



HUMAN CAPITAL THEORY AND ITS IMPLICATIONS IN THE MACROECONOMIC OUTCOMES OF MINIMUM WAGES

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

MSc Economics & Business

Master Specialization International Economics

Name: Alexandros – Nikitas Papanikolopoulos Siagkris

Student Number: 387075

Supervisor: Dr. Dana Sisak

E-mail address: alex-papas@hotmail.com

Abstract

Minimum wage policy has re-appeared on governmental agendas across Europe. The main reason for this is that labor markets have experienced significant changes over the last decade. First of all, the number of low-paid workers remains still high in Europe - 17 % of EU employees were low wage earners in 2010 - requiring a revision on minimum wage policy and its effectiveness. Secondly, there has been a further decline in Trade Union coverage and effectiveness, particularly in terms of setting wage floors and protecting the low paid. In Germany, for example, this caused debates on the minimum wage to become a national issue. Previous literature studied minimum wages by dividing the groups based on age characteristic - teenagers, young adults and adults - finding mostly negative effects on employment. Age is used as a proxy for the individual's work experience and skills originating from Capital Theory. In this paper, using a new dataset from Eurostat, the aggregated Labour Force Survey (EU LFS), the impact of a minimum wage policy on the employment of different age groups is investigated by incorporating an additional proxy: education. It was found that minimum wage effects vary substantially between the groups based on their education qualifications with more adverse effects on teenagers and young adults with up to post-secondary education. Finally, in order to control for labor market institutions, a set of control variables has been incorporated.

Keywords: minimum wage policy, education, human capital theory, employment, labor markets, low skilled, low-paid.

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1. Introduction

Minimum wage policy has been on the spotlight of empirical research over 40 years now. The minimum wage is a labor market policy aimed to regulate the weak bargain relations between employers and workers at the low paid professions, Kahn-Freund (1977). Policy makers establish a minimum, usually socially acceptable, living standard to eliminate the bargaining process under a set wage level, by setting a lower bound below which wages may not fall. This approach is necessitated by the policy goal in European countries of preventing market power from excessively depressing wages in a way that seriously affects basic living standards. The minimum wage has been used as a form of social protection, designed to promote fairness in the labor market, recognizing the value of work and the opportunities that work provides.

The reason why empirical research has been focused on minimum wage policy over the last four decades is that it is widely believed that it may harm the same group of people that it aims to help, Fairchild (2005). Empirical analysis until now has been focused on dividing the examined groups based on age used as a proxy for work experience and skills finding that although the policy can increase the income of some workers, it can also reduce employment for others.

The minimum wage is a controversial policy regarding its benefits and drawbacks, yet minimum wage laws have been in effect in many countries for over 50 years. Proponents of the legislation argue that it helps protect the low skilled workers from exploitation in the labor market and increases the standard of living up to some minimum acceptable standard (ILO,1992). In theory, lowest paid workers have very limited bargaining power in negotiating wages with employers. Setting a minimum wage to an 'acceptable' level eliminates this process, mitigating the comparative power of the employer. On the other hand, it is argued by neo classical critics of the policy that the introduction or the increase of the minimum wage level may lead low skilled workers out of the market, as companies decrease the number of workers in order to offset the additional cost from this mandatory exogenous change, Stigler (1946), Brown (1982). It is thus argued that in the longer term, firms will be given more flexibility to deal with higher priced low-skilled labor, causing unintended adverse consequences for the workers. Investing in new technology along with labor-saving capital, skilled workers will eventually replace the unskilled workers (Dorn 2013)¹. A counter argument for this neoclassical view is that firms will always seek to standardize processes, invest in technology and in human capital. This would not have been a direct reaction in a minimum wage increase, but part of the continuous trend to minimize costs in order to maximize profits. Investing in technology and

¹ Cato Institute, James A. Dorn commentary, "The Minimum Wage Delusion, and the Death of Common Sense", 2013 <http://www.cato.org/publications/commentary/minimum-wage-delusion-death-common-sense>

seeking more productive labor is an inherent ongoing goal for firms and should not be taken as an argument against the minimum wage.

Despite this, there can be little doubt that a minimum wage increase will decrease employment for certain labor market groups. The question is how much; under which circumstances and which working groups are going to be affected. Knowledge of which groups are most vulnerable in the minimum wage policy would allow for either a restructuring of implementation or an incorporation of other measures that can support the initial goal of the minimum wage policy. As already discussed, these goals include: establishing an accepted living of standards, respecting the human right to work and fairness. In achieving these goals it is vital to offset the negative effects of the minimum wage increase and improve the overall effectiveness of the labor market. Therefore, the question that should be asked at the current moment is “How we could mitigate the negative effects of this policy?”

The main contribution of this thesis is the clarification of the different observed effects across groups, as well as the study of the above mentioned relationship in a pool of developed economies, some of which are members of a monetary union, sharing a common monetary policy since 2002. All countries in the panel follow a statutory minimum wage policy. It is believed that dis-employment effects vary within the age groups and between groups when other features such as education attainment is taken into consideration. Knowing these differences of the dis-employment effects among groups and what causing them, future literature could aim to study how can improve the minimum wage policy.

The bulk of the current literature has focused mainly on studying the effects of the minimum wage on employment, though there are studies examining the impact of minimum wage on income distribution and poverty. In this dissertation, the relation between the strength of minimum wage in the income distribution and employment is captured, through the division of the data into groups based on age and educational attainment. The analysis is done with fixed effects on a panel of 16 EU countries with statutory minimum wages over the period of 1998 - 2013².

A further complication is that a lot of arguments against the minimum wage policy are based on Brown's et al review paper “The Effect of the minimum wage on employment and Unemployment” as a starting point. Written in 1982, they summarized the existing research as suggesting that “time-series studies typically find that a 10 percent increase in the minimum wage reduces teenage employment by 1 to 3 percent” (p. 524). Apart from the fact that the study is based on labor market observations more than 30 years ago, these time series studies have been criticized of having biased

² The panel was reduced to 14 countries due to the lack of data.

results due to poor econometric results. Therefore, it is imperative to review the effects of the policy in debt, taking into account the new theory, new data set and more advanced econometrics techniques, as well as current social trends that can affect the interpretation of the results.

The rest of this dissertation is organized as follows: in Chapter 2, a thorough literature review is performed, whereas in Chapter 3 the theoretical framework is analyzed. In Chapter 4 data and methodology issues are analyzed, the empirical results are presented in Chapter 5 and, finally, in Chapter 6 the main conclusions are summarized.

2. Literature review and theory evolution

In this chapter a chronological approach is taken in reviewing the most substantial studies that are focused on the theory of minimum wage and its empirical implications.

The first part discusses the early literature, starting in 1913 and using mostly time series techniques. The need for such studies developed gradually alongside labor's growing demand in the late 19th Century for better working conditions. Fifty years later, the Fair Labor Standards Act (1938) was enacted, establishing the forty-hour work week and a national minimum wage in the United States.

In the second part of this chapter the "New Minimum Wage Research" is presented. This research wave was introduced in early 1990's and is considered a fundamental development in the minimum wage literature. The third part discusses the paradox on employment effects by a minimum wage policy, rising from the "New Minimum Wage Research". Finally, the fourth part concerns the most recent studies based on cross country time series techniques incorporating labor market institutions in the model in order to capture the true effect of a minimum wage hike on employment.

