# Income Inequality and Educational Attainment in Denmark Compared to the United States

Ivy Sandberg and Ruthie Rosenfeld

## 1 Executive Summary

According to the OECD, Denmark is one of the most economically and socially developed countries in the world. It has a literacy rate of approximately 99%. In 2011, Denmark spent the largest share of its wealth on education with a total expenditure on educational institutions of 7.9% of its GDP, larger than any other OECD country. Denmark requires compulsory school until the age of 15, at which point one has achieved the legal working age. In 2012, 40% of Danes 25-30 years of age had achieved a tertiary education, which includes postsecondary education, universities or colleges, and trade schools. In addition, 56% of youth reported expecting to attend a tertiary education before turning 25 (OECD). Denmark has a remarkably high percentage of people engaging in Vocational education opportunities, which are state-funded educational programs to develop trade and technical skills. Vocational schools serve as an alternative to higher education and often do not require completion of secondary school. In 2018, Danes with a Vocational Education accounted for approximately 32% of the labor force. In addition, the salary premium of workers with a bachelor's degree from a university relative to workers with an upper secondary level of education was 4 times larger than the salary premium relative to vocational workers. In 2018, the salary of the average individual with a bachelor's degree exceeded the average salary of an individual with a vocational education by almost 12%. Compared to the bachelor's premium relative to upper secondary, of 86%, those with a vocational education are drastically more equal. This implies, offering vocational education

opportunities potentially works to close the income gap between the highly educated and the less highly educated. The rest of this analysis works to diagnose changes in incomes and labor supply in relation to education, in an attempt to understand Denmark's relatively equal economy.

## 2 Introduction

Denmark's population is frequently rated as the happiest in the world. According to the OECD, Denmark is one of the most economically and socially developed countries in the world. The country ranks highly in education, health care, and social mobility, with surprisingly low levels of income inequality for a country with one of the highest per capita incomes. According to Eurostat, Denmark's Gini coefficient was the 7$^{th}$ lowest among EU countries in 2017, and according to the International Monetary Fund Denmark is stated to have the world's highest minimum wage. This leads to questions as to how Denmark has been able to raise its average levels of income and education across the country, but maintain low levels of inequality.

Through the findings by Autor and Acemoglu (2010) pertaining to education levels and wage premiums in the U.S., it was found that the wage premiums of college educated workers relative to workers with a high school education have been steadily increasing since the 1980s. Along with the increasing relative wages, relative supply had also steadily risen from soon after the 1970s into the 2000s. Autor and Acemoglu attributed the differences to an increasing demand for skills, which require more college educated workers. However, this has resulted in an increasing spread in inequality with respect to the income of college educated workers relative to less educated, less skilled workers. In comparison, given Denmark's lower persistence towards income inequality, this analysis is an assessment of the Danish labor supply's educational attainment in relation to income. The Autor and Acemoglu analysis of the U.S. covered the

expansive time period from 1964 to 2008, which caused them to have to account for changes in labor force composition and multiple historical market shocks. This analysis on Denmark is much more recent and over a shorter time period; from 2004 to 2018. While Autor and Acemoglu had to accommodate for potential sampling errors in the CPS data, Denmark makes all their accurate administrative data free and available for public research.

## 3 Overview of Data Source

To summarize the overall changes in Denmark income and education from 2004 to 2018, data was drawn from a centralized and comprehensive source: Statistics Denmark. Statistics Denmark was founded in 1850 as a "state institution under the Ministry of Economic Affairs and the Interior" ("About us"). Statistics Denmark derives the majority of its data from information provided by the administrative registers of governmental agencies ("Intro to Statistics Denmark"). It collects data on national demographics, employment, education, and trade, among others. To analyze the trends in salaries and education, we utilize both the Income Statistics and Attainment Registers administered by Statistics Denmark. All of this data is accessible through Statbank, the free online database for Denmark Statistics.

### 3.1 The Income Statistics Register

The Income Statistics Register is the central register in reporting income composition for the full Danish population. This register reports annual incomes at both the personal and family level, and includes over 100 types of income, including salaries, entrepreneurial income, taxes, public transfer payments, and capital income (Baadsgaard et al.). For the purposes of this paper, the annual personal income obtained from salaries are used, as its assumed these pertain to predominantly full-time, full-year workers.

The Income Statistics Register collects the majority of its data in August, eight months after the close of the income reference year. These income statistics are primarily drawn from data collected by the Central Customs and Tax Administration. Its main sources include the Central Taxpayer's Register (CSR), the Salary Information Register (COR), the Central Pension Register (CPS), and the Pension Tax Register (PAF). These administrative registers cover the entire population, thus there are no sampling errors. The units of analysis for these statistics are individuals that are at least 15 years of age by December 31st of the current year and have had a registered address in Denmark for that entire year. The register excludes individuals migrating in and out of the country, as well as individuals who have died during the year.

This data is considered to be of very high quality, as they are drawn from Danish Tax Administration registers. Information from final tax returns are confirmed by Tax authorities. However, undeclared incomes and false reporting may lead to discrepancies between actual incomes and incomes represented in the Income Statistics Register. In addition, data from the Central Customs and Tax Administration's registers can be revised for up to five years. Such revisions after August are excluded from the Income Statistics Register for that year. It's assumed these effects are minimal ("Income Statistics").

### 3.2 The Attainment Register

The Attainment Register reports annual information about individuals' highest level of education completed. It is a longitudinal register that contains information on each person's education career and its development over time. The Attainment Register collects the majority of its data on highest education attained in September, nine months after the close of the education reference year. These education statistics are primarily drawn from the administrative registers of

various educational institutions. The unit of analysis for these statistics are the completed education qualifications.

In order to ensure consistency on a national and international level, Statistics Denmark adheres to the framework provided by the International Standard Classification of Education (ISCED 2011). The Attainment Register defines the highest education completed in relation to the general groupings of the Danish Classification of Education (DISCED): primary education, upper secondary education, vocational education and training (VET), short cycle higher education, bachelors programmes, masters programmes, PhD programmes, and not stated ("Educational Attainment"). For this analysis, bachelors programmes and medium cycle higher education are equivalent, and masters and PhD programmes are combined into long cycle higher education.

