The impact of minimum wages on the incentives of education for the youth

*International analysis*
Abstract

The purpose of this thesis is to investigate the incentives regarding the education decisions, resulting from a minimum wage over the period 2005-2014. The question is investigated by comparing the changes in the wage dispersion and upper secondary graduation rate in 17 OECD countries. And then, by comparing the changes in the bites of the minimum wage and educational attainment for upper secondary students in 11 OECD countries, where minimum wages are regulated by law. The majority of previous research seem to point out a negative educational effect of minimum wages. However, this paper finds no evidence that increasing the minimum wage can decrease the high school graduation rate. A possible explanation is that the correlation between the higher employment prospect and educational attainment can create incentives for young individuals to undergo education. This study seems to be the first to investigate the educational effects of minimum wages using internationally comparative data.

Keywords

Minimum wage, wage dispersion, Nordic countries, education, upper secondary graduation rate, incentives, employment, labour demand and supply, labour market condition, Queuing hypothesis, and Substitution hypothesis.

Education is the most powerful weapon which you can use to change the world.
- Nelson Mandela
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Introduction

Decisions to drop out of school create challenges on both the individual and society level. For the individuals, it can mean lower earnings and higher likelihood of unemployment. Whereas, on a society level, it can impose different societal costs, such as loss of tax revenue and higher spending on public assistance. Thus, raising education is the concern of most economists and politicians. Indeed, education is a key factor in determining the success of the economy. Therefore, many countries are working on developing a good educational system that is capable of educating emerging generations in various industries, especially developed ones. This is because of the new trend that developed countries are taking towards advanced industries, where old and primitive industries have lost their popularity in modern times. Furthermore, many solutions have been given by economists to increase education, one of which is to increase the minimum wage. However, the opinions of researchers and politicians diverge concerning this method. Some say that it can increase efficiency in the economy by raising the skill level and improving the country’s workforce\(^1\), because a binding minimum wage would make the entrance hurdle to the labour market higher, and thereby would create incentives for young teenagers and low-skilled individuals to invest further in education, simply to maintain their position or/and gain access to the labour market. On the other hand, some argue that a minimum wage could have a negative effect on educational attainment\(^2\) because it creates incentives for young individuals to drop out from school and queue to minimum wage jobs. Another argument that has been made by researchers is the negative effect of minimum wages on educational programs, especially training\(^3\). A reason for this is that, if current wages are increased, employers will cut down on training to avoid the cost increase and workers with low wages will not be able to accept the wage cut to finance their training\(^4\). Consequently, the question is how a new legislation (or collective agreement to increase the minimum wage, would impact the educational attainment for youth.

To answer this question, this essay analyses how changes in the wage dispersion/minimum wage bites in a country are connected to and may explain its educational outcome.

The study utilizes substantial variation in the bites of minimum wage across 17 OECD countries, to investigate the impact of increasing minimum wage on upper secondary graduation

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\(^1\) Rebitzer et al. (1995), Pacheco et al. (2007)
\(^2\) Neumark (2010), Rice (2010)
\(^3\) Hashimoto (1982), Neumark et al. (2003)
\(^4\) Rosen (1972)
rate. Minimum wages in the Nordic countries are not regulated by law (Skedinger 2011). Besides, the first national minimum wage in Germany was introduced in 2015. Thus, Nordic countries and Germany cannot be included in the minimum wage analysis. However, since an increase in the minimum wage can be linked directly to the compression of the wage structure (Hyslop et al. 2004- Pacheco et al. 2007), this study investigates if an increased wage dispersion may increase, or decrease the upper secondary graduation rate in 17 OECD countries (Sweden, Denmark, Finland, Norway, Germany, Ireland, New Zealand, Canada, Portugal, Poland, Hungary, Spain, Italy, Greece, Japan, US and the UK) during the period 2005-2014. Secondly, the study utilizes data on countries with statute minimum wage laws (Ireland, New Zealand, Canada, Portugal, Poland, Hungary, Spain, Greece, Japan, US and the UK), to investigate how changes in the bites of minimum wage may affect the incentives to education. There are no studies that have used variation in minimum wages and graduation rates to estimate the effect of minimum wages before, which is surprising as this question/ results should affect policy decisions that aim to increase education and/or implement new training programs.

To understand the mechanisms of the labour market. One must understand the complex relationships between individuals, policy makers and social partners, whose interaction is essential in regulating the labour market. A large amount of literature has studied this relationship to conclude that countries that are highly regulated, such as Sweden, can be the best example of reducing wage inequality and ensuring better labour market outcomes when comparing to unregulated labour markets. On the other hand, it has been argued that countries with high regulations and generous unemployment benefits can contribute to less investment in education (Pissarides 2011). Besides, Hanushek et al. (2015), found that the return to skills are lower in countries with higher union density and restrictive labour market laws. Moreover, individuals with the same educational degree may have different levels of skills in different countries. This signifies that there are some connections between the labour market laws and the quality of the educational system in producing skills. For this reason, this paper took advantage of similarities in the labour market conditions in Nordic countries- for example, high minimum wages and generous unemployment benefits to understand how changes in wages over time may affect the decision for youth to graduate from upper secondary schools. However, to increase variation in the data, I include countries with different wage structures than that found in the Nordic countries, such as the US, UK, and Japan. Moreover, the level of minimum wages differs significantly

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5 According to Skedinger (2011), Minimum wage bite is defined as minimum wage to median wage. This measure is one of the standard indicators used in the minimum wage literature.

between all these countries (wage floors are higher in Nordic countries comparing to other countries, especially the US). This thesis studies changes in the wage dispersion/minimum wage and upper secondary graduation rate. The advantage of this method is that it helps us separate the real effect of minimum wages from other macroeconomic events that can evolve over time and affect education.

The conventional research proclaims that poverty is linked inversely to the level of education (Carter et al. 2014). According to the theory, this would mean that policies aiming to increase average schooling would be successful, meanwhile reducing the wage inequality by increasing the proportion of high earners in the country. In other words, this can suggest that a more equal distribution in education would contribute to a more equal distribution in income. If this is the case, we would expect to see a higher level of education associated with a lower wage dispersion. However, this essay shows that this is not necessarily the case. For example, Sweden that has the lowest wage dispersion among OECD countries (1,47), still ranks relatively low in education, compared to countries with higher wage dispersion such as Germany (1,84). Accordingly, the study at hand will help us understand why such differences in educational attainment exist.

While limited literature has examined the direct educational effect of minimum wages, even fewer studies have investigated the connection between the wage dispersion and educational outcome. Therefore, this study contributes to earlier literature by looking at changes in the wage dispersion/minimum wage and education. Also, due to similarities between training and schooling in the formation of the overall skills of workers, I have developed a discussion on how minimum wage laws may shape the overall investment in training across individuals.

This essay is structured as follows: Section 2 introduces the minimum wage effects, from the point of view of firms, individuals, and the welfare system. Section 3, discusses the effect of minimum wages on human capital accumulation. Section 4, presents a review of the existing literature and discusses the educational effects of minimum wages. Sections 5 and 6, explain the method and the data. Section 7 analyzes the results. And section 8 concludes.
I. Theoretical framework

A. Implications of minimum wages

Workers point of view

Researchers argue that the most disadvantaged group of workers, when the minimum wage increases are the low skilled workers (Neumark et al. 2010). However as minimum wages increase, workers want to maintain their jobs and develop in their skills to keep up with the new minimum wage requirement and consequently receive a higher wage. But, at the same time, the cost that individuals incur can play an important role in such investment decisions (Rosen 1972). In other words, because the cost function differs between workers, “more able” individuals that have more talent would face a lower cost from investing in education, while “less able” workers are less likely to make such investment decisions, because it will be costlier for them. Consequently, “more able” individuals end up investing more in education, while “less able” workers choose either to voluntary switch jobs or involuntary exit the labour market. Accordingly, if we suppose a case where the individuals switch between jobs and move to a secondary sector with lower reservation wage (if it exists). They will perhaps be forced to stay outside the labour market in later stages. Minimum requirement for this secondary sector may (would increase) change over time, perhaps individuals who do not catch up will be forced to take advantage of unemployment benefits (Agell et al. 1997).

Furthermore, Agell et al (1997) attribute these differences in education to three effects: First, incentive effect; that is when the cost of investment is higher than the return. Indeed, education is acquired at an increasing marginal cost. Therefore, if individuals do not possess a minimum requirement of education, they will incur a higher cost and thereby would be less likely to invest further in education.