2.1 Origins of the minimum wage literature

In 1912, the first minimum wage policy was introduced in the state of Massachusetts for women and children. By 1938, through the establishment of the Fair Labor Standards Act (FLSA,1938), the United States became the first country after New Zealand (1984) to introduce a federal minimum wage policy. Before the establishment of the Department of Labor (by FLSA), the literature was mainly based in theoretical reasoning, due to the lack of data and empirical evidence on the effects of the minimum wage on employment. The neoclassical school supported that employers productivity is the deterministic factor for wages and by introducing a minimum wage policy would increase unemployment for low skilled workers. On the other hand, those in the progressive school, such as

Rogers Seager (1913), argued that a minimum wage policy is a measure of fairness and would prevent employers from exploiting low skilled workers with weak bargaining power, touching the social aspect of the policy. They also supported that a minimum wage would not only encourage workers to increase their productivity, but also that with increased wages the purchasing power of low skilled workers would increase, resulting in an increase in consumption and therefore in aggregate demand, Neumark et al, (2014).

After the establishment of the FLSA in 1938, a similar debate erupted over the appropriate theoretical model of labor market under which minimum wage policy should be studied. Stigler (1946) and Machlup (1946), supporters of the neoclassical model, suggested that minimum wage reduces employment. Whilst Lester (1946) argued to the contrary that the main determinant factor of employment is the product demand rather than the level of wage.

During 1960s and 1970s, attention was drawn to the impact of the minimum wage on employment at a country – region level.³ The focus of these studies was mainly on the employment effects of minimum wage on teenagers who were treated as a proxy for low skilled workers. Brown et al. (1982) review the existing literature on minimum wages of that time and concluded that a 10% increase in the minimum wage can reduce teenage employment by 1-3%. In addition, for young adults the effect was found to be smaller than that of teenagers but still negative⁴. Whilst for adults “the direction of the effect... is uncertain in the empirical work as it is in the theory.”⁵

In these studies, single equation models were used with the following form:

$$Y = f(Mw, D, X_i)$$

Where:

- the dependent variable (Y) is a measure of labor force status,
- M_w is a measure of the minimum wage,
- D is an aggregate demand variable usually to control for the business cycle and,
- X_i are other exogenous explanatory variables to control for labor supply.

³ The main country examined was the USA, and the regions were the U.S states.

⁴ The reason why the minimum wage literature has concentrated on youth labor market is because teenagers are typically at the bottom of the earnings distribution and because a large fraction of low-paid workers are teenagers

⁵ These studies have been reviewed by Charles Brown, Curtis Gilroy and Andrew Kohen in 1982 making helpful conclusions for the later “New Minimum Wage Research”.

The main supply side controls were the population share, Kaitz(1970); participation in the armed forces, Hashimoto and Mincer (1970); school enrolment Kelly(1975)&(1976); employment programs, Gramlich (1976). Concerning the business cycle variables, the most common ones were the adult unemployment or prime age male unemployment rates, the Federal Reserve Board's index of industrial production and the GDP gap, Brown et al (1982). However, these studies can be criticized for their neglecting of potential loop causality between the minimum wage level and the (un)employment rate. Governments may choose to increase or decrease the minimum wage rate based on the employment/unemployment level at the given time. Knowing the adverse effects on employment that may occur by increasing the wage rates, governments tend to avoid increasing the minimum wage in times of high unemployment.

The later studies of this era made a positive contribution to labor economics. Abowd and Killingsort (1981); Betsey and Dunson (1980) and Boschen and Grossman (1981), for example, were amongst the first economists who replaced the unemployment rate with the employment rate. Recognizing that as employment effects measure the cost of the minimum wage in terms of job opportunities and therefore employment rate is dominant over the unemployment rate.

Finally, in 1970 Kaitz (1970) introduced a new minimum wage variable to deal with the potential endogeneity in the model: the Kaitz index. The Kaitz index has been generally measured by the ratio of the nominal minimum wage divided by the average hourly earnings weighted by coverage. The main reason that this variable was considered superior to other measurements was the information about relative prices of workers and the degree of coverage^{6 7}. Yet some of economists of that time were not convinced by Kaitz's methodology and continued to use the real minimum wage rate, Adie (1973) and Gramlich (1976). A more detailed discussion about the main and control variables can be found at chapter 4.

2.2 Moving forward to panel studies

In the early 90s, the publication of the Industrial and Labor Relations Review (ILRR) triggered a new wave of research, known as the "New Minimum Wage Research". While previous studies were using either time series or cross section techniques to study the minimum wage, the new strain of research

⁶ In 1938, when the first minimum wage was introduced in the United States, there was not full coverage in all industries. Thus, was essential to control for which industries the minimum wage was binding.

⁷ Others measurements of the minimum wages were the ratio of the minimum wage to average hourly earnings (Arthur Burns 1966), dummy variables for changes in the level or coverage of the minimum (Hugh Folk 1968) and the real minimum wage (Douglas Adie 1971).

attempted for the first time to exploit both time and cross section variations in order to identify the relationship between minimum wage and employment. These studies found a wider range of elasticity estimates in magnitude and significance – some papers found positive or no effects on employment by a minimum wage increase, (Card 1992a). This led economists to question the existent consensus that minimum wages decrease employment among lower-skilled workers, generating an intense debate between Card and Neumark⁸. Whilst Card tended to find positive or zero employment effects from a hike in the minimum wages, Neumark's findings suggested a negative relationship between minimum wage policy and employment which was consistent with the prior literature. This bilateral academic commenting on the different techniques used by both parties provided a substantial evolution of how we should study the minimum wage policy.

The specification used in these panel studies is based on the labor demand curve which in broad sense is no different from the traditional empirical approach used before 90's. The only difference is that there was experimentation on the econometrics techniques:

$$(1) Y_{it} = \alpha MW_{it} + \beta D_{it} + e_{it}$$

Where:

- the dependent variable is the employment (Y),
- the explanatory variable is the minimum wage variable (MW),
- (D) is a vector of control variables. The data set may include state (i) and time (t) effects.

In April 1990, the United States increased the minimum wage at a federal level. Card (1992a) took the opportunity to study the effect of the increase in the federal minimum wage on teenager employment using regional variation in employment and wages. He analyzed the data as a whole and by State using a two-stage Least Squares. The instrumental variable was the fraction of teenagers in the affected wage range to account for the change in teenage wages. Card's (1992a) findings consistently found that the minimum wage increase raised the average teenage wages without finding any evidence of corresponding losses in employment. These findings were in contrast with the existing literature of that time which had concluded that a 13% increase in the minimum wage would result in reducing the aggregate teenage employment by 1 to 4 percentage points, Brown et al. (1982).

Using panel data on state minimum wage laws and economic conditions from 1973 to 1989, Neumark and Wascher (1992) estimated the effects of a rise in the minimum wage on the employment to

⁸ The exact papers are analyzed later in Chapter 2.2

population ratios of teenagers and youths. They used a first difference model incorporating coverage, demand and supply controls. Their results, in contrast to Card's, supported the earlier consensus that an increase in the minimum wage has a negative effect on employment among teenagers. In particular, employment elasticity's ranged from -0.1 to -0.2 for teens and -0.15 to -0.2 for the youth population as a whole. Neumark and Wascher (1993), replying to Card's and Krueger criticism (1993), proved that omitting lagged minimum wage effects leads to substantial upward bias in short first differences estimates. In addition, they showed that demand variables are as important as supply variables for unbiased results.