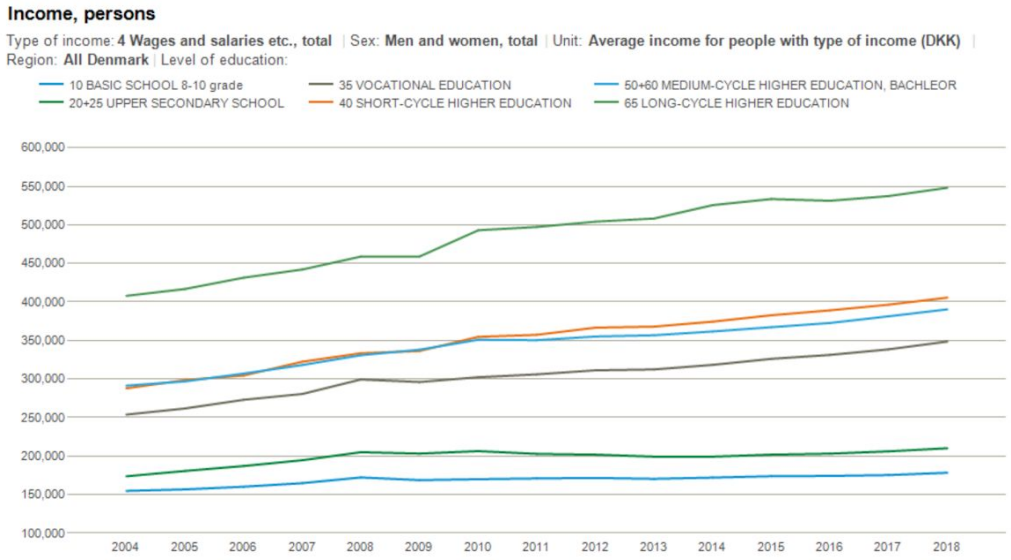
This education data is considered to be of very high quality, as 80% of it is extracted from administrative sources. Other non-administrative sources included in this register may be less reliable. Statistics Denmark has prioritized sources accordingly. "Priority 1" sources, such as registers from educational institutions, are considered to have higher accuracy as they come from administrative sources versus self-reporting. "Priority 2" sources, which include self-reported census information, are only used in the absence of other information. Still, the inclusion of the Priority 2 sources may skew the statistics presented in the Attainment Register ("Highest Education Attained").

## 4 Annual Salaries by Educational Attainment in Denmark:

The data used in the following analysis was filtered to only include people in the wages and salaries categorization of income. This ensures that only full-time, full-year, salaried

employees are included in this summary of income by educational attainment in Denmark. In their analysis of U.S. incomes, Autor and Acemoglu compositionally-adjust their income figures to account for potential changes in the relative employment shares of demographic groups – gender, education, and potential experience. Acemoglu and Autor's analysis covered almost five decades of U.S. data. Due to the short time span analyzed in this Denmark data, it is assumed that there is little change in the relative employment shares of these demographic groups.

**Figure 1: Average Real Salaries by Education Level**




The data in **Figure 1** contains the average annual salaries (DKK) of each education level for each year from 2004 to 2018. These are real values and are not adjusted for inflation or hours worked. This figure illustrates that the average annual salaries for each education group increased during this period. There was a roughly proportional rise in wages among vocational education, short-cycle higher education, bachelor's degree, and long-cycle education. During this period, the average annual salary increased by roughly 34% for both long-cycle education and bachelor's degree, 37% for vocational education, and 41% for short-cycle higher education. It

should be noted that much of this growth can be attributed to approximately a 30% growth in Denmark's GDP from 2004 to 2018 (World Bank). However, these four education levels are growing significantly faster than the basic school and upper secondary school levels. During this period, the average annual salary increased by roughly 15% for basic school, and 21% for upper secondary school. An interesting feature of this graph is the difference between average annual salaries for upper secondary school and vocational education. After finishing basic school (8-10th grade) in Denmark, students wishing to continue their education can choose from two main paths: general upper secondary programmes or vocational education and training ("Denmark Guide: Education"). Average salaries for those with a vocational education were higher and increasing faster than average salaries for those who have completed upper secondary school instead.

The following salary graphs for Denmark serve as comparison to the College/High-School wage premium analyses made for the US labor market by Autor and Acemoglu. Their approach was to compare "skilled" and "unskilled" workers. This analysis for Denmark extends that approach to not only look at skilled and less skilled workers, but to look at skilled and vocational skilled workers.

**Figure 2a**

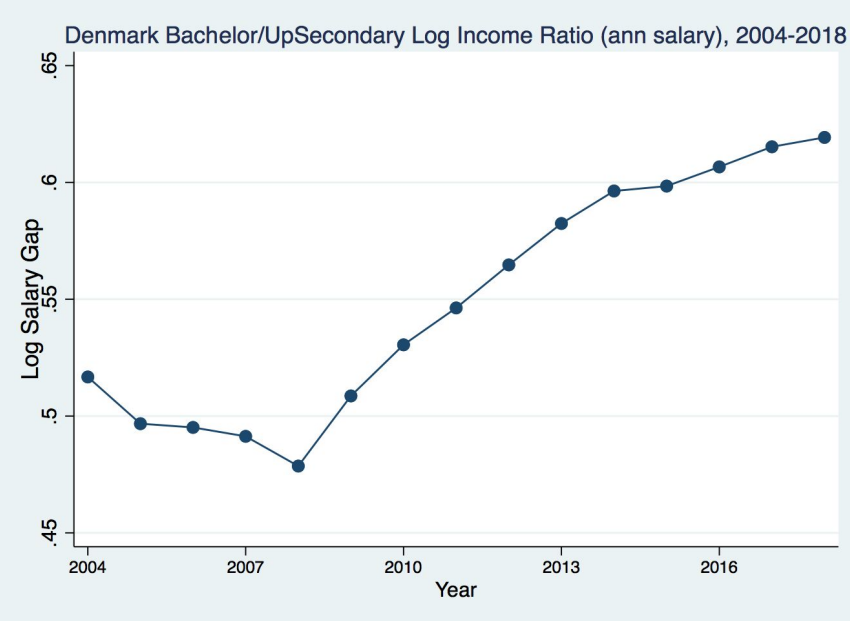



**Figure 2a** depicts the bachelor premium relative to upper secondary school from 2004 to 2018. The bachelor/upper secondary log income ratio was constructed by taking the log of the average salary of those with a bachelor's degree divided by the average salary of those who have completed upper secondary school. This figure shows that the bachelor premium relative to upper secondary school hit an inflection point in 2008. This premium trended downwards from 2004 until 2008, after which it increased rapidly until slowing down around 2014. The bachelor premium relative to upper secondary school stood at about 62 log points in 2018. This premium implies that, in 2018, the salary of the average individual with a bachelor's degree exceeded that of the average individual who completed secondary school by 86%, an increase of approximately 13% since 2008.