Second, hurdle effect; a binding minimum wage will make the entrance hurdle to the labour market higher. Thus, as the educational hurdle also binds, individuals must choose between investing more in education or not. Due to this effect, workers with a lower ability level will increase their education just to gain access to the market under individual bargaining.

Third, discouragement effect; it accounts for the effects at the lower ability margin, implying discouragement for less talented workers to obtain more education. Indeed, if a big proportion of the population is concentrated with workers whose productivity is close to the lower talent hurdle, minimum wage policies must create incentives for workers to pursue more education. Otherwise,
if the level of education does not change, we would expect to see more loss in employment.

Eventually, as argued by Rosen (1972) schooling and work are complementary in learning new skills. Thus, if we want to investigate how workers can maximize their future earnings, one must look at both demand and supply opportunities in the labour market. Individuals will think in a way that can increase their working opportunities and skill acquisition in order to be more attractive to firms, and firms will offer those opportunities depending on their cost once they are reimbursed. Indeed, firms will hire young individuals as long as their value of service exceed their cost (price of the job). Accordingly, individuals will invest to obtain more human capital until the return of an additional unit of skill exceed the (unit) cost. However, the demand for investment opportunities can differ significantly between individuals. According to Rosen, workers with intermediate ability will invest more in their skills and education to maintain their jobs. Thus, increasing the minimum wage can boost their education, whereas less able workers will be less motivated to invest in their skills, instead, they would either choose to seek opportunities in a secondary sector that may demand less skill level or choose to exit the labour market and probably receive welfare. On the other hand, increasing minimum wage for high ability workers would be no real issue.

**Firms point of view**

Conventional economic theory argues that a binding minimum wage would lead firms to move backward for low skilled workers (Neumark et al. 1995). The logic behind the theory is that increasing the minimum wage above the competitive market wage would increase both the average and marginal cost of labour, which consequently would lead firms to displace “more” productive workers for” less” productive ones to compensate for the cost increase. (Rebitzer et al. 1995).

Now, if education is the indicator to signal productivity to employers, the minimum wage will increase the requirement for workers to enter and/or to maintain their job position in the labour market and employers will decide whether or not to invest in the training of workers. Thereby, if policies aim to increase the investment in education for intermediate skill workers, then, it must be a motivational policy, because workers need incentives to pursue more education. Hence, in this setup, the job offered by firms must pay for both current investment expenditure and alternative return in a lower paid job.

**B. The nature of the labour market**

The nature of the labour market can produce different results when the minimum wage is
introduced. For instance, in a competitive market set up, increasing minimum wages may have more challenging results for the enterprise, because, the marginal cost of employing an extra worker will be the current wage, plus cost of training. Thus, if current wages are increased, employers will cut on training to avoid for the cost increase. As a consequence, available on-the-job training may decrease and thus, limit the growth of earning. A perfect example is given in an article named “Minimum wage effects on training on the job” by Hashimoto (1982). He argues that increasing minimum wages can have a negative effect on young workers, by decreasing their training opportunities and thus, limit subsequent growth in their wages. Similar conclusions were made by Rosen (1972). She states that increasing minimum wages can impose a ceiling on the learning opportunities for workers and endorse a more flat-lifetime income pattern. However, the effect of minimum wage on wage growth does not necessarily stem from its effect on training. For example, Grossberg et al. (1999), compared minimum wage workers to those earning slightly above and slightly below the minimum wage. They found no effect of minimum wage on training—but at the same time, they still found a negative wage growth effect for workers affected by the minimum wage. Thus, the reduced wage growth for minimum wage workers should not be attributed only to receiving less training. Nevertheless, minimum wages can have more beneficial effects in a less than a perfectly competitive market, Acemoglu (1999).

When firms pay efficiency wage, they maximize profit through solving different profit maximization problems with respect to both labour and wages- in this set up, a higher wage may affect a worker productivity in many dimensions; it can boost productivity level among workers through reducing work misbehaviours such as shirking, absenteeism, turnover and job mobility. A perfect example is a study made by Rebitzer et al (1995). In their article “The consequences of minimum wage laws” they argue that firms may pay efficiency wage to reduce work misbehaviour, such as shirking. Indeed, when wage increases, the cost of losing a job becomes higher, as a consequence, this can increase the marginal productivity per worker, increase effectiveness and reduce such work misbehaviours.

Next, Swinnerton (1996) claims that increasing minimum wage can eliminate less productive activities in the labour market and help firms that are labour supply constrained, using equilibrium search model. He states that, imposing a higher wage can improve the distribution of labour. For example, less efficient firms can have workers that may be employed more productively at better firms. Nevertheless, according to the author Agell et al. (1997), firms who wants to improve efficiency would only hire workers if their skills and education matches some minimum level required by the firm and then accordingly, decide how much to invest on training.
On the other hand, if workers do not fulfil this requirement, they will not enter employment at the first level.

C. Welfare point of view

Minimum wage allows individuals who are already employed to live a worthy life without the state transfer. Therefore, increasing the minimum wage may seem beneficial to lower public expenses. According to some researchers (e.g., Cahuc et al. 1995) a binding minimum wage can be elaborated to improve welfare by motivating more human capital accumulation among unskilled workers. However, according to the bargaining theory, this may not necessarily always be the case. Because, if the educational level is too low for individuals under a certain cut off value of talent “ability”, then, a small increase in minimum wages may lead to a higher welfare cost. Indeed, when wages increase, “low” skilled workers are no longer allowed to accept the low wage offer. Also, because they may have “too little” education in the first place, they may find it costly to invest in education and choose to receive some form of unemployment benefits instead. Moreover, although studies have not examined the direct effect of Unemployment Insurance on education, Pissarides (1992) have warned from generous unemployment benefits and unemployment becoming too long. According to Pissarides, when workers stay outside the labour force for a long period, they lose their skills, become less productive and, as a consequence, this increase their unemployment spell. Indeed, when a person has been unemployed for a long period it will be harder to get them back to work, meanwhile, their human capital may cease to increase or even start deteriorating. As a consequence, their education level may go down and welfare effect will be positive.

Next, another scenario could be that the presence of minimum wages may increase the total education, especially in cases where workers have more power to bargain over wages in wage setting. Nevertheless, such argument can be challenging to the welfare and may produce inefficiencies. Because, according to Agell et al. (1997) the social return will not match with the increase in private educational cost. Accordingly, the wage increase in a country must be subjective to the productivity level. Also, an efficient level of wages, must be decorated in a way that reward those with higher productivity and “push” those with lower productivity to invest further and be worth the wage increase, otherwise, the social burden may increase. Nevertheless, predictions seem ambiguous and more empirical work is necessary.
II. State of research

A. Minimum wages and human capital investment

In this thesis, the main subject is formal educational. However, since, like schooling, training increase human capital accumulation, the respective considerations on training are relevant to some extent. Therefore, this chapter discusses how a wage floor may impact related work training.

Young workers usually lack skills, thereby, when they enter the labour market, they accept a lower pay offer as to compensate their employers for the investments in their skills. However, under a binding minimum wage, young individuals can no longer accept the low wage offer. Because increasing wages for this group of workers would impede firms from providing such learning opportunities. According to Rosen (1972) individuals accumulate large part of their human capital at the work place. Nevertheless, despite similarities between training and schooling in the sense of human capital accumulation. In contrast to schooling, where the educational decision is made by the individual, training is often a joint decision made by both workers and firms (see footnote). Indeed, in the on-the-job training context, workers cannot train by themselves. But instead, training must be offered by “firms”, who may end up paying a high fraction of the cost. The empirical evidence of minimum wages on training is mixed.

In the standard Becker model (1964), with competitive labour markets, minimum wages seem to reduce training. According to the Becker’s theory, with a binding minimum wage firms have to pay the minimum wage irrespective of whether workers are skilled or not and the cost of training will be most likely passed to employers, while the return to training will be captured by workers. Accordingly, if the initial productivity level of workers does not exceed or equal a certain cut off of skills, workers will not receive neither the minimum wage nor training, since they cannot accept the wage cut.