Card and Krueger (1994) published an influential study which assessed the impact on employment of the 1992 increase minimum wage level of New Jersey State. The study was based on a telephone survey of 410 fast-food restaurants in New Jersey which was the examined group with Pennsylvania considered as the control group. Their results, using three statistical experiments, showed that the minimum wage increase led to an increase in employment, with the level of elasticity varying from 0.63 FTEs to 0.73 FTEs (full time equivalents).⁹

The divergent findings of these studies brought into question the methods used. Therefore, later studies dedicated themselves to explaining and studying the appropriate methodology by which the employment effects of minimum wage should be measured. More specifically, the attention was drawn to the appropriate measurement of the variables, the appropriate specification of the economic model and the relevance of the comparison groups used in studies.

In summary, the first wave of empirical research which adopted time-series approach, focused on specific demographic groups to measure the employment effect in the presence of a rise of minimum wage. The key demographic group was teenagers, under the assumption that teenagers are most likely affected by the minimum wage since they lack in skills and work experience¹⁰. One of the main criticisms of these studies is that previous literature failed to recognize that time-series require different techniques than cross-sectional. Williams and Milss (2001) argue that previous times-series studies did not adequately account for serial correlation, stationarity in the data and endogeneity issues and that is why they tend to find no effect or positive coefficients. Finally, using the same dataset as Card and Krueger (1995) they find a negative relationship between the minimum wage and

⁹ The three different comparisons that they used were employment changes between new Jersey restaurants initially paying different starting wages, between stores located in the examined state and the control state and a comparison which combines the above two comparisons.

¹⁰ Other demographic groups were also examined such as Hispanics, Blacks, and women.

teenage employment¹¹. Other studies that criticized and addressed the time series studies are those of Bazen and Marimoutou (2002), as well as Wolfson and Belman (2011 & 2004).

As we will see in the subchapter 2.4, the literature turned to greater panel sets in order to exploit a greater variation in relative minimum wages across individuals, industries or countries. Studies based on time-series cross-section appear to have more reliable estimates. However, the endogeneity problem still remains over the measurement of the employment variable even if there are attempts to correct it with an IV, failed.

2.3 Consensus paradox

In his book “Theory of Unemployment Reconsidered”, Malinvaud (1977) questioned the simplistic theoretical model by which the labor market is studied, with the level of wages as the only determinant of employment. The rationale behind this reasoning is that one should not examine only a partial equilibrium (labor market), but a general equilibrium in order to study the involuntary unemployment. He supports this view by arguing that rationing in the labor market is related and dependent on the goods market. In this context, he develops a general equilibrium under three different regimes. The first regime called “Keynesian unemployment”. This relates to when both markets (goods and labor) are rationed, i.e. a situation of a recession caused by demand shocks – technological change or austerity measures.¹² The second regime called “classical unemployment” refers to where labor is not fully employed but sellers sell all their supply¹³. Finally, the “inflationary regime” where demand exceed supply in all markets and since price rigidities exist, the inflation is somewhat repressed¹⁴. Based on this framework he applies different policy implications and proves that in the presence of different regimes, policy implications have a different impact in employment-unemployment.

¹¹ Card and Krueger (1995) in their book “Myth and Measurement: The New Economics of the Minimum Wage,” revised the previous literature based on time series and concluded that there is no statistically reliable evidence that minimum wage decrease employment.

¹² Cyclical, deficient-demand, or Keynesian unemployment, occurs when there is not enough aggregate demand in the economy to maintain full employment. There is a decrease in demand for most goods and services which leads to less production and consequently fewer workers are needed, wages are sticky and do not fall to meet the equilibrium level, and deterioration of unemployment.

¹³ Classical or real-wage unemployment occurs when real wages are set above the market-clearing level, resulting to excess labor supply.

¹⁴ Terminology: A situation in which price and wage increases are restrained by official controls. This can lead to an increase in inflation when the controls are relaxed, unless policies to remove the excess demand are adopted.

Malinvaud takes into account as a policy measure the increase of the wage rate. However, he does not mention minimum wage policies, though he states that policy measures can change the wage rate. Under that concept, an increase in the minimum wage will change the wage rate in the group that is binding and it may also affect the average wage to increase through spillover effects. In the Keynesian regime he finds that in an increased wage rate the excess supply of goods will decrease, resulting in an increased labor demand. On the other hand, an increased wage rate will also increase the labor supply, thus the effect on unemployment is ambiguous. There are two cases: first, the firms trade the additional cost by increasing the hours per worker, increasing unemployment or employ more workers. Second they can increase employment only if the increase in the supply of labor is less than the increase of the labor demand. Otherwise, there will be no employment effect. Under the classical unemployment regime, an increase in the wage rate will lower the employment. Finally, under the inflationary regime an increase in the wage level induce a reduction of the demand for labor by firms.

Malinvaud mathematically proves that where different assumptions taken as a benchmark, different results can be derived. The different regimes that Malinvaud talks about can also be taken as different economic cycles or economic regimes that can exist in a specific time period. Therefore, one possible explanation for the divergence of results on the employment elasticities due to a rise in the minimum wage is that the studies covered different time periods capturing different regimes or more than one each time or even omitting these factors.¹⁵

A different opinion is offered by Schmitt (2013) who argues that the added wage cost on employers by a minimum wage increase is relatively small to most firms' overall expenses. Employees have in their disposal a lot of other adjustment channels to compensate the added cost such as reduction in hours worked, non-wage benefits, training. Some employers may also accept a smaller profit margin. Card and Krueger (1995) argued that the employer's response to a rise in the minimum wage depends on the employer's credo and the ability to pay combined with the structural characteristics of labor markets. An employer with a high sense of fairness or with a relative higher profit margin is more likely to absorb the higher minimum wage cost. Furthermore, employers may compensate their added costs of a higher minimum wage by increasing prices for consumers. However, a higher price level will decrease consumption and real wages and possibly, employment.

¹⁵ On the other hand, a lot of the literature in the New Minimum Wage Research have been "accused" by later papers, for biased results arising from misspecifications in their models. David Neumark and William Wascher (2006) they reviewed over 100 citations on the employment effects of minimum wages.

Finally, a higher minimum wage may also motivate workers to work harder, -“efficiency wage”, Marshall (1920)¹⁶ - may therefore increase productivity. An increased productivity, either by inducing current employers to work harder or by attracting other more productive workers to seek for a job with the new higher minimum wage, will shift up the production function and the demand for labor, mitigating dis-employment effects. Indeed, some studies have found little or no effect on employment by an increase in the minimum wages.

2.4 Going towards macroeconomic modeling

In late 90's the literature started using cross-country time series analysis to estimate the minimum wage effects on employment under the assumption that minimum wages vary considerably across countries than over time within a country finding mostly negative effects, Hamermesh (2002). OECD (1998) is the first paper that used data from a panel of industrialized countries to study the effect of minimum wage on employment. The panel includes seven to nine OECD countries over the period 1975 to 1996.¹⁷ Using different specifications, their results indicate negative and significant minimum wage effects on the employment rates of teenagers. The estimates for youth and adults have a wider variation ranging from -0.22 to 0.05.¹⁸

Neumark and Wascher (2004) extended the panel to 17 OECD countries over the period 1975-2000, finding negative and significant minimum wage effects on teen and young employment. Their findings showed that it is important to account for institutional and other policy-related differences when using international data to study the effect of the minimum wage on employment. Dolton and Bondibene (2012) studied the effect of the minimum wage on age-grouped employment and, following Neumark and Wascher (2004), tried to shed some light on the different measures of the minimum wage variable and control variables that can be used but failed to come up with robust results. It should be noted that while Neumark and Washer (2004) used the institutional factors to see whether they interact with the minimum wage, Dolton and Bondibene (2012) incorporated the institutional factors in the demand labor model as control variables to estimate the employment elasticity levels. The paper examined 33 countries over the period 1971-2009 controlling for

¹⁶ Marshall, Alfred (1920) “Principles of Economics”. Library of Economics and Liberty, Book VI, Chapter III, 8th edition.

