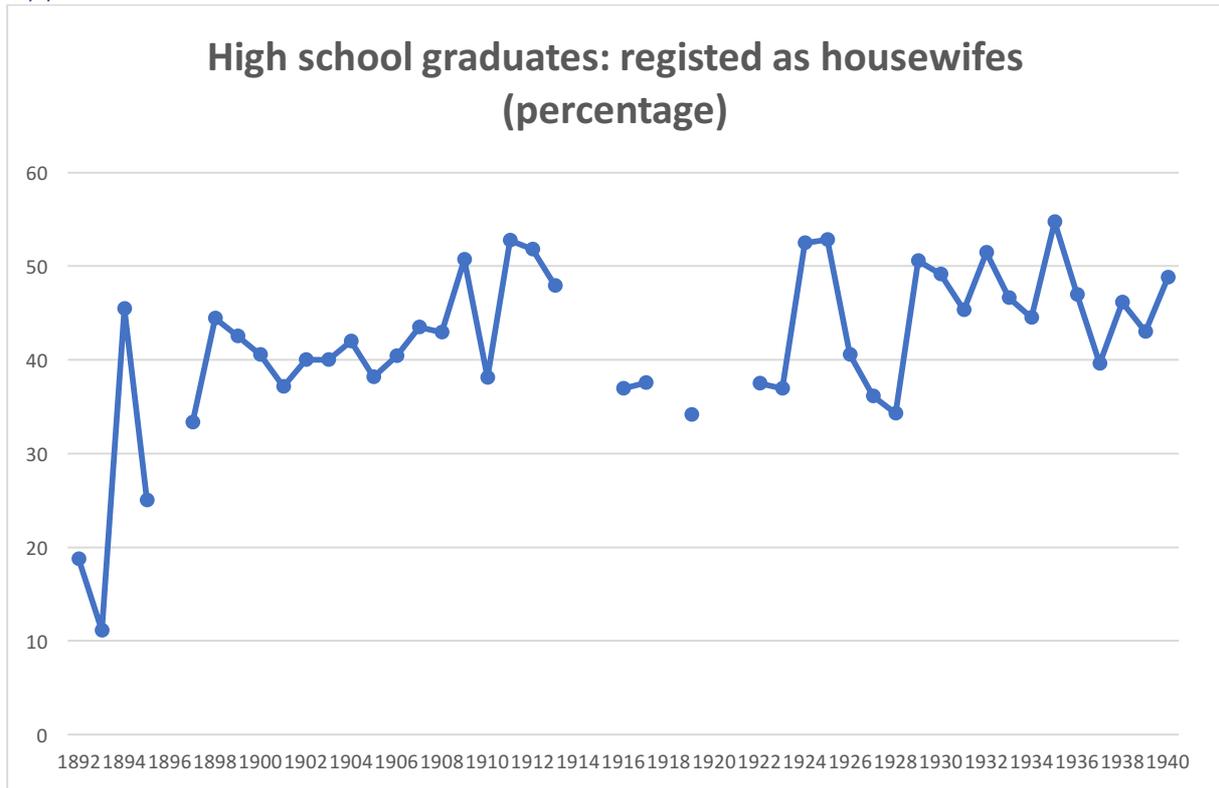
Appendix 5



Appendix 6

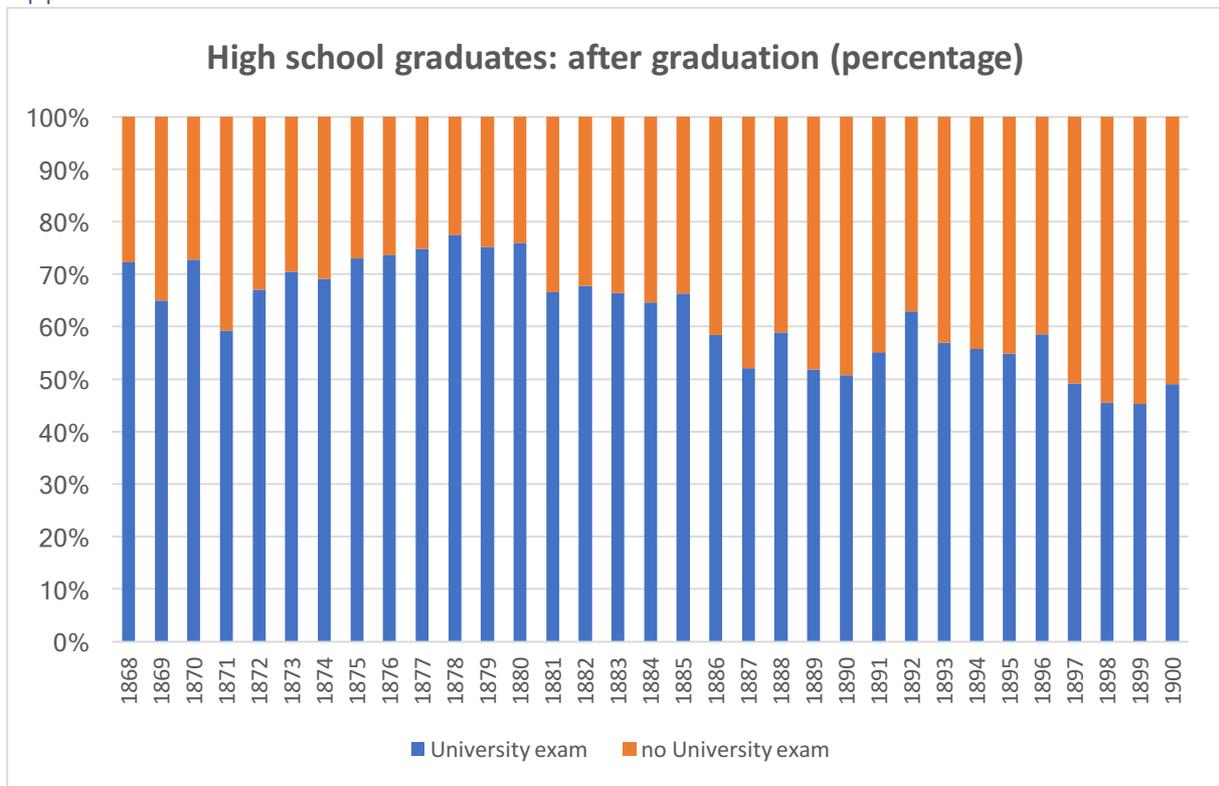


Appendix 7



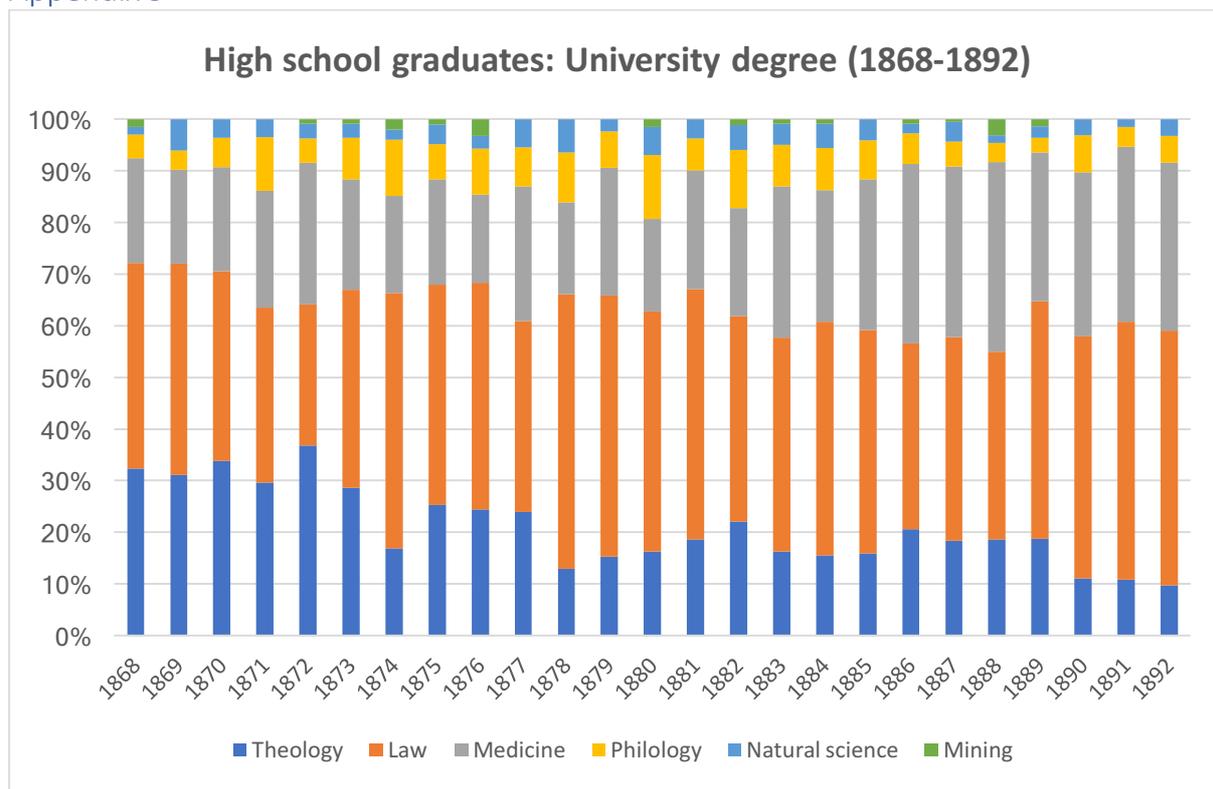
Sources: *studentene* (1854-1940)

Appendix 8



Source: *Studenterne fra 1892*, Kristiania, Grøndahl & Søns Boktrykkeri, 1917.

Appendix 9



Source: *Studenterne fra 1892*, Kristiania, Grøndahl & Søns Boktrykkeri, 1917.

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