On the other hand, in a less- competitive market set up, with firms rents, employers seem to

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7Training can be determined both on individual, firm or government level. for example, occupational training programs can be adopted by either adult education courses, business schools, government training programs, vocational or technical institutes etc. Acemoglu (2013). Although, specific training obtained by individuals to acquire a job are an important source of employment and formation of skills, researchers are still interested in the kind of on-the-job training, provided by employers in their definition of training in the data.
8 Acemoglu (2013).
9In the US, Neumark et al (1998) found a negative effect on-on-the job training. Neumark and Wascher (2001) found a small evidence that minimum wage can increase training to acquire a job. In the UK, Arulampalam et al (2004) found a positive effect of minimum wage on training.
10 Hashimoto (1982) found that minimum wages, cause losses in surplus for both workers and employers.
pay for employees training. Acemoglu et al. (1999) claim that increasing minimum wage may increase rather than decrease firm-sponsored training in a non-competitive market, because it compresses the wage structure. According to authors, after workers have accumulated a certain level of skills, the effect of minimum wage will depend on the presence and size of labour market rents. For example, increasing minimum wages in a competitive labour market with no rent in the employment relationship would give no options to firms, rather than terminating training and “maybe” laying workers off. Whereas, in the presence of labour market rents, the minimum wage can induce firms to provide more training instead of laying workers off. The logic here is that, when workers are not paid their value of marginal product, the labour market rents between wages and productivity can induce firms to invest more in its workers’ skills; in the absence of minimum wage, the rent was constant and there was no point for firms to pay extra cost for training. But, with the introduction of the minimum wage, wages will go up and profit will decrease if the productivity level does not increase. Accordingly, since there is some rent in the employment relationship, it can still be more profitable for firms to invest in worker's skills at a moderate cost instead of hiring new ones. Another argument that was stated by Acemoglu et al. in (2001), is that, in the presence of minimum wage, a fraction of workers can “buy” and “pay” for training from their employers, and increase their human capital accumulation, as long as the minimum wage do not rule out the wage cuts. Accordingly, workers with a certain level of ability, who were prior to minimum wage, constrained with their human capital investment are now able to receive training. On the other hand, investing in training for workers with lesser ability will not be of interest to employers. Accordingly, if the minimum wage does not create incentives for young teenagers or low-skilled individuals to return to the educational system or invest in professional training programs, the overall minimum wage may set a ceiling on the range of learning opportunities.

B. The minimum wage and education

Possible educational affects

As a consequence to minimum wages, two educational effects may appear. The first one, as explained by Neumark et al. (2010) is called the “Queuing hypothesis” which is the potential outcome of individuals choosing to search for employment instead of education. For example, when young individuals make their educational choices, they balance their costs and returns. Accordingly, as wages raise, it improves earnings for individuals at the lower bottom of the wage distribution, hence increasing the short run opportunity cost of education for these individuals. Further, they choose to look for full employment instead of schooling. Chaplin et al. (2003) state
that, when minimum wages are binding, they improve earning for individuals at the lower end of the wage distribution. And thereby, the negative effect on schooling may occur, because the long run returns from more education are reduced.

The second effect is called the “substitution effect”.\textsuperscript{11} As wages increase, employers will only keep workers, whose productivity level is at or above the minimum wage level. Hence, workers with “less skills” will be substituted by higher skilled one.\textsuperscript{12} This shift in the labour demand, decrease the employment probability for the “less skilled” workers, and the opportunity cost of education fall. Indeed, with the strong drop in labour demand, less skilled workers become less certain of getting a job, and the low employment probability outweighs the wage level. As a consequence, the marginal utility of education exceeds the labour marginal cost and young individuals are encourage to undergo on education, in order to improve their employment prospects.\textsuperscript{13} (In contrast to the Queuing Hypothesis, which suggest a negative educational effect, the substitution hypothesis suggests a positive educational effect).

Moreover, according to Agell et al. (1997), when wages are conditional on the educational level and human capital level, choosing zero education, can imply that workers will move to a secondary sector with less educational requirement, or workers would choose to obtain further schooling if the return after they finish can compensate them for both initial investment expenditure and alternative return if they were employed.

\textsuperscript{11} Skedinger (2011), Neumark (2010), Ehrenberg et al. (1982).
\textsuperscript{12} Newmark et al. (2010).
\textsuperscript{13} Pacheco et al. (2007)
III. Empirical research

While a large literature has been conducted to investigate potential employment effects of minimum wages, only very limited literature has studied the educational effects. Major findings from inspected literature indicate that it is not possible to clearly predict the educational effect of minimum wages. Furthermore, this section summarizes the earlier literature according to their findings, in order to understand the real implications of minimum wages on education.

A. Evidence of Minimum wage effects on education

Negative impacts of minimum wages

Most of the research investigating the relationship between minimum wage and education comes from the US and research on minimum wages was first inspected by American researchers. Mincer et al. (1980) linked the human capital theory to a wage floor to investigate the willingness of employers to finance specific on the job training. According to authors, before the imposition of the minimum wage, employers may offer on the job training and workers are able to receive it. But, when the floor on wages increase, the cost for employer increase and, less skilled workers will not receive the full wage according to their productivity, but instead a deducted one. Nevertheless, this will not be possible because employers are not allowed to pay below the minimum wage and less skilled workers will be offered no training. Mincer and Leighton, in their article “Effect of Minimum Wages on Human Capital Formation” utilized a linear panel regression analysis to support their argument. They found that the minimum wage reduces the probability for low skilled workers receiving training by 2.2 percent and by contrast increase receiving training for higher skilled workers by 0.1 percent.

In the US, Neumark and Wascher (1995), conducted a panel analysis using a conditional logit model with year and state effects for the years 1977-1980 to investigate the linkage between minimum wage, employment and school enrolment. In their article “Minimum Wage Effects on Employment and School Enrolment” authors divided potential young individual’s activities and choices into four groups: in school and not employed (SNE), not in school but employed (NSE), in school and employed (SE) and neither in school nor employed (NSNE). They found that 10 percent increase in minimum wage, would decrease school enrolment by 3.4 percent and increase the proportion of (NSNE) by 6.7%. Also, they found a negative but insignificant effect

14 Neumark et al. (2010)
15 This classification is based on the Employment Status Recode, in which individuals are first asked whether they are employed, and if not, asked to indicate their activities
on teenage employment. According to authors, labour substitution may explain why the employment effect was nearly zero; employers desire enrolled higher quality teenagers to less qualified ones to recoup with the wage increase. Consequently, these teenagers leave school to employment, while, the teenage who are not in school but employed (near the old minimum) become less attractive to employers\textsuperscript{16}.

Besides, Neumark and Wascher (1995b) provide another evidence to support their argument, they computed the transition probability from one group to another between the four groups (NSE), (SNE), (SE) and (NSNE). There results were consistent with the previous study. They found again a negative effect of minimum wage on the probability of enrolment. Precisely, they found that whether employed or not (SNE and SE) had a small negative effect, while (SE and NSE) had a positive effect on the probability of being (NSNE). Furthermore, their results are consistent with the substitution of workers between teenagers who were not in school but previously employed to those individuals originally (SE). Additionally, they found a negative effect on the probability of moving from no schooling to schooling again, as a consequence, their results can imply that individuals who lose their jobs, do not seem to return back to education. Furthermore, Neumark et al. (2003) recorded their results for the periods 1978-1989 and 1980-1998. In line with their earlier studies, they found a negative effect of minimum wages on schooling enrolment, but a positive effect for the (NSNE).

Moreover, another negative educational effect was found by Chaplin et al. (2003). These authors took advantage of the different compulsory schooling age laws\textsuperscript{17} across states in the US to estimate the share of students who continue schooling, in the following year, when minimum wage increase. They found that the higher minimum wage, had a significantly negative impact on the transition from grade 9 to 10, when compulsory schooling age was between 16-17. While they found no educational effect in states, where students cannot drop out until the age of 18. Thus, according to their findings, a fraction of students seems to be willing to work at the new minimum wage but they are held by the law to stay in school\textsuperscript{18}, whereas, another fraction seem to intend to finish high school, regardless of a higher minimum wage. Nevertheless, these findings suggest that schooling compulsory laws can encourage continued school enrolment.

Moreover, minimum wages also decrease the demand for less skilled workers. Currie et al (1996) using a linear probability model in their paper “\textit{The Minimum Wage and the Employment}”

\textsuperscript{16} In their research the Queuing effect seem to dominate the substitution effect.

\textsuperscript{17} Legal school leaving age is 16 -17 or 18.