¹⁷ The countries included are Belgium, Canada, France, Greece, Japan, the Netherlands, Portugal, Spain and the United States. In some specifications they exclude Portugal and Spain due to unavailability of data.

¹⁸ The positive effects are only for adults while in both groups the majority of the coefficients are not statistically significant.

institutional and other policy-related differences across countries that might have an impact on employment other than the minimum wage. They found significant and negative employment estimators for teenagers of minimum wage increases and less significant results for adults (e.g. only with one out of three alternative measures of minimum wage). Dolton and Bondibene (2012) also found that in recession periods the negative effect on employment of the minimum wage on young population is large¹⁹.

3. Theoretical framework

In this chapter, the theoretical framework used is discussed. Initially, the simple supply-demand labor market model and the effects of minimum wage on employment are presented. The subsequent analysis relies on analyzing which groups earn the minimum wage and the role of education on the effect of minimum wage on employment. Finally, there is a discussion regarding the role of labor market institutions on employment.

3.1 The Neoclassical supply-demand labor market model

Most of the papers mentioned in the previous chapter have based their model on the simple Supply-Demand model with homogenous labor, complete coverage and competitive labor market.

The competitive labor market is in equilibrium at wage level w^* and employment E^* where demand for labor $D(w)$ is equal to the supply of labor $S(w)$ and employment is determined by demand and supply (see Figure 1). At the equilibrium point, firms can only employ additional workers if real wages decrease, Hansjörg (2009).²⁰ A minimum wage policy with universal coverage and with a binding minimum wage²¹ $w_m > w^*$ will distort the equilibrium, reducing employment to E_m .

A binding minimum wage leads to a demand-determined employment $E_m = D(w_m)$ and an excess supply of labor $S(w_m) - D(w_m)$. As a consequence, firms move up the labor demand curve and the

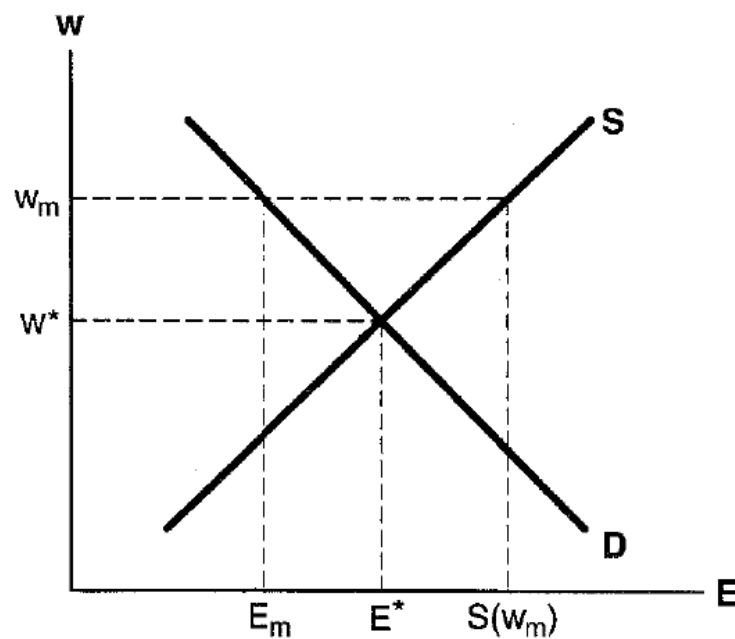
¹⁹ Only when GDP growth is used as a control variable.

²⁰ Marginal productivity of labor is equal to real wage rate.

²¹ Minimum wage above the equilibrium wage. A minimum wage which is below the clearance level does not have any effect on the labor market.

employment loss $\ln(E_m) - \ln(E^*)$ depends only on the elasticity of demand for labor and the difference between the minimum wage and the competitive wage, $\ln(w_m) - \ln(w^*)$.²²

Figure 1: Minimum Wage Theory as in Brown (1999, p.2104)



An increase of the minimum wage creates unemployment $S(w_m) - E(w_m)$ through two channels. Firstly, firms will try to compensate the increased cost from a minimum wage increase by displacing workers from their current jobs creating unemployment $E(w_m) - E^*$. Secondly, a higher wage rate will attract workers in the labor market and since demand at the new minimum is “decreased” they will fail to find a job. Thus, additional unemployment will be generated, $S(w_m) - E^*$.²³

According to the neoclassical framework, employment will decrease if the minimum wage rate is valued above the market clearing-wage level. The negative relationship is attributed to the fact that an increase in the minimum wage will lead to a laying off of the workers who were paid the new minimum wage or lower. Minimum wage workers who were paid more than the new minimum wage

²² Borjas (2005) “Labor Economics” Chapter 3, Brown et al. (1982) and Brown (1999).

²³ Borjas (2005) “Labor Economics” Chapter 3, Brown et al. (1982)

before the increase are relatively cheaper – in terms of productivity – in relation to workers who were paid less than the new minimum wage before the increase. Thus, a rise of the minimum wage will generate a substitution effect away from low skilled minimum wage workers towards higher skilled workers, Grant and Hamermesh (1981). However, the decreased employment is depended on the minimum wage increase and the elasticity of labor demand.

A rise of unemployment caused by increased wages will affect prices as the marginal product of labor now equals the new minimum wage. Thus, goods and services will be more expensive relative to the competitors resulting in a loss of international competitiveness and therefore decline in exports. In addition, Rodrik (1997) emphasized that the elasticity of demand for labor to be higher with greater openness. However, Riihimäki (2004) showed that the labor demand elasticity is increased by intensified trade competition, whereas the effect can be balanced by decreasing the elasticity of substitution between differentiated products only by better advantage economies of scale. Thus, a minimum wage far from the clearing wage will have the most adverse employment effects in a small open economy where competitiveness is more significant.

As labor costs are highly linked with international competitiveness the argument goes that an increase in minimum wage will raise wages relatively to competitors with adverse effects on traded goods industries. However, for such a scenario to be realistic, the new minimum wage rate has to be far away from the equilibrium level of the labor market.

To conclude, firms decide whether they will defend the existing profit mark-up or not. If firms decide to keep the existing profit mark-up either they will roll over the labor cost to the prices or they will lay off a proportion of the less productive workers. If the firms decide to increase their prices they will face administration cost and a loss in their exports.

3.2 Who earns the minimum wage and what is the role of education?

Minimum wage theory indicates that minimum wage workers are individuals with low work experience and young in age. Therefore, the literature focuses on studying the effects on minimum wage on different age groups. Findings suggest that the effects of an increase in the minimum wage are different between these groups with negative effects on teenagers, a lower coefficient than teenagers but still negative and significant for young adults and no effect or close to zero for adults. The difference in effects among teens, young adults and adults is attributable to the fact that the individuals younger in age are paid less and therefore are more likely to earn the minimum wage.

A popular and significant idea in the field of labor economics is to consider the set of marketable skills of workers as capital in which they can make some types of investment. This view is crucial in understanding both wages and earnings' structure.