**Figure 2b**

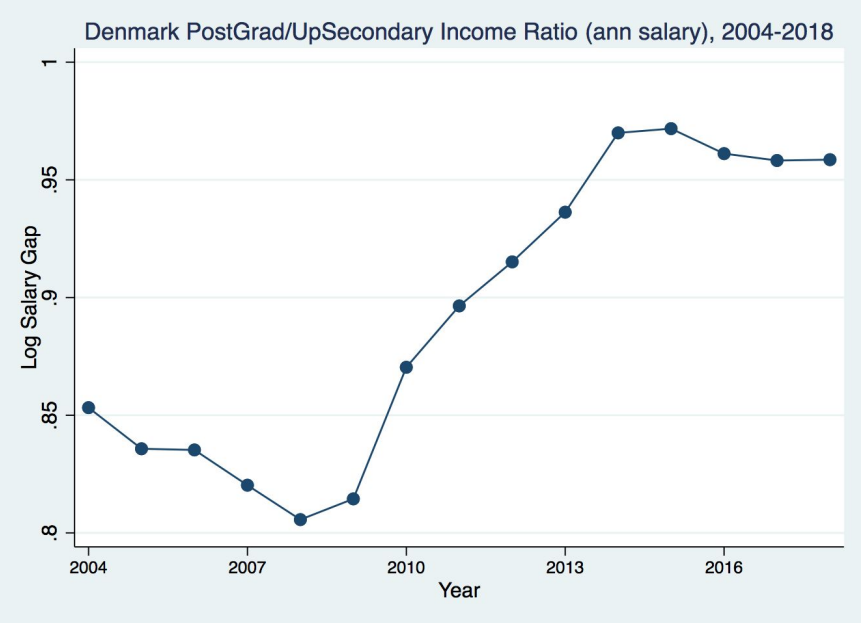



**Figure 2b** shows the extra return to graduate school, or long-cycle higher education, relative to upper secondary school from 2004 to 2018. Graduate school education includes Masters and PhDs. The graduate/upper secondary log income ratio was constructed by taking the log average salary of those with a graduate degree divided by the average salary of those who have completed upper secondary school. This figure has a similar overall shape as **Figure 2a**. Both bachelor and graduate premiums relative to upper secondary school are decreasing until they hit an inflection point in 2008, reversing this direction. However, the log salary gap between graduate degree and upper secondary education is above that between bachelor degree and upper secondary education at all points. The graduate premium in **Figure 2b** peaks in 2015 and levels out in the three following years. In 2018, the graduate premium relative to upper secondary school stood at about 96 log points, meaning that the salary of the average individual with a

graduate degree exceeded that of the average individual who completed upper secondary school by about 161%.

**Figure 3a**

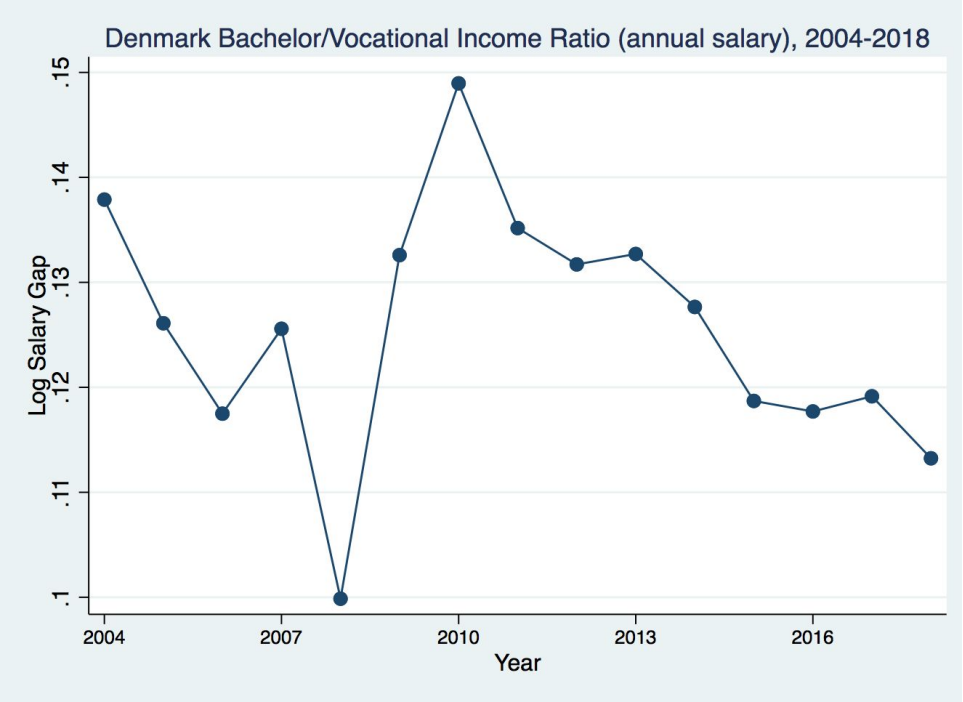



**Figure 3a** depicts the bachelor premium relative to vocational education between the years 2004 and 2018. The bachelor/vocational log income ratio was constructed by taking the log average salary of those with a bachelor's degree divided by the average salary of those who have completed vocational school. Comparing **Figures 2a and 3a**, we can see that the bachelor premium relative to vocational education is much more volatile than the bachelor premium relative to upper secondary school. In addition, the log salary gap between bachelor degree and vocational education is smaller than that between bachelor degree and upper secondary school over the entirety of this time period. The bachelor premium in this figure is generally downward

trending from 2004 until its minimum point in 2008. From 2008 to 2010, this premium increases rapidly, peaking at about 15 log points, and then decreasing in the years to follow.