\textsuperscript{18} The Queuing hypothesis of minimum wages Neumark et al. (2010)
"OF YOUTH: EVIDENCE FROM THE NLSY" investigated the effect of the increases in the federal minimum wage on the probability of workers retaining their jobs one year after the law was implemented. They found that workers were 3 to 4 percent less likely to still retain the same job one year later. Consequently, as facing a binding minimum wage, a fraction of young individuals seems to be queuing for the minimum wage jobs\textsuperscript{19}, but the low demand for such low-skilled work seem to constrain them.

Moreover, as mentioned earlier most research on minimum wage and education is conducted in the US. Therefore, empirical evidence from other countries is not as large.

In the UK, with the introduction of minimum wages in 1999, only workers of 18 years old or above were covered by the legislation. Rice (2010) investigated the educational effect of minimum wages at the time of its introduction using a difference in differences approach: in the same school cohort, she used students aged 18 as a treatment group\textsuperscript{20} and students who were 17 years old as the control group. She found a significant negative effect on education.

In New Zealand comparing to the case of the US, relative minimum wages are high and the rate of exclusion from paying the minimum wage is low\textsuperscript{21}. This means, less skilled workers do not have the alternative to escape to uncovered sectors. Further, Pacheco et al (2007) in their article "MINIMUM WAGE EFFECTS ON EDUCATIONAL ENROLMENTS IN NEW ZEALAND" exploit the general minimum wage laws in the country and conduct a study over the period 1986–2004 to measure the level of school education by school enrolment rate. In their method, they utilized a broad cohort of individuals aged between 16 to 24 and then divided the sample into teenagers group (16-19 years) and young adult (20-24 years). Their results from the panel least square analysis produced a negative and insignificant effect on enrolment rates for all age groups. i.e. (16-24). Whereas, when splitting the age cohorts into two subgroups (teenage/adults). Their results differed significantly across the two groups; they found a statistically negative effect of minimum wage on school enrolment for the teenager’s subgroup (16-19year) and insignificantly positive effect for the older group (20-24 years). First, minimum wages seem to create incentives for young teenagers to search for employment over education, and the effect seem to be more sensitive on teens’ schooling in their early grades\textsuperscript{22}. Whereas, young adults who had already

\textsuperscript{19} See Chaplin et al. (2003)
\textsuperscript{20} These students were eligible to the minimum wage in 1999.
\textsuperscript{21} For example, five states in the US have no minimum wage laws (including, Mississippi, Louisiana, Tennessee, Alabama, and South Carolina). Also, in 2008, thirty-two states established a minimum wage higher than the federal wage (Neumark et al. 2010).
\textsuperscript{22} This result also highlights the importance of the quality of education in providing guidance to teenagers.
finished their high school and may be on other educational form or training program are intent to finish education and graduate, and, thereby, will not be discouraged by the minimum wage.

Additionally, in later stages, authors investigate the impact of the youth minimum wage, which was implemented by the government in 1994 for teenagers between 16-19 years- those workers had not been covered before. In comparison to the negative result, now they found that, the enrolment rate increased significantly by 10- 15 percent- depending on the set of variables included. As an explanation, authors attribute the positive effect on education to the restricted labour demand for teenagers.

**Other minimum wage impacts on education**

The majority of studies have found negative educational effect on minimum wages. Nevertheless, this section will address findings other than negative effect.

Campolieti et al. (2005) exploit the variation in minimum wage laws in Canada-both across provinces and over time to investigate the impact of minimum wages on various employment-enrolment status among individuals between 16-19 years old\(^{23}\). With this method, authors utilized the panel (CL) analysis used earlier by Neumark et al. (1995, 1995b, 2003).

In contrast to Newmark and Wascher, they found no educational effect of minimum wages. They found that the presence of minimum wage had a large negative effect on employment. Precisely, they claim for 25 percent reduction in teenage employment for every 10 percent increase in minimum wage. As an explanation, authors state that the negative effect on the probability of being in school and employed (SE) cancels out the positive effect of the probability of being in school and not employed (SNE). Accordingly, there findings suggest that, teenagers will not dropout from school to queue for the minimum wage jobs. But at the same time, students having part time jobs seem to no longer be able to keep their jobs.

Warren et al (2010), in “**THE EFFECT OF MINIMUM WAGE RATES ON HIGH SCHOOL COMPLETION**” utilized a state level analyses\(^ {24} \) to inspect the impact of changes in state and federal minimum wage rates on the high school completion rate between 1982-2005. In line with Campolieti et al. (2005) They found no evidence that increasing minimum wage can decrease the high school graduation rate. However, the supported argument made by authors was that, the development of societal and institutional factors may explain why students would drop out/ stay

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\(^{23}\) Minimum wages in Canada are set under provincial jurisdiction. Ehrenberg et al (1982)

\(^{24}\) This method uses fixed effect to control for state-year time- varying covariates.
in school rather than the minimum wage itself. Precisely, they argue that a very small minority of students would make the calculus to weigh between benefits and costs of remaining in school.

In an article by Agell et al. (1997), the authors argue that increasing minimum wage can be beneficial in increasing efficiency of firms when the marginal product of skilled workers is shared between the enterprise and the employee. Authors argue that minimum wage can serve as an engine to motivate workers to undertake more training when firms and workers bargain over wages. In this method, on the job training is defined as a fixed cost paid by the employers to initiate employment and firms recoup with the higher cost only indirectly in later wage bargaining, but only by employing workers with productivity level above a certain cut-off. Further, authors state that a binding minimum wage can increase the surplus for employers through employing workers that are as qualified as possible. However, in their setup, the positive effect on education is clear and pronounced for workers with intermediate skills. But, on the other hand, less skilled workers who are the most affected when wages increase are not the one of concern. Hence, according to their findings, there seem to be a trade-off between equity and quality.

The effect is limited

Educational choices may vary with gender, ethnicity, family background, etc. Hence, the effect of minimum wages on education, may be limited to some sub-groups of the population and may affect some different than others. The best example is “Minimum Wages and Teenagers’ Enrolment-Employment Outcomes” written by Ehrenberg et al (1982). Authors utilize US data for teenage between (14-19) years old to study the relationship between family income and the effect of minimum wages on teenagers, on four educational and labour force choices (SE-SNE-NSE-NSNE). In their method, they conducted the minimum wage variable into two stages: first, the minimum wage variable, adjusted to minimum wage levels and coverage. Second, minimum wage adjusted to family background25. Then, they interacted the minimum wage variable with the corresponding income class. They found that, as a reaction to a minimum wage increase, teenagers from low-income families are more likely to drop out of school. Whereas, those from higher-income families are more likely to increase their educational attainment. According to authors, as part time jobs are difficult to find26, financially constrained teenagers cannot afford the cost of education and thereby, will move out of education, seeking full time work opportunities. On the other hand, teenagers from higher-income families may pursue more schooling, as they are not

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25 Minimum wage adjusted to family size and income: if the adjusted family income is below or equal 4000$, then family is classified as, low-income family. Whereas, if family adjusted income is above or equal 8000$, family is classified as high-income. Children whose family income is between 4000$ and 8000$ are excluded.

financially constrained. Furthermore, the same minimum wage policy seems to affect teenagers differently. For example, Ehrenberg and Marcus found that schooling and employment for non-white male teenagers from high income families were not affected by the minimum wage. Whereas, non-white male teenagers from low-income families seemed to shift from full time schooling to full time employment. Furthermore, in line with Mincer et al (1980), minimum wage policies seem to set higher incentives for individuals from less wealthy families to enter the labor market. But, also, social inequalities seem to motivate such choices.

Moreover, differences in learning capacities among individuals may also affect their choice of working and investment decision. Rosen (1972) in her research "LEARNING AND EXPERIENCE IN THE LABOR MARKET" argues that workers with higher level of formal schooling can be more efficient learners. According to Rosen, more “able” individuals can be expected to incur lower cost in accumulating knowledge and skills and, thus, learn faster comparing to their “less able” co-workers with lower formal education. Furthermore, variations in learning capacity may produce a variation in real costs of learning and thereby alter incentives to accumulate knowledge and skills”.