Wage rates are determined to a large extent from the bargaining power between employers and employees. One of the determinants of the wage level is educational attainment which is closely related with productivity. Human Capital theory (Becker, 1964) suggests that individuals and firms foresee education and training as an investment where the individual invests some proportion of income during the education and training period in return for increased future earnings and productivity. The yield on the investment in education that the investors will receive as future net earnings is called private returns to education. Therefore, it is theorized, higher education offers better job prospects and higher flexibility in the market. Recent evidence supports this theory. The wage gain from an extra year of schooling is around 5–10% gain in earnings per year of education (Card, 1999; Harmon et al., 2000). However, private returns of education vary substantially across Europe. Badescu et. al (2011), studied the private returns to education for 24 European countries using the data of the European Community Statistics on Income and Living Conditions (EU-SILC) in a log wage equation. The findings suggest that returns to tertiary education ranging from 98% in Portugal to 21% in Sweden while the wage penalty for not attaining the secondary education ranges from 7% in Denmark to 31% in Austria²⁴. Clearly, higher education can yield higher future earnings.

But does this mean that individuals with higher education are less likely to earn the minimum wage? An OECD (1998) Employment Outlook that uses cross-country comparisons to investigate the impact of the minimum wage on employment reports some evidence on the minimum wage workers characteristics. The data provide information only for Hungary on 1997. Workers who are paid minimum wage or less with a basic education account for 5.1%, with upper education for 3.3% and with higher education for 1.1% of all the minimum wage or less workers. The same figures in the United States are 14.7%, 4.4% and 3.1% respectively. The authors also provide evidence concerning the age of the minimum wage workers which actually indicates that minimum wage workers vary also based on age with highest rates for teenagers and young adults.

A more recent survey from Eurostat, Structure of Earnings (2010), found that 30% of the employees (excluding apprentices) below the age of 30 were low-wage earners in 2010. According to Eurostat, low- wage earners are employees earning less than 66% of the median gross hourly earnings²⁵.

²⁴ Upper secondary or post-secondary non-tertiary level of education are referred as secondary education.

²⁵ Excluding apprentices, http://ec.europa.eu/eurostat/statistics-explained/index.php/Wages_and_labour_costs

Netherlands and United Kingdom ranked first on low wage earners with a 46.1% and 40.6% respectively while Sweden ranks last with 9.5%.

A study by Rycx and Kampelmann (2013) using the SILC database, studies the socio-demographic characteristics of minimum wage earners in Europe. They found that minimum wage earners are characterized by a lower average age and lower levels of educational attainment than workers with higher wages. Their results also indicate that there is some diversity among different countries. In particular, among others they study the distribution of employees according to educational attainment of the three first educational levels separately. Table 1 below contains the likelihood for each group of being paid the minimum wage in 2007 and we can identify two key points. First, countries in Europe have differences in their income distribution. In particular, we can see that countries from South and Eastern Europe tend to have fat tail distribution of minimum wage workers with lower educational levels (1-2) to the left while more developed countries such as Ireland, United Kingdom and Belgium show a smoother educational distribution among minimum wage workers. This indicates that there are individuals with higher educational attainment that may earn the minimum wage. It would have been interesting to see the same distribution results when we divide the groups by age and all levels of educational attainment. Secondly, Table 4 proves that there is a significant number of people with the lowest level of education that work for or below the minimum wage. Even if in these countries there is a national coverage, statistics show that the individuals with the lowest educational attainment (ISCED 1, 2 & 3) may earn less than the minimum wage in the uncovered sector. The last point is supported by my results and it is discussed in Chapter 5.

Taking into account what was discussed in 3.2 we can conclude on the followings: First, minimum wage workers exist across all age groups in Europe especially below the age of 30. Secondly, the level of education attainment can affect the individual's earnings. Thirdly, minimum wage earners have lower educational attainment than workers with higher wages. Fourth, minimum wage distribution varies across Europe²⁶. Fifth, there are low-skilled workers that may earn below the minimum wage. Sixth, individuals with higher upper secondary and tertiary education can "bite" in the minimum wage. Difference in dis-employment effects may also exist if we divide the examined groups based on educational attainment and skills-age. By dividing groups based on education, it is possible to isolate the effect of the minimum wage on groups that are less flexible in the labor market, and therefore can't move away from the low paid/skilled sector.

²⁶ This point is made to further support the minimum wage variable used in the model, minimum wage divided with the median. Chapter 4.3

Table 1. Individual characteristics of employees below and above minimum wages (2007)

Individual wage Educational Attainment	Average age		Distribution of employees according to educational attainment (ISCED)					
	<=MW ¹	>MW	<=MW			>MW		
			ISCED 1	ISCED 2	ISCED 3	ISCED 1	ISCED 2	ISCED 3
Countries								
Hungary	37.4 (11.2)	40.2 (10.8)	30.6	66.9	2.6	11.4	64.1	24.5
Ireland	33.5 (14.6)	39.8 (12.5)	35.6	52.3	12.2	22.5	36.5	27.4
Poland	36.7 (12.2)	39.5 (11.1)	15.2	77.6	7.2	5.7	66.9	27.4
Spain	36.1 (13.0)	39.5 (10.7)	55.5	20.7	23.8	35.9	25.1	39
United Kingdom	41.5 (14.8)	41.1 (12.1)	23.5	61.8	14.7	9.4	54.5	36.2
Belgium	36.1 (11.7)	41 (10.1)	29.1	41.5	29.4	16.8	38.4	44.8

Source : Rycx and Kampelmann (2013), Table 4, I have include the relevant countries for my analysis.

¹ MW are the (differentiated) national minimum wages

² Standard errors in parenthesis

3.3 Statutory Minimum wage Legislation and wage rates in EU

Nearly 75% of EU Member States have statutory national minimum wage legislation, Funk and Lesch (2005)²⁷. In the examined countries, more than 65% sets the minimum wage solely by government decision while the rest countries of the panel allow a form of negotiation with unions. The national minimum wage usually has a full coverage and applies to all employees, or at least to the vast majority of employees in a country. It can be set on a fixed rate by hour, week or month and is binding by law, often after consultation with social partners, or directly by a national inter- sectorial agreement, Eurostat (2015)²⁸.

²⁷ <http://www.eurofound.europa.eu/observatories/eurwork/comparative-information/minimum-wages-in-europe>

²⁸ <http://ec.europa.eu/eurostat/documents/2995521/6652357/3-26022015-AP-EN.pdf>

Minimum wage has returned to the center of policy debates in EU member states, as a way of ensuring minimum standards in the face an EU enlarged labor market and capital movements. The rise of new, and increasingly precarious, forms of employment contracts rung the bell for a revised legislation for the low paid. There are, however, disparities on the results and policies followed within EU governments. Voluntary policies as in France the Baltic and the Central and Eastern Europe (CEE) countries led to positive minimum wage developments, while in Ireland United Kingdom and Benelux countries the minimum wage lost ground²⁹, Vaughan-Whitehead (2010).

The new EU Member States from CEE had a rapid growth in GDP which was extremely beneficial for the wage rate as a result of joining the EU. The rapid increase of wages in real terms had a knock-on effect on the value of the minimum wage. Graph 1 presents the minimum wage growth in real terms over the period 1997 to 2013. Estonia experienced a 134% increase in real minimum wage. CEE countries followed the same pattern starting from a 60% increase (Poland) over the period 1997 to 2013.