**Figure 3b**

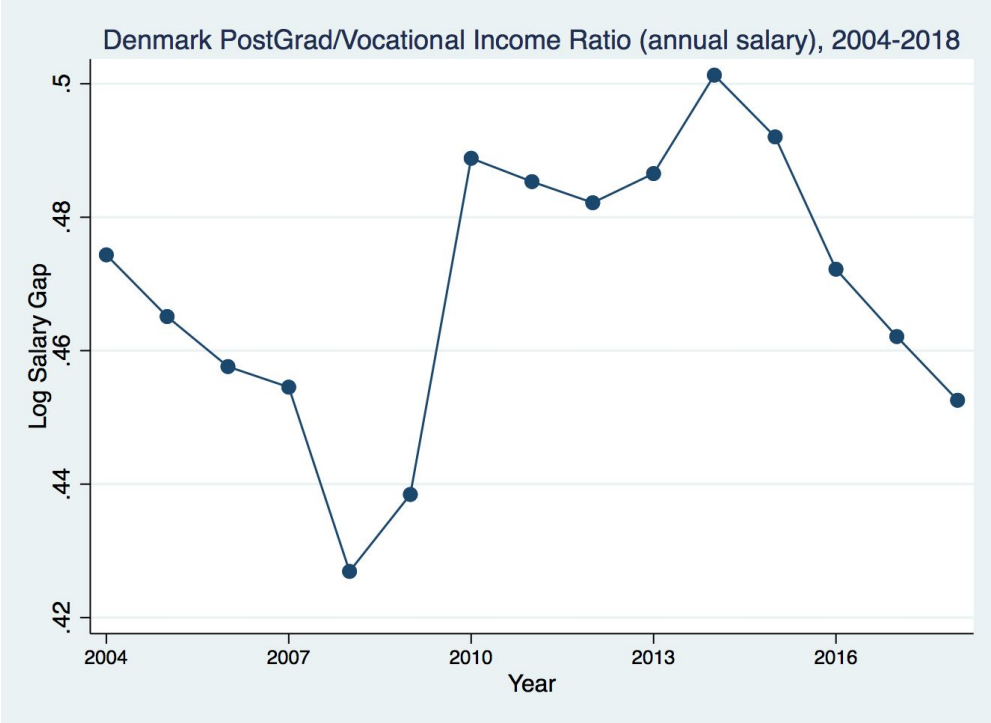



**Figure 3b** shows the extra return to graduate school, or long-cycle higher education, relative to vocational education. The graduate/vocational log income ratio was constructed by taking the log of the average salary of those with a graduate degree divided by the average salary of those who have completed vocational school. A similar comparison can be made for the two graduate premiums that was made for the two bachelor premiums. The graduate premium relative to vocational school is more volatile and universally smaller than the graduate premium relative to upper secondary schools. Similar to **Figure 3a**, the log salary gap is decreasing from 2004 until 2008, after which we see a sharp increase until 2010. The graduate premium relative to vocational school peaks in 2014 at about 50 log points, and then quickly declines in the four

following years. The salary of the average individual with a graduate degree exceeds that of the average individual with a vocational education by almost 57%.

**Comparison to average income and premiums in the U.S.:**

These average and relative income graphs can be used to generally compare Denmark income trends to U.S. income trends. There are only four overlapping years between this Denmark data and the data that Acemoglu and Autor use when analyzing the U.S., and thus comparisons must be made with caution. When analyzing the changes in U.S. real wage levels from 1963 to 2008, Acemoglu and Autor find that "real wages rose for highly educated workers, particularly workers with a post-college education, and fell steeply for less educated workers" (10). In contrast, average real salaries for all education levels in Denmark increased over the period from 2004 to 2018. While Denmark's higher education levels are increasing at a faster rate relative to its lower levels, the fact that they are all increasing implies that the country is less persistent towards income inequality than is the U.S.

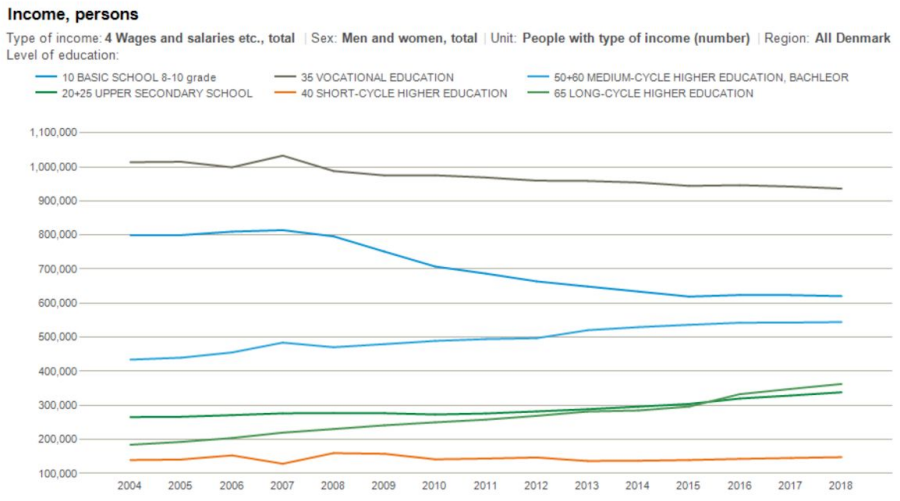
Figure 1 of Acemoglu and Autor shows that the composition-adjusted U.S. college premium has trended upwards since the beginning of the 1980s. In 2008, the average U.S. college graduate was earning 97% more than the average U.S. high school graduate. **Figure 2a** depicts the Denmark statistic most comparable to this U.S. college premium calculated by Acemoglu and Autor. From 2004 to 2008, the Denmark bachelor/upper secondary log income ratio decreased by about 3 log points, while the U.S. college/high-school log wage ratio increased by about the same amount. Throughout the entire four year period, the U.S. college premium is higher than the Denmark bachelor premium.

This analysis of relative income was expanded to include graduate school education, or long-cycle higher education, and vocational education in Denmark. The two graduate premiums, relative to both upper secondary school and vocational education, are higher than the two bachelor premiums at all points during this period. Additionally, throughout this period, the bachelor and graduate premiums relative to upper secondary school were everywhere higher than those relative to vocational education.

## 5 Supply of Laborers by Educational Attainment in Denmark:

For the data on Denmark's labor supply, it was set to only include people who receive wages and salaries as their type of income, to remain consistent with what was used in the analysis of the salary premium. This was to ensure that only the educational levels of people in the labor force with a salary income were being analyzed. The same six education groups that were analyzed for Income, are analyzed again for their supply to the labor force; basic, upper secondary, vocational, short-cycle higher, bachelors, and long-cycle higher education.