To conclude, the majority of previous literatures seem to point out a negative educational effect of minimum wages. Although, minimum wage seems to create incentives for individuals to move from education and queue to minimum wage jobs. They seem to be constrained by the limited labour demand. Besides, differences in the labour market structures, educational institutions and other personal characteristics seem to affect the overall educational outcomes. Consequently, the important observation is that effects may be heterogeneous.
IV. Methodological framework

This paper aims to investigate the impact of increasing minimum wage on upper secondary graduation rate. Minimum wages in Nordic countries are not regulated by law. Instead, they are subject to collective agreements between employers and unions at the industry level according to Skedinger (2011). Therefore, Nordic countries cannot be included in the analysis of minimum wages. However, since an increase in the minimum wage can be linked directly to the compression of the wage structure. This paper investigates if an increased wage dispersion, may increase, or decrease the upper secondary graduation rate. This is done in three steps; first, this essay analyzes the wage dispersion for the time period (2005-2014) by breaking down the change in the wage dispersion into three sub-periods (2005-2009-2014) and then studying the change in the wage for each period. Second, analyse the educational rate for the same time period (2005-2014), by breaking the change in the upper secondary graduation rate down into two parts (2005-2012), and after study the change in educational attainment for each part. Finally, to investigate for a possible relationship between the wage dispersion and upper secondary graduation rate, changes of the two components are linked. This study utilizes 17 OECD countries (Sweden, Denmark, Finland, Norway, Germany, Ireland, New Zealand, Canada, Portugal, Poland, Hungary, Spain, Italy, Greece, Japan, US and the UK) between the period (2005-2014). There are different measures of the wage dispersion. Nevertheless, in this paper the 50-10 measure is used. As, an increase in the minimum wage, affect mostly the less skilled/educated workers, who earn below or are at the minimum wage (Neumark 2010). The 50-10 wage measure is ideal, because it provide us with useful information about median earners and workers at the lowest end of the wage distribution.

Second, since Minimum wages are not statute in Nordic countries and the first minimum wage in Germany was introduced in 2015, the research uses data only in 11 OECD countries, in which, minimum wages are settled by the law (Ireland, New Zealand, Canada, Portugal, Poland, Hungary, Spain, Greece, Japan, US and the UK). Substantial variation in the bites of minimum wage across these countries, will make it interesting to determine whether a new legislation (or collective agreement) of higher minimum wage may increase or decrease the educational attainment in a country.

27 Pacheco et al. (2007)
28 According to Skedinger (2011), Minimum wage bite is defined as minimum wage to median wage. This measure is one of the standard indicators used in the minimum wage literature.
V. Data

The data collected are yearly data on 17 OECD countries, for 9 years only, between 2005 and 2014, due to limitation of data sources. The graduation rate data are obtained from OECD database and missing years are completed from Education at a Glance reports. The data includes both men and women to the age of 25.

Graduation rate represents the estimated percentage of individuals who graduate from upper secondary education, in a particular year. Graduation rates are calculated as net graduation rates. Precisely, in a given year, for a particular country, the number of graduates is broken down into age groups. For instance, the number of 16 years old graduates is divided by the total number of 16 years old in the country - the number of 17 years old graduates is divided by the total 17 years old in the population, etc. Then, the graduation rate is the sum of all the age groups. Moreover, this measure help us to understand how much a country can succeed in preparing students to meet the minimum labour market requirement. However, the graduation rates do not imply that all young individuals have graduated from upper secondary school from the first time. Some pupils may come back to school and graduate after they spent some time working. Therefore, policy makers can encourage young individuals to finish their upper secondary school before they enter the labour market.

Likewise, decile ratios of gross earnings for full time workers are collected form the OECD database. It contains the 50-10 earning dispersion measure for both males and females for all mentioned countries. The measure used is gross earning which does not include neither tax payments nor other fringe employment benefits. Moreover, the (50-10) measure provide useful information about the median earner and workers in the bottom of the wage distribution. Besides, data on the distribution of earning may reflect the risk associated with further educational investment and other labour market factors.

Data on minimum wages are available on the OECD database for countries where minimum wage is set by statute. Therefore, because Minimum wages in Nordic countries are not statute, instead they are subject to negotiation agreement between unions and employers, it will not be possible to include Nordic countries in this comparison. However, according to Skedinger (2008)

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29 Education at a glance reports of the years (2011, 2014, 2016)
30 Perhaps the most effective way to encourage competitions of high school, can be to set a sub-minimum wage that attract low-skilled adults above a certain cut-off of age. In this way teenagers will be below the defined age to leave school and enter the labour market, while less-skilled individuals can find a job to invest in their skills until they meet the minimum wage requirement.
31 Laws such as minimum wage legislation, strength of union and coverage of agreements.
the minimum wage bites in 2006 was between (63-73%) in Norway, (61-71%) in Sweden, and (56-57%) in Finland

Minimum wage bites data are also obtained from the OECD database. It represents the ratio of minimum wages to average earning of full time workers. The measure used for average earnings is median earnings which does not include either overtime nor bonus payments. The advantage of using median earnings is that it provides a more precise measure of average earnings, which accounts for differences between the average earners across countries. However, while median earnings are preferred measure of average wages of minimum to median earnings, they are not available to all countries.

A. The upper secondary graduation rate

This section will first study the evolution of upper secondary graduation rate, and the wage gap from 2005-2014. And then, calculate changes of averages in the wage dispersion and plot it against changes in the graduation rate over the same time period, to investigate for possible relationship between the two components.

Table (1): graduation rate at upper secondary level between (2005 and 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Sweden</th>
<th>Denmark</th>
<th>Norway</th>
<th>Finland</th>
<th>Germany</th>
<th>Ireland</th>
<th>Greece</th>
<th>New Zealand</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>76</td>
<td>82</td>
<td>89</td>
<td>94</td>
<td>99</td>
<td>91</td>
<td>99</td>
<td>73</td>
<td>78</td>
</tr>
<tr>
<td>2014</td>
<td>69</td>
<td>94</td>
<td>84</td>
<td>97</td>
<td>91</td>
<td>89(^{33})</td>
<td>71</td>
<td>95</td>
<td>89</td>
</tr>
<tr>
<td>Change</td>
<td>-9%</td>
<td>15%</td>
<td>-6%</td>
<td>3%</td>
<td>-8%</td>
<td>-2%</td>
<td>-28%</td>
<td>30%</td>
<td>14%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Spain</th>
<th>Italy</th>
<th>Hungary</th>
<th>Poland</th>
<th>Portugal</th>
<th>Japan</th>
<th>US</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>72</td>
<td>81</td>
<td>82</td>
<td>85</td>
<td>51</td>
<td>93</td>
<td>76</td>
<td>86</td>
</tr>
<tr>
<td>2014</td>
<td>74</td>
<td>93</td>
<td>88</td>
<td>83</td>
<td>97</td>
<td>97</td>
<td>82</td>
<td>93(^{34})</td>
</tr>
<tr>
<td>Change</td>
<td>3%</td>
<td>15%</td>
<td>7%</td>
<td>-2%</td>
<td>90%</td>
<td>4%</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>

32 Country fixed affect variables such as GDP per capita and investment in schooling as share of GDP can be included to check for robustness. However, by using changes, those variables are taken care of in the inspected diagrams.

33 Reference year is 2013 instead of 2014

34 Year of reference 2012 instead of 2014
Table 1 represents graduation rate at upper secondary level between (2005 and 2014). In 2005, five countries have graduation rate that exceed 90%. Whereas, in 2014, 91% or more graduate from upper secondary school in 11 countries, (Denmark, Finland, Germany, New Zealand, Portugal, Italy, UK and Japan). The increase seems to be interestingly striking most in both Portugal from (54% to 90%) and New Zealand from (73% to 95%). By contrast, upper secondary graduation rate has dropped for the same period in (Sweden, Norway, Germany and Greece) with the most pronounced drop seen in Greece (from 99% to 71%) and then, in Sweden (from 76% to 69%). On the other hand, upper secondary graduation remained constant over time in some countries with slightly small differences. Finland (from 94% to 97%), Spain (72% to 74%) and Poland (85% to 83%).

Looking closely at the gradational rate in Nordic countries, in 2005, Sweden had a relatively low graduation rate by 76% (which is identical to that in the US for the same time period), followed by Denmark by 82%, and Norway by 89% (similar to that in the UK). The exception is Finland, with a 94% graduation rate in 2005. Nevertheless, Finland seem to historically have had a higher upper secondary graduation rate among all Nordic countries (Table 1). In 2014, the upper secondary educational level seems to have increased rapidly in Denmark to 94%, while it has only increased moderately in Finland to 97%. By contrast, Sweden and Norway upper secondary graduation level seemed to drop by -9% and -6%, respectively, over the same time period. On the other hand, the graduation rate in both the US and the UK seem to have increased by the same rate 8% over the period of 2005-2014.