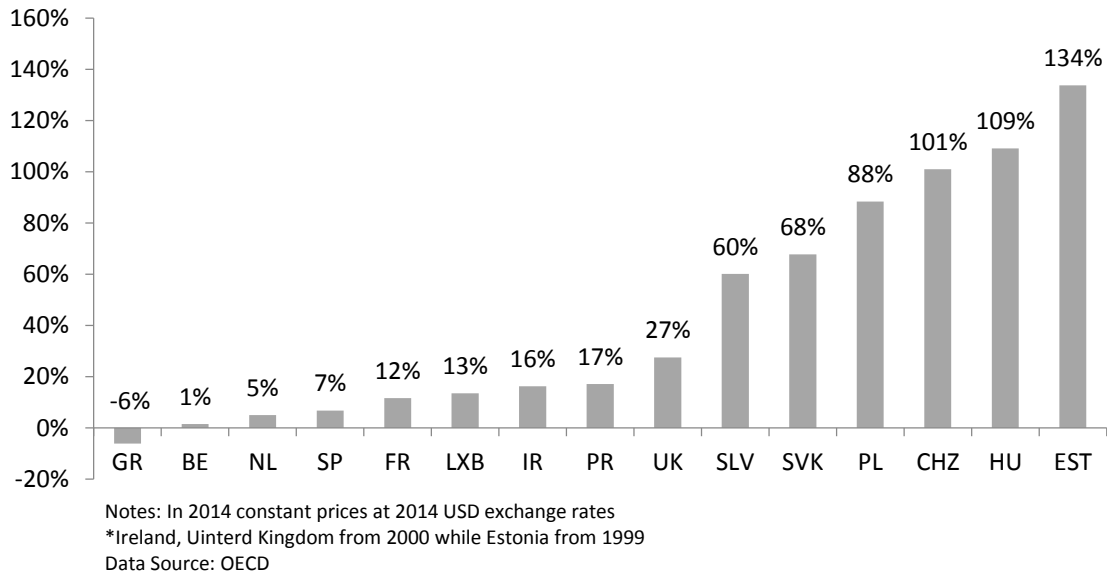
More moderate increases can be observed in the UK where, since its introduction in 1999, the minimum wage has increased by 27% which is 3.5% above average inflation. In contrast, Spain, Greece and the Benelux countries have followed contractionary policies resulting into wage moderation policies.

In order to assess the minimum wage policy strength a measure known as the “Katz index” is usually analyzed which is the minimum wage divided to mean or median wage. This dissertation uses as its main variable for its analyses the minimum wage to the median³⁰. The reason for this is that the importance of the minimum wage is dependent on the shape of the wage distribution. Given the level of the minimum wage the percentage of workers who are affected by the policy is determined by the shape of the earnings distribution, Rutkowski (2003). The advantages of this index are discussed in detail in subchapter 4.3.

²⁹ Greece belongs to these countries due to recent years where economy suffers from shock wage moderation policy adjustments.

³⁰ Herein, the Kaitz index will refer the minimum wage to the median earnings variable

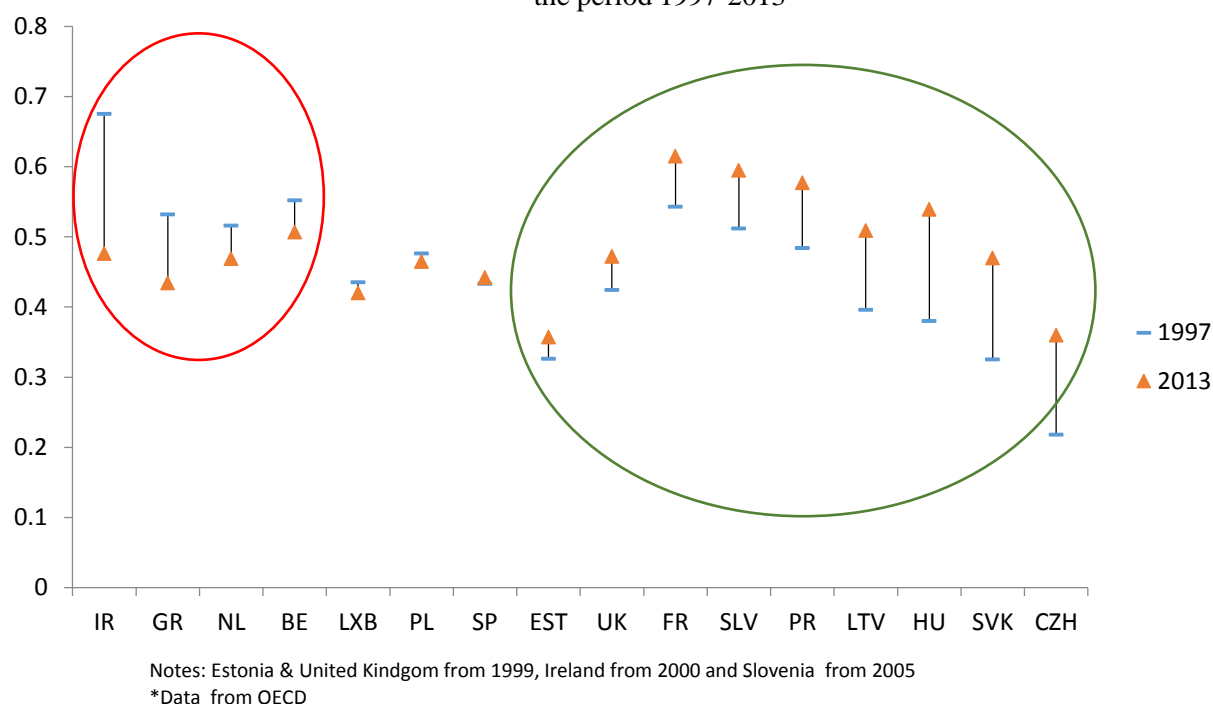
Graph 1: Growth of real minimum wages, 1997-2013 (%)



Indeed, when we analyze the countries based on the minimum wage as a percentage of the median wage a different picture is revealed. Graph 2 presents the Kaitz index evolution over the period 1997-2012. We can distinguish three patterns. An increase in the strength of the minimum wage related to the income distribution, no significant change and a decrease in strength. In particular, Ireland in Graph 1 seems to have a 17% increase on real minimum wages however the Kaitz index plummeted by 30%. That means that the median wage grew much more faster than the minimum wages which was resulted by non-active minimum wage policy. In general, Ireland, Greece, Netherlands, Belgium and Luxembourg had a decrease in the Kaitz index while Poland Spain and Estonia remained stable. Estonia is another good example. Real minimum wage growth over 2000-2013 was 134% but the minimum wage as a percentage of the median wage remained constant. This is an indication that wages in the low paid market rose substantially in relation with the minimum wage. The third group on the chart is the one that experienced a substantial increase on the Kaitz median. In particular, the most of the examined CEE countries experienced an increase of 0.6% to 65%.

To conclude, there is a significant variation in minimum wages and Kaitz index over the period 1997-2013 which can be exploited in order to get bias results.

Graph 2: Minimum wage as a % of median wages of full-time employees over the period 1997-2013



3.4 Labor Market Institutions

In the empirical model of this dissertation, a set of five labor market institutions and regulations controls are incorporated. The control variables selected for this analysis are the standard amongst empirical labor market policies literature – Laporšek (2013), Neumark & Washer (2004, Dolton & Rosazza (2012)- and include: active labor market polices, passive labor market policies, employment protection for fixed term contracts, employment regulation for temporary contracts and union density.