**Figure 4: Number of People per Educational Attainment (Labor Supply)**




*Source: Statistics Denmark*

**Figure 4** contains the number of people that make up each of the educational levels for each year from 2004 to 2018. This shows that after 2008, Denmark experienced a steep decline in the number of individuals with only a basic level of education. The number of people dropped from 814,200 to 620,720, approximately a 31% decrease. The number of individuals with a bachelor's degree has been steadily increasing since 2004, from approximately 434,000 to 545,000 people, about a 20% increase. This could be indicative of a shift in people that would normally not go on to upper secondary education after finishing compulsory education. In comparison, the amount of people completing upper secondary school and bachelor's programmes are increasing. There has also been a consistent fall, with the exception of a short increase in 2007, in the number of people with a vocational education. However, the vocational level of education persists as the largest proportion of individuals in Denmark, at an average of approximately 974,000 people from 2004 to 2018. The average number of people with a vocational education is over 476,000 more people than the average number of people with bachelor's degrees. Leading up to 2007, there appears to have been a brief supply shock, increasing the number of workers with vocational education. There was a short 3% increase in supply from 06 to 07, followed by an equivalent decrease from 07 to 08. Since 2008, the supply of vocational educated workers has experienced a steady, persistent downward trend.

**Figure 5**

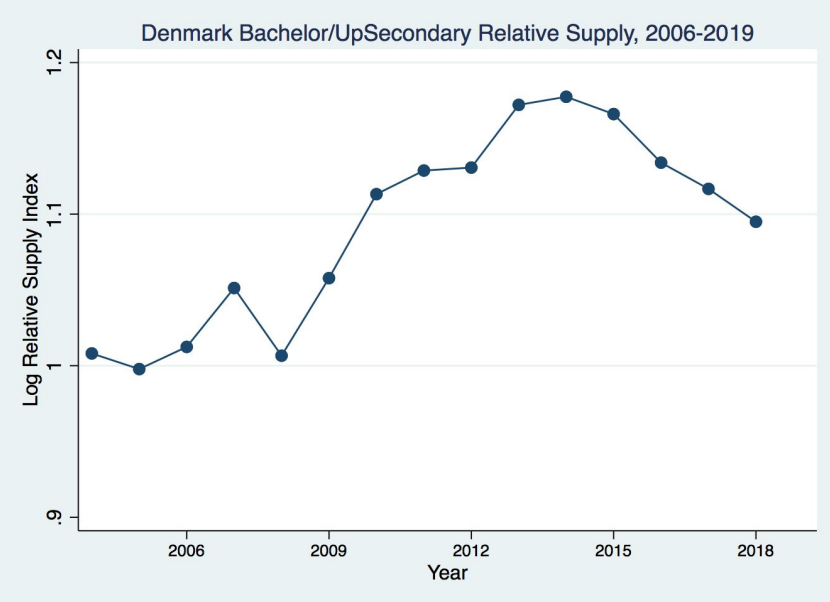



**Figure 5** shows the relative supply of people in the labor force with a bachelor's degree to the supply with an upper secondary education. The log relative supply index was made by weighing the supply of bachelor's with its fixed wage premium for each year. Autor and Acemoglu refer to this weighting as an "efficiency unit", as it adds weight to the supply of workers with higher education due to their additional productivity. **Figure 5** shows a short decline after 2008, but then a steady rise of almost 20 log points from 2008 to 2014. After 2014, Denmark has seen a decline in the supply index of workers with bachelor's relative to upper secondary. However, it should be noted that this change may be too minimal, across too short a time period to conclude any real changes in relative supply.

**Figure 6**

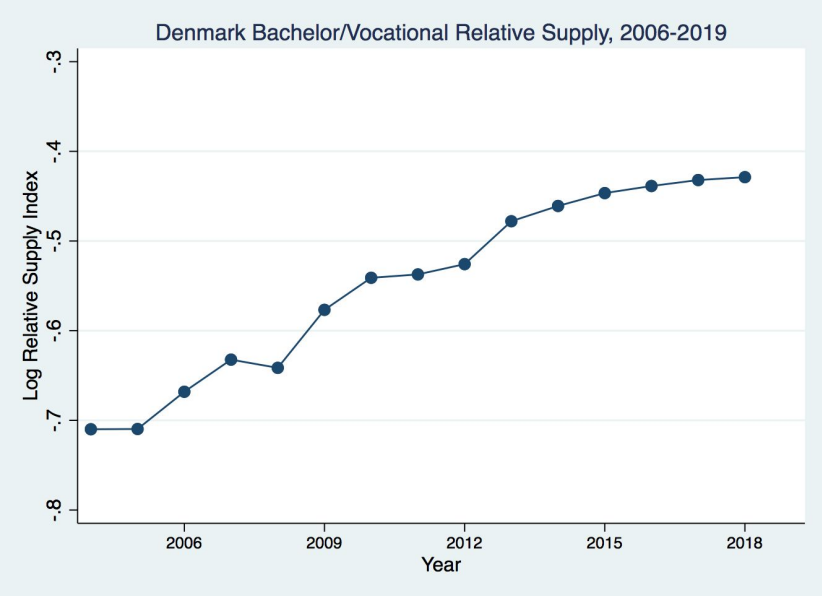



**Figure 6** shows the relative supply of workers in the labor force with a bachelor's degree to those with a vocational education. The supply index was created similarly to that in **Figure 5**. Instead, the supply of bachelors was weighed each year with an efficiency unit of the salary premium for bachelors relative to vocational. The supply of workers with vocational education has remained significantly larger than the supply of people with a higher education. The relative number of people with a bachelor's degree has been increasing, to close that gap. In the past decade and a half, the supply index for bachelor's relative to vocational workers has risen almost 30 log points. The trend appears to have leveled out in the past four years, as it has increased at a slower rate than it had been in the previous decade.

**Comparison to Relative Supply in the US:**

These relative supply graphs for Denmark serve as comparison to the trends in the relative supply of college versus non-college educated workers in the US labor market. Figure 2, of Autor and Acemoglu, shows the relative supply of college workers has risen significantly

since the 1970s. Thus, the proportion of college workers continued to increase substantially well into the 2000s. From 2000 to 2009, the US relative supply of college workers rose approximately 30 log points. This increase is close to, but potentially a significantly larger increase in relative supply of college workers compared to Denmark.