Moreover, looking at changes in the upper secondary educational rate between the year 2005 and 2014, the changes can happen for two reasons. Either, the overall reward structure (wage compression) in the labour market create incentives for young individuals, or, labour market factors such as demand and supply for educated individuals can drive the overall change in education. Moreover, variation in earnings across listed countries may reflect different labour market factors, such as, supply and demand of skills, MW legislation, strength of unions and coverage of agreements. Thereby, the next section will investigate the earning differential among all 17 OECD using the 50-10 wage gap measure.

35 See “analytics section”
36 50-10 wage shows the difference in earning between the middle class and low wage workers.
B. The 50-10 wage gap

Table (2): wage gap (50/10) between 2005 and 2014.

<table>
<thead>
<tr>
<th>Country</th>
<th>Sweden</th>
<th>Denmark</th>
<th>Norway</th>
<th>Finland</th>
<th>Germany</th>
<th>Ireland</th>
<th>Greece</th>
<th>New Zealand</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-10 Ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>1.35</td>
<td>1.42</td>
<td>1.46</td>
<td>1.42</td>
<td>1.83</td>
<td>1.83</td>
<td>1.73</td>
<td>1.57</td>
<td>2.00</td>
</tr>
<tr>
<td>2009</td>
<td>1.36</td>
<td>1.43</td>
<td>1.55</td>
<td>1.47</td>
<td>1.85</td>
<td>1.89</td>
<td>1.59</td>
<td>1.55</td>
<td>1.95</td>
</tr>
<tr>
<td>2014</td>
<td>1.36</td>
<td>1.46</td>
<td>1.62</td>
<td>1.46</td>
<td>1.87</td>
<td>1.98</td>
<td>1.72</td>
<td>1.57</td>
<td>1.95</td>
</tr>
<tr>
<td>Change</td>
<td>0.7%</td>
<td>2.8%</td>
<td>10.7%</td>
<td>4.2%</td>
<td>2.2%</td>
<td>5.8%</td>
<td>9.1%</td>
<td>0%</td>
<td>-2.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Spain</th>
<th>Italy</th>
<th>Hungary</th>
<th>Poland</th>
<th>Portugal</th>
<th>Japan</th>
<th>US</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-10 Ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>1.67</td>
<td>1.50</td>
<td>1.94</td>
<td>1.99</td>
<td>1.62</td>
<td>1.68</td>
<td>2.10</td>
<td>1.83</td>
</tr>
<tr>
<td>2009</td>
<td>1.70</td>
<td>1.46</td>
<td>1.76</td>
<td>2.02</td>
<td>1.54</td>
<td>1.62</td>
<td>2.11</td>
<td>1.81</td>
</tr>
<tr>
<td>2014</td>
<td>1.64</td>
<td>1.50</td>
<td>1.61</td>
<td>1.92</td>
<td>1.56</td>
<td>1.60</td>
<td>2.09</td>
<td>1.80</td>
</tr>
<tr>
<td>Change</td>
<td>-1.8%</td>
<td>0%</td>
<td>-17%</td>
<td>-3.9%</td>
<td>-3.9%</td>
<td>-4.8%</td>
<td>-0.5%</td>
<td>-1.6%</td>
</tr>
</tbody>
</table>

Source OECD (own calculation)

As shown in table (2). The wage dispersion shows significant variation in earning across countries for the period (2005 and 2014). Most countries have seen a drop in the wage dispersion (the highest drop seen in Hungary by 17%, and the lowest drop in the US by -0.5%). On the other hand, Greece, Ireland, Germany and the Nordic countries had seen an increase in the wage dispersion over the same period (with the highest increase being in Norway by 10.7%, and the lowest being in Sweden by 0.7%).

In 2005, the Nordic countries had the lowest wage dispersion, with the wage gap being the lowest in Sweden at 1.35% followed by Denmark 1.42%, Finland 1.42% and Norway 1.46. By contrast, Canada and the US, UK, Germany, Ireland, Poland and Hungary had the highest wage gap for the same period. In 2014, the wage gap in Sweden has been fairly constant with a slight increase (from 1.35% to 1.36%) while it had increased remarkably in Norway (from 1.46% to 1.62%). The US has almost the same wage gap as in 2005 but with a slight decrease (from 2.10%
to 2.09%). The biggest decrease in the wage gap is seen in Hungary from (1.94% to 1.61%). In Germany, the wage gap increased (from 1.83% to 1.87%).

Looking closely at changes in the two countries which have witnessed the highest increase in upper secondary graduation rate, different patterns show, the wage ratio has dropped in Portugal by 3.9%, while it remained constant in New Zealand over the same period. On the other hand, the wage ratios seemed to increase in the two countries with the highest drop in upper secondary education (Greece by 9.1% and Sweden slightly by 0.7%).
VI. Reflection of results and analysis

As seen in the table above, the wage dispersion in Sweden has been almost constant over the period of 2005-2014. On one hand, the compressed wage dispersion can explain part of the low graduation rate, since it contributes to a lower return to education. On the other hand, despite similarities with the other Nordic countries, no other country has experienced such a low graduation rate, except for Norway, both Finland and Denmark have experienced an interestingly higher educational rate at 94% and 97% respectively.

The wage ratio has decreased in both Portugal and Poland by -3.9% and by -17% in Hungary over the period of 2005-2014. This may be explained by the increase in the skill level among workers. Indeed, in countries such as Portugal, Hungary and Poland, although the overall income levels are low, the higher education level generates a large earning premium among the educated, and thereby, individuals are willing to invest in education in order to increase their earning premiums over their life cycle. The short supply of educated individuals in those countries have driven up wages over time. According to OECD (2009), in Portugal, 40% or more of those who have completed a university degree or other advanced research programs, earn twice as much as the median worker. Another explanation is that the unemployment rate had increased in these countries, especially over the period of (2005-2013), the higher unemployment rate may have mostly affected the low educated individuals. Consequently, individuals may invest further in education, to increase their employment chances. And this is also evident in the higher graduation rate in the recent years.

In Germany, a relative increase in earnings is markedly in the recent years. The industry structure and the development pace of the country have increased the demand for educated individuals, driving up wages for the recent years. However, in contrast to the rigid wage structure in Sweden, Germany have experienced a more flexible wage structure, especially since the Hartz reforms. This implies that, during fluctuation in supply and demand, wages are more likely to adjust in Germany than in Sweden.

A. The Nordic countries “wage dispersion”

Variation in relative earnings in a country may reflect different important factors such as, the demand for skills, Minimum wage legislation, strength of unions, coverage of agreements and the supply of workers at different educational levels.
As seen in the table above, Sweden has had always the lowest wage dispersion among all OECD countries between 2005 and 2014. This means that it can be less expensive in Sweden to employ a higher educated individual relative to less educated one in comparison to other counties. Indeed, Hanushek et al. (2013) found, the return from an additional year of schooling to raise gross earnings by 2.6% in Sweden, 4.2% in Norway, 4.3%, in Finland and 6.4% in Germany.

Next. Minimum wages are high in Sweden and labour unions are strong and covers almost 90% of all the labour force. According to Newmark (2004), high union density and rigid labour market laws, tend to compress the wage structure. Accordingly, when the country is hit by a supply shock, as it has happened in the recent years, there is not enough flexibility, and wages may not be able to adjust to the new condition. Sweden has a long history with immigration. However, in the recent years, the large immigrants’ inflow was concentrated with low educated individuals. Therefore, rigidity in the wage structure, the supply shock, and the lower earnings premium for educated individuals- all together may explain a big part of its drop in the overall upper secondary graduation rate. In contrast to Sweden- the US, Canada and New Zealand have more well educated immigrants and the overall flow is controlled by the country (OECD 2016). Indeed, if immigrants come from a more educated background, this may contribute to increase educational attainment both among them and for their children in the future. This is also evident in the graduation rate, where educational attainment has increased among all these countries.

Further, Denmark, Finland and Norway share several similarities with Sweden, including the high minimum wage and generous unemployment benefits (Newmark 2004). However, despite these similarities, the upper secondary graduation rates still differ significantly. A possible explanation is that, there are still differences between these countries that may be driving changes in educational attainment.