Labor market policies and institutions influence the effects of the minimum wage on employment, Buchele and Christiansen (1999), Neumark and Wascher (2004), Addison and Ozturk (2011). For example, in the presence of a minimum wage hike, teenagers might experience larger unemployment effects in a country where labor market rights are strong and there are restrictions on using regular contracts, as opposed to countries where employers have the legal convenience to adjust employment levels. On the other hand, if a government decides to increase the minimum wage rate, it can mitigate its effect by implementing policies designed to bring unemployed individuals back to employment. Therefore, the government will substitute the adverse employment effect with higher government spending.

Europe has a long tradition on labor market policies and institutions which differs significantly across countries and across time. Therefore, a fixed effect model omitting these labor market institutions will fail to capture their effect on employment giving false results regarding the employment effects by the minimum wage policy.

3.4.1 Employment Protection Legislation

The first index used is the employment protection legislation ('EPL') for regular contracts, including collective dismissals and measures the "strength of legal framework governing hiring and firing" (Nickerll, 1997 p.60). EPL strictness takes into consideration the procedural inconvenience to firing or hiring, notice and severance pay for no-fault individual dismissal and difficulty of individual and collective dismissals. Therefore, a higher EPL strictness value indicates a high degree of protection while low values are associated with relative ease in dismissing employees.

EPL strictness index gives an indication of the law that aims to enhance workers welfare and improving employment protection by imposing firing costs either directly, severance pay, or indirectly via red tape costs linked with procedural inconvenience, Holmlund (2013). Imposing firing costs will not only affect firing but hiring decisions as well. In an increase of the EPL strictness, firms will anticipate that the adverse future demand conditions may require future dismissals following by layoff costs, Millard and Mortensen, 1997; Millard, 1996; Nickell, 1982).

Theoretical work related to EPL predicts that EPL lowers labor turnover for both hiring and firing, but at the same time increases the length of unemployment spells. Therefore, the net impact on the employment is ambiguous. Nunziata (2002) finds no overall significant effect. However, a study from OECD (2004) finds that the reduced turnover will increase youth unemployment relative to adult unemployment.

The second index is the EPL index used to control for labor market regulation is the employment protection for fixed-term and temporary work agency contracts. The indicator is constructed from OECD by measuring the rigidity of labor standards in legislated working time rules, labor market flexibility to use employment contracts and workers' rights. In order to distinguish it from the previously discussed EPL I will call this indicator Labor Rigidity. This index is incorporated into the model as we expect a lot of young adults and teenagers to work with temporary contracts, Rycx and Kampelmann (2013). Flexibility on temporary forms of employment means that the employer can tackle the increased labor costs rising from a minimum wage hike by adjusting employment levels. Therefore, we expect labor standards to have a negative effect on employment. Groups that are expected to be binding to labor standards are teenagers, young adults and maybe adults with the lowest level of education attainment. However, in some cases more labor market flexibility in itself does not

necessary increase the employment rate, Koranchelian and Fanizza (2005). They argue that in some case increasing labor flexibility should be accompanied by sound economic policies aimed to improve job creation.

3.4.2 Labor Market Policies and Union Density

Labor Market Policies ('LMP') are public labor market interventions which are aimed at correcting disequilibria in the labor market and are explicitly targeted at groups with difficulties in the labor market. There are two kinds of LMPs: Active LMP ('ALMP') and Passive LMP ('PLMP'), these will be considered below.

The third OECD measure incorporated in the model is the Active Labor Market Policies ('ALMP') which aims to bring unemployed individuals to employment by various public programs such as direct job creation, employment incentives, and training and public employment services. The indicator shows the level of public expenditure on such programs as a percentage of GDP.

In theory, ALMP is associated with enhancement of the job matching process and offering skills to the unemployed. Therefore, ALMP is expected to have a positive impact on employment. However, empirical results found that the success on these policies vary significantly from program to program and across countries. Jaap de Knonning (2001) on his literature review concludes that there is a considerable variation between regions and sites that makes the average effect of ALMP look very small. On the other hand, OECD outlook (2006) finds a negative relationship between ALMP and unemployment³¹. Nevertheless, on a macroeconomic level the positive effects of ALMP to employment need to be weighted with the amount of taxes that are needed to support these programs.

The fourth labor market control variable incorporated is the Passive Labor Market policies ('PLMP') which are measured as a percentage of GDP. PLMPs include the full, partial and part-time unemployment benefits, bankruptcy and redundancy compensation.

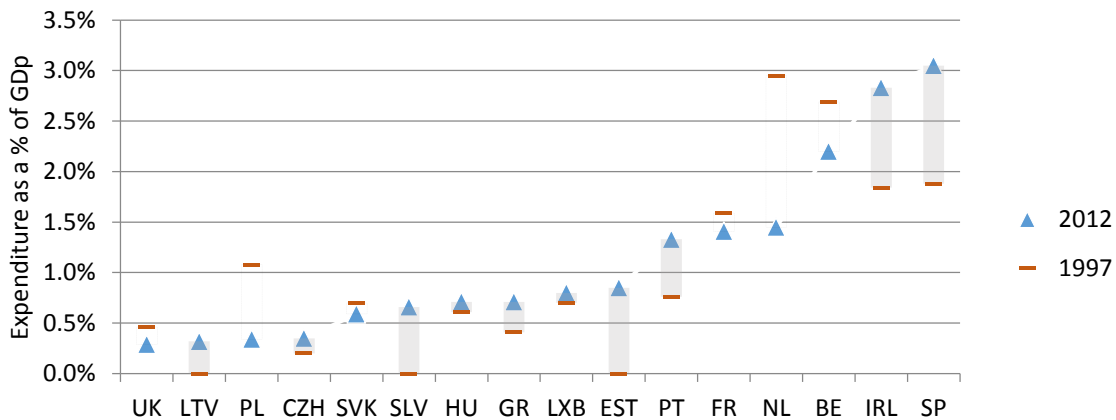
PLMPs can have adverse effects on labor market performance. As passive labor market policies are designed to provide financial assistance for a prolonged period in the case of involuntary dismissal, they can reduce the job search intensity or lower the economic cost of unemployment for the individual. In particular, the effects of unemployment benefits seem to be stronger when the maximum duration of unemployment is longer Holmlund (2013). However, these adverse effects on employment should be weighted with the effects on employment in the case of an absent

³¹ OECD Employment Outlook (2006) Chapter 7, "Reassessing the Role of Policies and Institutions for Labour Market Performance: A Quantitative Analysis".

unemployment benefit. The nature of the unemployment benefit and the rest of the passive labor markets policies are to secure a standard of living and support economically the unemployed individuals to find a new suitable job. Nevertheless, we expect to find a negative relationship between employment and PLMP for all groups.

In Chart 3 we can see the expenditure on PLMP as a percentage of GDP. The blue triangle indicates the percentage of GDP spent on PLM in 2012 while the orange line is the value in 1997. As we can see PLMP's vary significantly across countries but also across time. In particular, Spain, Ireland, Belgium, Netherlands and France have historically a more social approach regarding passive labor market policies, while the rest of the panel never exceeded the 1.5% of GDP over the period 1997-2013. Belgium for example, dedicated 1.9% of its GDP than UK for unemployment benefits in 2013.

Chart.3 Passive Labor Market Policies Expenditure as % of GDP



Source: OECD and Eurostat, derivations by the author

Finally, following prior literature the last market control used is the union density, which is an indicator, constructed by OECD. Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners³².

Normally, in a statutory minimum wage regime government set a statutory minimum wage rate independently. However, as we see on Table 2 Belgium, Greece Ireland Poland and Slovakia allow active and direct negotiations with trade unions. Although, apart from countries such as Latvia that allow for indirect influence on the minimum wage fixing, trade unions can also influence governmental decisions on the level of minimum wage through public demonstrations, industrial

³² OECD Labour Force Statistics

action, collective bargaining or other means of publicly expressing opinion. Union density should be included as a control variable since, in theory; strong trade unions can push wages above market clearing level at the cost of lower employment.