## 6 Conclusions

In Denmark, children are required to attend compulsory school until age 15. After that, Danes have the opportunity to attend upper secondary schooling designed to prepare students for higher education, similar to high school in the US. Another option for Danes is to attend a vocational school. In the past decade and a half, the number of people in the labor force with vocational education has decreased steadily, while the number of people with higher educational attainments have increased. It was expected that the income of these groups would differ relative to their supply. In the analysis of the salary premium, **Figure 2a** shows that the bachelor premium relative to upper secondary school has been increasing since 2008. The 2018 premium implied that the salary of the average individual with a bachelor's degree exceeded that of the average individual who completed secondary school by 86%, an increase of approximately 13% since 2008. This is indicative of a substantial income gap attributed to educational attainment, similar to the substantial income gap seen in the US between college graduates relative to high school graduates.

In comparison, the bachelor premium relative to vocational in **Figure 3a** has trended downward from 2004 until its minimum point in 2008. From 2008 to 2010, this premium increases rapidly, peaking at about 15 log points, equivalent to a 5% increase in the bachelor premium. This increase in inequality coincides with the 3% supply shock in vocational labor that

was seen in 2007 (**Figure 4**). Along with a steady decrease in supply, the bachelor premium relative to average vocational salary has decreased in the years following 2010. In 2018, the salary gap of a bachelor's education relative to vocational education indicated the salary of the average individual with a bachelor's degree exceeds that of the average individual with a vocational education by almost 12%. Compared to the bachelor's premium relative to upper secondary, of 86%, those with a vocational education are drastically more equal. **Figure 3b** showed, in 2018, the salary of the average individual with a graduate degree exceeded that of the average individual with a vocational education by almost 57%. While this is large, it has been decreasing since 2010, closing the income gap. This is also significantly smaller than the gap between those with graduate education, whose average salary was 161% more, and those with an upper secondary education.

This analysis indicates that vocational education programs provide an economic advantage to people in the labor supply. Relative to workers with a bachelor's education, workers with a vocational education are better off than those with only an upper secondary education. According to the European Centre for the Development of Vocational Training, in 2011 Denmark spent a total of DKK 7 479 million (EUR 1 006 million) on vocational programs, and DKK 10 977 million (EUR 1 476 million) on Upper Secondary programs. Due to the large number of Danes with vocational education, the opportunity appears to provide citizens with an attractive alternative to formal university. Based on the smaller income gap between those with a formal university education and those with a vocational education across Denmark, it may be advantageous for the US to up it's offering of vocational opportunities.

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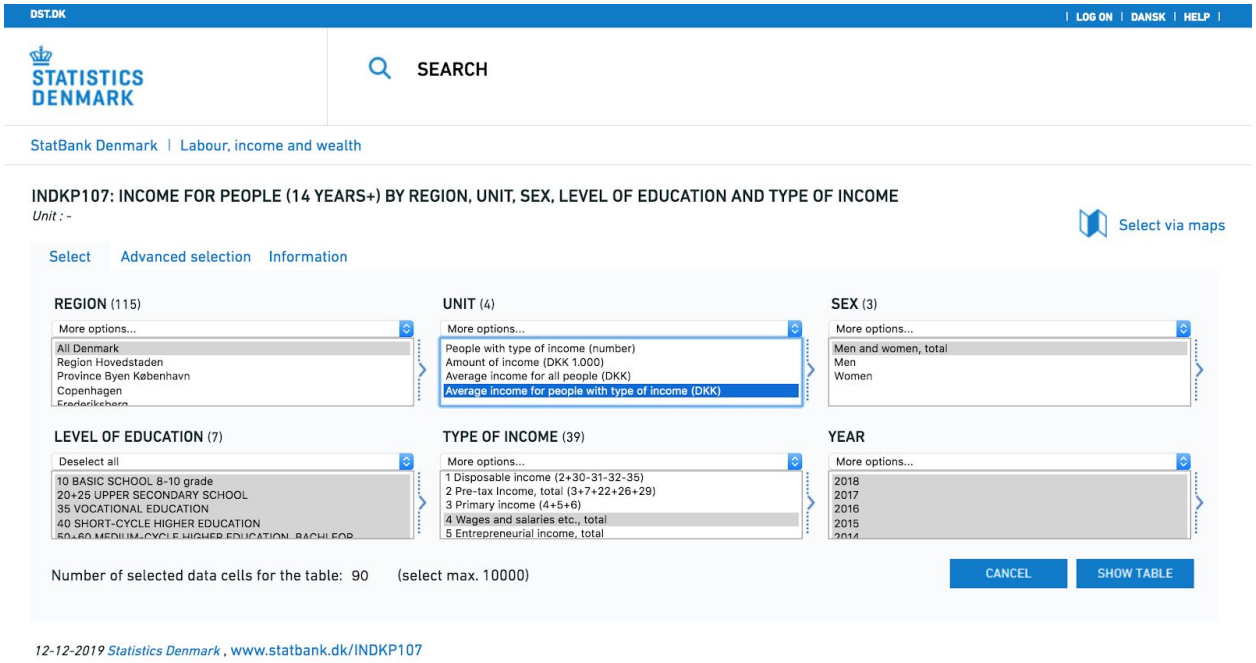
# 8 Appendix

## Data Visuals

Statbank Database:



Salary Data by Educational Attainment:

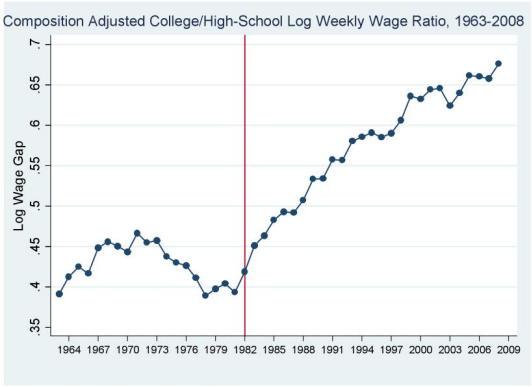
| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | YEAR | BASIC | UPPER_SECONDARY | VOCATIONAL | SHORT-CYCLE-HIGHERED | BACHELOR | LONG-CYCLE-HIGHERED |
| 2 | 2004 | 154802 | 173784 | 253831 | 287917 | 291358 | 407903 |
| 3 | 2005 | 156790 | 180704 | 261778 | 298640 | 296961 | 416802 |
| 4 | 2006 | 160251 | 187161 | 273039 | 304563 | 307079 | 431484 |
| 5 | 2007 | 164884 | 194647 | 280598 | 322466 | 318143 | 442065 |
| 6 | 2008 | 172250 | 205038 | 299447 | 333466 | 330894 | 458911 |
| 7 | 2009 | 168796 | 203287 | 296083 | 336390 | 338064 | 459019 |
| 8 | 2010 | 170034 | 206453 | 302359 | 354698 | 350925 | 492971 |
| 9 | 2011 | 170992 | 202893 | 306064 | 357356 | 350361 | 497268 |
| 10 | 2012 | 171668 | 201891 | 311285 | 366576 | 355107 | 504154 |
| 11 | 2013 | 170445 | 199281 | 312446 | 367943 | 356785 | 508252 |
| 12 | 2014 | 172088 | 199254 | 318379 | 374435 | 361730 | 525600 |
| 13 | 2015 | 173916 | 201887 | 326172 | 382691 | 367281 | 533503 |
| 14 | 2016 | 174296 | 203181 | 331303 | 389085 | 372685 | 531256 |
| 15 | 2017 | 175367 | 206116 | 338505 | 396425 | 381338 | 537353 |
| 16 | 2018 | 178429 | 210139 | 348549 | 405579 | 390340 | 548041 |

Supply of labor by Educational Attainment:

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | YEAR | BASIC | UPPER_SECONDARY | VOCATIONAL | SHORT-CYCLE-HIGHERED | BACHELOR | LONG-CYCLE-HIGHERED |
| 2 | 2004 | 799907 | 265658 | 1013706 | 139646 | 434226 | 184495 |
| 3 | 2005 | 799691 | 266627 | 1014993 | 141153 | 440053 | 192809 |
| 4 | 2006 | 809813 | 271421 | 998772 | 153236 | 455290 | 204189 |
| 5 | 2007 | 814200 | 276543 | 1032968 | 128616 | 484112 | 219992 |
| 6 | 2008 | 796067 | 277625 | 987880 | 159922 | 470721 | 230532 |
| 7 | 2009 | 751395 | 276987 | 975063 | 157828 | 479690 | 241527 |
| 8 | 2010 | 707534 | 273139 | 975165 | 141678 | 489144 | 250159 |
| 9 | 2011 | 686749 | 276202 | 968793 | 143930 | 494531 | 258247 |
| 10 | 2012 | 663894 | 282321 | 959639 | 146989 | 497236 | 269272 |
| 11 | 2013 | 648942 | 288673 | 958728 | 136788 | 520590 | 281927 |
| 12 | 2014 | 634192 | 296232 | 954155 | 137575 | 529666 | 285041 |
| 13 | 2015 | 619382 | 304181 | 944336 | 139707 | 536590 | 296418 |
| 14 | 2016 | 623899 | 320190 | 946355 | 142914 | 542538 | 332972 |
| 15 | 2017 | 623491 | 328875 | 942197 | 145448 | 542981 | 348297 |
| 16 | 2018 | 620720 | 338390 | 936309 | 148130 | 544529 | 362801 |

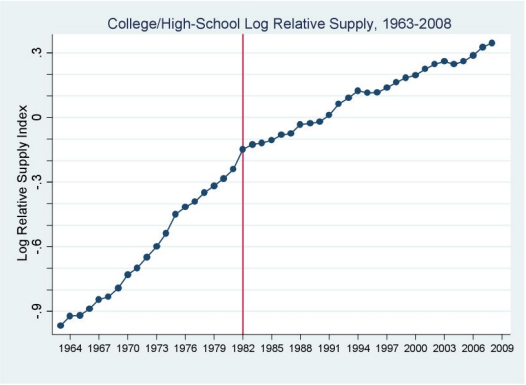
# Autor and Acemoglu referenced Figures:

Figure 1



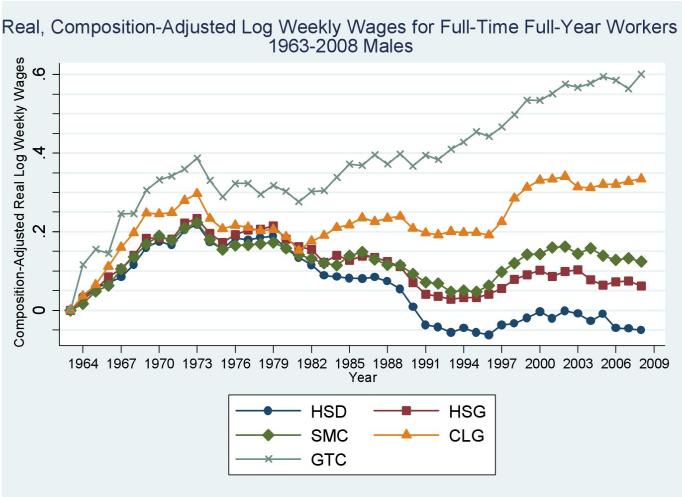

Source: March CPS data for earnings years 1963-2008. Log weekly wages for full-time, full-year workers are regressed in each year on four education dummies (high school dropout, some college, college graduate, greater than college), a quartic in experience, interactions of the education dummies and experience quartic, and two race categories (black, non-white other). The composition-adjusted mean log wage is the predicted log wage evaluated for whites at the relevant experience level (5, 15, 25, 35, 45 years) and relevant education level (high school dropout, high school graduate, some college, college graduate, greater than college). The mean log wage for college and high school is the weighted average of the relevant composition adjusted cells using a fixed set of weights equal to the average employment share of each group. The ratio of mean log wages for college and high school graduates for each year is plotted. See Data Appendix for more details on treatment of March CPS data.

Figure 2




Source: March CPS data for earnings years 1963-2008. Labor supply is calculated using all persons ages 16-64 who reported having worked at least one week in the earnings years, excluding those in the military. The data are sorted into sex-education-experience groups of two sexes (male/female), five education groups (high school dropout, high school graduate, some college, college graduate, and greater than college) and 49 experience groups (0-48 years of potential experience). Number of years of potential experience is calculated by subtracting the six (the age at which one begins school) and the number of years of schooling from the age of the individual. This number is adjusted to the assumption that an individual cannot begin work before age 16. If this calculation is less than zero, the years of experience are set to equal zero. The labor supply for college/high-school groups, by experience level, is calculated using efficiency units. Efficiency units are the mean labor supply for broad college (including college graduates and greater than college) and high-school (including high school dropouts and high school graduate) categories, weighted by fixed relative average wage weights for each cell. The labor supply of the "some college" category is divided equally between the broad college and high-school categories. The fixed set of weights for 1963-2008 are constructed using the average wage in each of the 490 cells (2 sexes, 5 education groups, 49 experience groups) over this time period, relative to the reference wage of a male high school graduate with 10 years of experience.