First, in the case of Norway, as shown in table (2) the wage structure has become more flexible in the country. Besides the country is not part of the EU. This imply that, it has a more freedom to stipulate policies that are more desired at the country level. For example, immigrants’ flow seems to be controlled by the county and moderately low in comparison to Sweden. Nevertheless, even though, an overall increase in the graduation rate may be expected, (Table 1) shows a drop of -6% in the educational ratio. However, an increased wage dispersion in the country did not seem to increase its educational attainment. A possible explanation can be, the low constant unemployment rate in Norway. Individuals probably invest in their education to increase their income and employment chances. Therefore, perhaps when wages are high and the probability of being unemployed is low, individuals are more sure of being employed with a
“relatively” high wage in the future, and thereby, the incentives to education are reduced (Pissarides 2011).

In Denmark, the graduation rate ratio has increased interestingly by 15% between 2005-2014. The lack of supply of educated individuals in the 2000s seem to have pushed up wages (OECD 2011). In 2002, the Danish government presented the “Danish Growth Strategy”, which proposed reforms to the education system, to encourage earlier completion of degrees, in order to increase the supply of labour for relevant skills. Nevertheless, the policy seems to have succeeded in raising the educational level, and wages have been relatively more able to adjust. This is also evident in table (2) The wage ratio has increased by 2.8%.

Finland wage ratio has increased by 4.2% over the 2005-2014. Also, the upper secondary graduation rate has increased by 3% over the same period of time. However, Finland stand out in educational attainment among all OECD countries. The country has enjoyed an interestingly increasing graduation rate over the entire period. This can be explained by different factors: first, wages seem to converge over time, increasing the earning premium among the educated individuals. Also, the country had a relatively “higher” unemployment rate comparing to other Nordic countries, which may have contributed to increase the incentives to education, since individuals want to increase their employment chances. At last, the Finnish educational system is unique and thereby the educational set up may also explain a big part of the constant high educational rate.

To conclude, Factors such as supply and demand for highly educated individuals seem important in some countries while the overall wage compression plays an important role in other countries. Therefore, the effects may be heterogeneous.

Moreover, Table (1) and (2) show that in 2014, all Denmark, Finland, Germany, New Zealand, Portugal, Italy, UK and Japan scored above 90% in upper secondary graduation rate. However, the wage ratio differs significantly, which makes it hard to make a clear interpretation of the relationship between the graduation rate and the wage ratio. Therefore, I plot in the graph below the change in the wage dispersion and the change in education rate between all countries to determine whether an increase in the wage dispersion may increase/ decrease upper secondary graduation rate.
Looking at Figure (1). The regression line indicates that, an increase in the wage dispersion, leads to a decrease in the graduation rate. Excluding outliers” Hungary, Portugal and Greece”, the regression line indicates rather a negative relationship between the two components. In other words, an increase in the wage dispersion maybe linked to a decrease in the upper secondary graduation rate. Therefore, there is no evidence, that an increased wage dispersion may increase educational attainment. Instead, the positive educational effect of a decreased wage dispersion confirms the substitution hypothesis discussed earlier and reflect a significant increase in productivity and skills. As workers get paid according to their productivity, when wages are high, employers substitute low skilled workers to high skilled ones. Accordingly, due to this shift in the labour demand, and as the probability of getting employed among the low skilled decrease. Individuals are encouraged to stay in school to improve their employment prospects.

Besides, the labour market condition and institutional set up may greatly affect the educational decision for teenagers. For example, if individuals are threatened by higher unemployment probabilities and poor labour market conditions, education will be almost their only hope to help them get a place in the labour market. Whereas, if the educational system is not very rewarding and labour market standards are high, teenagers may perhaps choose to drop out of school, unless they are intent to continue. Therefore, perhaps that interaction between minimum wages, the labour market condition and institutions are high and thereby what apply well for one country will not necessary apply to the other.
B. Minimum wage

This section exploits variation in the bites of minimum wages across 11 OECD countries, to examine the impact of minimum wages in creating incentives for the youth to invest in education. Precisely, this paper will try to answer the following question: Would an increase in the minimum wage, increase incentives for the youth to drop out from school, queuing for the higher wage. Or, would our results from the previous section be confirmed, and a minimum wage would encourage them to increase their educational attainment and accumulate more human capital, to meet the minimum skills required by the minimum wage.

*Table (3) Minimum wage to median wage (2005-2014)*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>0.40</td>
<td>0.42</td>
<td>0.45</td>
<td>12.4%</td>
<td>14%</td>
</tr>
<tr>
<td>Greece</td>
<td>0.45</td>
<td>0.48</td>
<td>0.47</td>
<td>4.6%</td>
<td>-28%</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.46</td>
<td>0.47</td>
<td>0.54</td>
<td>17%</td>
<td>7%</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.54</td>
<td>0.47</td>
<td>0.45</td>
<td>-17%</td>
<td>-2%</td>
</tr>
<tr>
<td>Japan</td>
<td>0.33</td>
<td>0.36</td>
<td>0.39</td>
<td>17.4%</td>
<td>4%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0.54</td>
<td>0.59</td>
<td>0.60</td>
<td>11%</td>
<td>30%</td>
</tr>
<tr>
<td>Poland</td>
<td>0.42</td>
<td>0.46</td>
<td>0.51</td>
<td>20.4%</td>
<td>-2%</td>
</tr>
<tr>
<td>Portugal</td>
<td>0.46</td>
<td>0.50</td>
<td>0.55</td>
<td>18.7%</td>
<td>90%</td>
</tr>
<tr>
<td>Spain</td>
<td>0.37</td>
<td>0.39</td>
<td>0.37</td>
<td>0.3%</td>
<td>3%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.45</td>
<td>0.46</td>
<td>0.48</td>
<td>6.6%</td>
<td>8%</td>
</tr>
<tr>
<td>United States</td>
<td>0.32</td>
<td>0.37</td>
<td>0.37</td>
<td>15.6%</td>
<td>8%</td>
</tr>
</tbody>
</table>

*Source OECD (Own calculation)*

Table (3), shows that, the bites have continued to increase over time in all countries (except for Ireland). In 2005, there seem to be a substantial variation in the bites of minimum wage across countries. With the level of the minimum wage ranging from 54% of the median wage both in New Zealand and Ireland, to only 32% in the US. In 2009, the bites continued to increase in all countries (except in Ireland). On the other hand, the increase was moderate in Hungary, Spain and the UK. In the period of 2014, only Poland, Hungary, Portugal and New Zealand had a relatively
higher minimum wage ratio at 51% and above. Whereas, the US, Spain and Japan had a minimum wage ratio at 39% or below. As mentioned earlier, Nordic countries have no one national minimum wage. However, Skedinger (2008) estimated the minimum wage bites in 2006 in the Nordic countries. The bites were (56%-57%) in Finland, (61%-71%) in Sweden, (63%-73%) in Norway. Looking at table (3) column (2), the bites in the Nordic countries appear to be substantially higher than other countries. On the other hand, the level of minimum wage seems to be similar in both New Zealand and Finland.

Column (4) indicate that Some countries had substantial changes in the minimum wage for the period of 2005-2014. Which, mostly for all countries (except for Ireland), increased the level of the minimum wage relative to a median wage. The increase varies across countries. The most notable increases are seen in Poland 20.4%, Portugal 18.7% and Hungary 17%. While the lowest are seen, in Spain 0.3%, Greece 4.6% and the UK 6.6%. On the other hand, only in Ireland, the minimum wage ratio has declined by -17% over the same time period. Nevertheless, as seen in Skedinger results and table (3), the level of minimum wage seems to differ significantly across countries. Wage floors are considerably higher in Nordic countries and New Zealand, comparing to the US, Japan and Spain. Besides, countries where minimum wages are regulated by the law, seems to be the one with higher minimum wage bites.

Further, to account for potential endogeneity of the minimum wage, either between the minimum wage or the median wage on the labour market condition or education. Changes in the averages in the minimum wage and education are plotted in the figure below.

Figure (2) change in minimum wage bites and change in the graduation rate in Canada, Greece, Hungary, Ireland, Japan, New Zealand, Poland, Portugal, Spain, UK and the US.

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37 In Ireland, notable reductions in the minimum wage took place, especially to young workers. For example, in 2011, there was a reduction in the minimum wage for all workers below 18 years old by 30%, a reduction to workers above 18 in their first year of employment by 20%, and a 10% reduction for workers above 18 in their second year of employment (Ibec 2015).

38 In the appendix, a regression analyses have been done. However, because of few observations, the power of the statistical tests are low.
In figure (2), excluding outliers (Portugal and Greece), the regression line indicates a weak positive relationship between the minimum wage bites and the graduation rate. This means, according to the figure, an increase in the minimum wage may be associated with an increase the graduation rate. On the one hand, this is not surprising because minimum wages are high in Europe in general, and still EU member states enjoy a high educational rate than other countries (Education at a glance 2011). Also, according to OECD statistics, in 2011, at least 10% of upper secondary graduates in Denmark, Finland, New Zealand, Norway and Portugal were 25 years or older. Even though students that graduate from high school are generally between 17 and 20 years old, in these countries students seem to return to school to graduate. A possible explanation can be, the declining demand for the less qualified individuals “Substitution hypothesis”, thus the low demand for less skilled individuals may have created incentives to individuals to return to school in order to improve their carrier prospects. Further, in Ireland, notable reductions in the minimum wage took place, especially to young workers. For example, in 2011, there was a reduction in the minimum wage for all workers below 18 years old by 30%, a reduction to workers above 18 in their first year of employment by 20%, and a 10% reduction for workers above 18 in their second year of employment (Ibec 2015). Moreover, the reduction in the minimum wage seem to have decreased the incentives to education. (As seen in Table 1, upper secondary graduation rate dropped by -2%).

The figure above provides no evidence that, an increased minimum wage bite, may decrease the upper secondary graduation rate. However, even if the educational impact of minimum wages on two countries are similar (for example, Japan and Hungary). The labour market institutions and structure still differ significantly. Therefore, it can be hard to draw a real conclusion. Indeed,
According to Neumark et al. (2004), each country is unique, and thereby, labour market instruments and structure differ significantly across countries. Besides, country specific supply chock may influence the minimum wage effects and bias the results.

Moreover, in a country level, there are particular areas where minimum wage policies might be expected to influence the educational outcome: first, the way minimum wages are settled “either are regulated by law or determent by collective bargaining agreements”. According to Neumark et al. (2004), countries with high minimum wage bites are those where unions play an active role in the negotiating power. Furthermore, in the case where minimum wages are set by collective bargaining between employers and unions- if unions use its role to increase minimum wages regardless of relevant current productivity circumstances of the type of skills existed in the labour market, it can decrease incentives to education.

Second, the presence of sub-minimum wage is found by Neumark et al. (2004), to reduce disemployment for teenagers. Hence, if we suppose a scenario where employers tend to substitute low-skilled adults who are subject to the full minimum wage- for teenagers, due to cheaper labour. Perhaps, teenagers will escape school to employment. Thereby, sub-minimum wages may be associated with higher dropout rate in some countries. Nevertheless, since this study utilizes changes in the minimum wage. The sub-minimum wages may not be a problem, if changes in theses are correlated with changes in the regular minimum wage.

To conclude, the relationship between minimum wages and graduation rate should not be interpreted as causal among investigated countries. Besides, by using changes- as has been done in this study, indeed, has the advantage of controlling for all factors that are fixed over time in each country- like most labour market institutions. However, country specific shocks, are not possible to account for in an international analysis. Accordingly, the need for future investigation of educational effect of minimum wages with country-specific analysis is essential. This study seems to be the first to study the educational effect of minimum wage using international comparative data.

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39 Countries that they classified youth sub-minimum wages as important for teens are Ireland, Denmark, New Zealand, Portugal, Spain, Sweden, and the United Kingdom. Countries that they classified as having no or limited youth sub-minimum provisions are Canada, Germany, Greece, Italy, Japan, and the United States (Newmark et al. 2004).
VII. Conclusion

The purpose of this thesis was to investigate the impact of increased minimum wages/decreased wage dispersion on upper secondary graduation rate in 17 OECD countries. This question is interesting, because of the ongoing debate regarding minimum wages. Some researchers argue about negative educational impacts of minimum wages, because it increases the opportunity cost of education and increase the incentives for young individuals to drop out of school and enter employment. Whereas, others claim for a potential positive educational effect. A binding minimum wage would make the entrance hurdle to the labour market higher and thereby would create incentives for young teenagers and low-skilled individuals to undergo education in order to improve their employment prospects. Section 3 provided a theoretical framework to discuss the evidences found in earlier studies of educational effect of minimum wages. The major findings support the critics concerns, suggesting a negative educational impact arising from a higher opportunity cost to education, induced by the raise in the minimum wage “Queuing hypothesis”. Particularly, in the US and the UK, young individuals are encouraged to seek employment over completing school. However, a binding minimum wage can affect the demand side as well, because it induces employers to substitute less productive individuals to more productive ones “Substitution hypothesis”. Accordingly, section 4 investigates for a potential relationship between the wage dispersion/minimum wage and educational attainment for upper secondary graduates by linking the changes of the two components. However, each country is unique. Therefore, country specific shocks can make it hard to find a real effect of minimum wages on education. Furthermore, country specific labour market characteristics may produce different minimum wage effects.

The results of this section suggest a negative relationship between the wage dispersion and education, and a weak positive relationship between the minimum wage and upper secondary graduation rate, indicating that, a minimum wage encourages youth to undergo education. However, it is not possible to indicate if these results are significant, due to lack of available micro data.

A conclusion from this thesis is that, country specific shocks are hard to control for in an international comparative analysis and the level of minimum wages vary considerably among investigated countries. Therefore, while the overall wage rewarding structure (wage compression) seem to play an important role in some countries, for example in Sweden. Supply and demand factors for highly educated individuals, seem to play an important role in other countries. Such as Germany, Portugal and New Zealand. The extent to which supply and demand match, can depend
highly on the industry structure and pace of economic development. For example, when labour laws such as Minimum Wage legislation, strength of unions and coverage of agreement are rigid, they tend to compress the wage distribution among different educational groups and thereby, the labour market become less effective in signalling the demand for skills. Also, when the earning premium to education is not rewarding for highly educated individuals this can affect the supply of labour. For example, in Nordic countries, the earning premiums for those with university or advanced research degrees are low. According to OECD, In Sweden, Denmark, Finland and Norway the estimated difference between the maximum and the minimum salaries is 30% or less. This result reflects the relatively compressed wage scale in these countries and can decrease the incentives to education. On the other hand, in Portugal and New Zealand, the increase in labour supply have pushed up wages, and because the wage structure is more able to adjust than that found in the previous group of countries, incentives to education increased. Finally, the need for future investigation of educational effect of minimum wages with country-specific analysis is essential to help examine the contrasting education effects of minimum wages. Also, including control variables such as, individual’s family background can make the effect clearer.
VIII. References


Hashimoto, M. 1982. “Minimum wage effects on training on the job”. American economic review, 72, 1070-1087


IX. Appendix

Table 1: OLS regression- dependent variable change in graduation rate

(1)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Base sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in 50-10</td>
<td>-1.336</td>
</tr>
<tr>
<td></td>
<td>(0.937)</td>
</tr>
<tr>
<td>Observations</td>
<td>17</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.117</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The regression in table 1 is based on the model: $\Delta \gamma_i = \mu + \Delta \alpha R_i + \epsilon_i$. The coefficient $\alpha$ is -1.336, in line with figure (1), an increase in the wage gap seem to be associated with a lower graduation rate. However, the coefficient is not statistically significant and the standard error is large. R-square indicates that only 12 percent of the variation in the upper secondary graduation rate is explained by the model. Besides, with an endogenously determined market wage, the relationship between the two variables should not be interpreted as causal. This is because causality can run in both directions: the skill/educational level of workers can determine the market wage, which in its turn sets educational incentives for the individuals and thereby shapes the future average education level.
Table 2: OLS regression - dependent variable change in graduation rate

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Base sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in minimum wage bites</td>
<td>0.972</td>
</tr>
<tr>
<td></td>
<td>(0.839)</td>
</tr>
<tr>
<td>Observations</td>
<td>11</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.130</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As seen in table 2, educational status is slightly positively correlated with the minimum wage bites differences. The coefficient is 0.972, in line with figure 2, an increase in the bites of minimum wages seem to be associated with a higher upper secondary graduation rate. However, the coefficient is not statistically significant. R-squared also is very low. Only 13 percent of the variation in the upper secondary graduation rate is explained by the model. Nevertheless, a minimum wage that is fixed outside the labour market can be assumed to influence the educational decision, while the reverse causality is less likely to happened: minimum wages are proposedly fixed above the current low skilled market wage to raise income. Therefore, the at least partial absence of endogeneity enables to formulate a clear relation between the variables.