Figure 4a




Source: March CPS data for earnings years 1963-2008. See note to Figure 1. The real log weekly wage for each education group is the weighted average of the relevant composition adjusted cells using a fixed set of weights equal to the average employment share of each group.

## Stata Log File:

```
      name:  <unnamed>
       log:  /Users/ivysandberg/Desktop/Denmark/DK_final_log.smcl
  log type:  smcl
 opened on:  12 Dec 2019, 12:23:11

. do "/var/folders/mh/lks6b4p506b3g1kjvhz8kwjw0000gn/T//SD32585.000000"

. // Data: Using wage/salary data = average annual salary
.
. // College/HS Log Wage Ratio (Compare to Figure 1 in AA)
. import excel /Users/ivysandberg/Desktop/AvgSalary_byEducation.xlsx, firstrow
(7 vars, 15 obs)

. gen Year = real(YEAR)

.
. * Wage premium to a Bachelor's Deg
. gen colprem = BACHELOR/UPPER_SECONDARY

. gen lcolprem = log(colprem)

.
. * Figure 2a Bachelor premium relative to upper secondary
. scatter lcolprem Year, c(l) xlabel(2004(3)2018, labsize(small)) legend(region(lstyle(none))) ytitle(
> "Log Salary Gap", size(medium)) ti("Denmark Bachelor/UpSecondary Log Income Ratio (ann salary), 2004
> -2018", size(medium)) legend(size(small)) saving("fig1-clp-hsg-gap.gph", replace)
(file fig1-clp-hsg-gap.gph saved)

.
. * Wage premium to Post-Grad
. gen post_colprem = LONGCYCLEHIGHERED/UPPER_SECONDARY



. gen lpost_colprem = log(post_colprem)

.
. * Figure 2b Graduate premium relative to upper secondary
. scatter lpost_colprem Year, c(l) xlabel(2004(3)2018, labsize(small)) legend(region(lstyle(none))) yt
> itle("Log Salary Gap") ti("Denmark PostGrad/UpSecondary Income Ratio (ann salary), 2004-2018", size(
> medium)) legend(size(small)) saving("fig2-clp-hsg-gap.gph", replace)
(file fig2-clp-hsg-gap.gph saved)

.
.
. // Bachelor/Vocational Log Wage Ratio
. gen colprem_vocational = BACHELOR/VOCATIONAL

. gen lcolprem_vocational = log(colprem_vocational)

.
. * Figure 3a Bachelor premium relative to vocational
. scatter lcolprem_vocational Year, c(l) xlabel(2004(3)2018, labsize(small)) legend(region(lstyle(none
> ))) ytitle("Log Salary Gap") ti("Denmark Bachelor/Vocational Income Ratio (annual salary), 2004-2018
> ", size(medium)) legend(size(small)) saving("fig3-clp-hsg-gap.gph", replace)
(file fig3-clp-hsg-gap.gph saved)

.
.
. // HigherEd/Vocational Ratio
. gen post_vocational = LONGCYCLEHIGHERED/VOCATIONAL

. gen lpost_vocational = log(post_vocational)
```

```
.
. * Figure 3b Graduate premium relative to vocational
. scatter lpost_vocational Year, c(l) xlabel(2004(3)2018, labsize(small)) legend(region(lstyle(none)))
>  ytitle("Log Salary Gap") ti("Denmark PostGrad/Vocational Income Ratio (annual salary), 2004-2018",
> size(medium)) legend(size(small)) saving("fig3-clp-hsg-gap.gph", replace)
(file fig3-clp-hsg-gap.gph saved)

.
.
. clear

.
. // College/high-school relative supply (Compare to Fig 2 in AA)
. import excel /Users/ivysandberg/Desktop/NumberPeople_EduGroup.xlsx, firstrow
(15 vars, 15 obs)

.
. gen Year = real(YEAR)

.
. gen colhs_relsupply = BACHELOR/UPPER_SECONDARY

. gen lcolhs_relsupply = log(colhs_relsupply)

.
. * Figure 5 Bachelor supply relative to upper secondary
. scatter lcolhs_relsupply Year, c(l) xlabel(2006(3)2019, labsize(small)) legend(region(lstyle(none)))
>  ylab(.4(.1)1.2) ytitle("Log Relative Supply Index") ti("Denmark College/High-School Log Relative Su
> pply, 2006-2019", size(medium)) saving("fig2-relative-supply-index-titled.gph",replace)
(file fig2-relative-supply-index-titled.gph saved)



.
. * use efficiency weights to account for productivity
. gen efficient_bachsupply = BACHELOR*colprem

. gen eff_colhs_relsupply = efficient_bachsupply/UPPER_SECONDARY

. gen leff_colhs_relsupply = log(eff_colhs_relsupply)

.
. * Figure 5 Bachelor supply relative to upper secondary with efficiency weights
. scatter leff_colhs_relsupply Year, c(l) xlabel(2006(3)2019, labsize(small)) legend(region(lstyle(non
> e))) ylab(.9(.1)1.2) ytitle("Log Relative Supply Index") ti("Denmark Bachelor/UpSecondary Relative S
> upply, 2006-2019", size(medium)) saving("fig2-relative-supply-index-titled.gph",replace)
(file fig2-relative-supply-index-titled.gph saved)

.
.
. * efficiency weights to account for vocational
. gen efficient_vocsupply = BACHELOR*colprem_vocational

. gen eff_vochs_relsupply = efficient_vocsupply/VOCATIONAL

. gen leff_vochs_relsupply = log(eff_vochs_relsupply)

.
. * Figure 6 Bachelor supply relative to vocational with efficiency weights
. scatter leff_vochs_relsupply Year, c(l) xlabel(2006(3)2019, labsize(small)) legend(region(lstyle(non
> e))) ylab(-.8(.1)-.3) ytitle("Log Relative Supply Index") ti("Denmark Bachelor/Vocational Relative S
> upply, 2006-2019", size(medium)) saving("fig2-relative-supply-index-titled.gph",replace)
(file fig2-relative-supply-index-titled.gph saved)
```