Table 2. Minimum Wage Legislation, National minimum wage 2011

Country	Procedure	Coverage	Youth Subminimum	Other rates
Belgium	Negotiated	National	<21 ^{a)}	-
Czech Republic	Statute	National	<21 ^{a)}	Disabled, Domestic workers
Estonia	Statute	National	No	-
France	Statute	National	<18 ^{a)}	Disabled, Domestic workers
Greece	Negotiated	National	No	Marital status
Hungary	Statute	National	No	-
Ireland	Negotiated	National	<18 ^{a)}	Domestic , trainees
Latvia ^{c)}	Statute	National	<18 ^{b)}	Disabled, piece-rate workers
Luxembourg	Statute	National	<18 ^{a)}	Youth, disabled
Netherlands	Statute	National	<23 ^{a)}	Disabled, Piece-rate workers
Poland	Negotiated	National	No	
Portugal	Statute	National	No	Trainees, Disabled
Slovakia	Negotiated	National	No	-
Slovenia	Statute	National, private	No	trainees
Spain	Statute	National	No	Trainees, domestic, temporary workers
United Kingdom	Wage Council	National	<21 ^{b)}	Piece-rate workers, trainees

There are different fix rates for each age. Please advise table 3b.

Subminimum for youths is a fixed hourly level.

A separate minimum hourly rate is established for workers under 18 years of age, this rate may not be less than the hourly rate set for adult workers

Source : Travail legal databases, ILO

Table 3. Minimum Wage Legislation, Subminimum wage rates, 2011

Country	Teenagers	Youths
Belgium	70%-88%	94%
Czech Republic	80%-90% ^{a)}	90%
France	80% to 90% ^{b)}	80%
Ireland	70%-80% ^{c)}	80% - 100%
Luxembourg	75% to 80% ^{d)}	
Netherlands	30% - 52.5% ^{e)}	61,5% - 85% up to 22
United Kingdom	Fixed rates for 16 to 17 and 18 to 20	

a) Czech Republic sets a subminimum of 80% for ages below 18.

b) Workers below 17 years old receive 80% of the minimum wage. In addition, there are special rates for trainees ranging from 55% to 80% up to 21 years old.

c) The 70% of the national minimum wage applies to workers below 18 years old.

d) Workers of 15 to 17 years old receive 75% of the general minimum wage

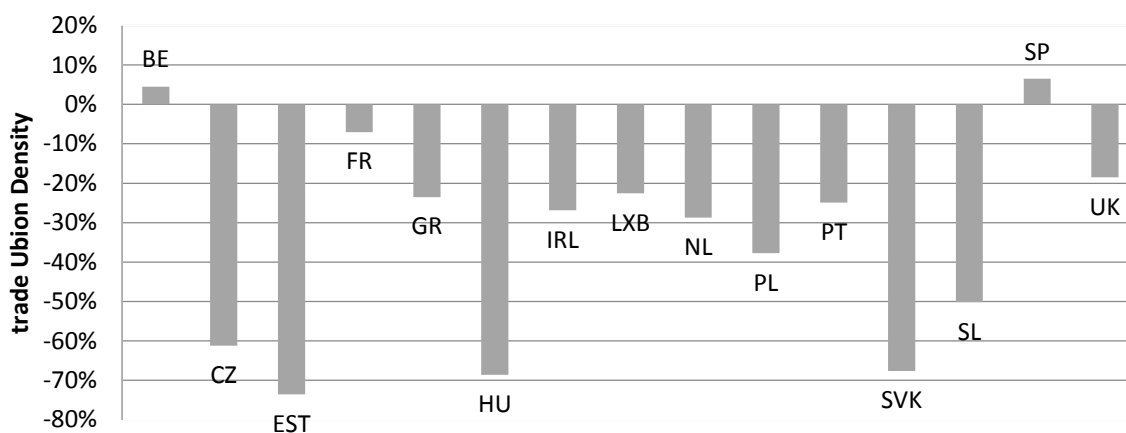
e) In Netherlands, subminimum are different for each age up to 22 years old

*Latvia set a subminimum not less than the national minimum of 2009 for teenagers under 18 years old.

Source : Travail legal databases, ILO

It should be noted that the strength of unions in Europe, at least for the countries included in the panel, has been substantially weakened in recent decades. Chart 4 presents the union density growth over the period 1997-2013, measured by the number of wages and salary earners that are trade union members divided by the total number of wage and salary earners. Belgium and Spain experienced a slight increase in union density. The rest of the panel experiences a decline from 7% in France to 74% in Estonia. Therefore, even if we expect the relationship between union density and employment to be negative it might not be significant.

Chart 4. Union Density Growth % 1997-2013



Source: OECD, derivations by the author

4. Data and methodology

The main goal of this dissertation is to investigate whether human capital theory differentiates the observed effect of minimum wages on employment. This study differs from the existing empirical literature by investigating the macroeconomic impact of a minimum wage policy on employment taking into account the education as a determinant factor of wage levels. As affirmed throughout this dissertation, education offers flexibility in the labor market. It is hypothesized that by distinguishing the dependent variable not only by age but also by the acquired level of education differences on the dis-employment effect arising from a minimum wage hike will be observed between groups with different education attainment who are within the age group.

4.1 Hypothesis development

Based on the literature discussed and theoretical framework outlined, there is diversity in both the age and educational level of minimum wage workers. In a rise of the minimum wage rate, higher education offers comparative advantages in the labor market. There are two reasons for this: firstly, minimum wage workers with higher education are less likely to be substituted from the lower educated counterparts. Secondly, in the post-dismissal period, higher educated minimum wage workers will experience shorter term unemployment, as they have the flexibility to seek employment in the competitive sector. By contrast, workers with lower education are less flexible and may be stuck in the minimum wage market. These groups will experience longer term unemployment until the minimum wage decreases or the labor demand curve moves to the right.

In this context, the hypotheses that are evaluated in the empirical part are the following:

Hypothesis 1: Individuals with lower educational attainment are more likely to bind at the minimum rate and therefore their employment will be more vulnerable to minimum wage changes.

Hypothesis 2: Younger individuals have a lower level of experience and thus they are more likely to have less flexibility to switch to the competitive market.

Hypothesis 3: Individuals with the highest level of educational attainment are not expected to bind at the minimum wage.

In summary, I expect to find a declining magnitude in the minimum wage coefficient when, within the same age group, educational attainment increases. I also expect to find a decrease in magnitude the older the group is.

4.2 Methodology

The specification of the model is based mainly on the results of Neumark and Washer (2004) as well as Dolton and Bondiebene (2012). Both of which recognised the necessity of including labor market characteristics as they differ temporally and across countries.

A fixed effects methodology is used, with cross fixed effects and time fixed effects. The model that we estimate is of the form³³:

$$E_{it} = a + \beta Mw_{i,t-1} + \Gamma G'_{it} + \delta T_t + \theta I_i + \varepsilon_{it} \quad (1)$$

Where:

- E_{it} is the employment to population ratio of the examined group,
- $Mw_{i,t-1}$ is the ratio of the statutory minimum wage to the median wage at time t-1 in country i. Baker et al (1999) and Neumark and Wascher (1992), showed that minimum wage effects on employment usually takes at least a year to be fully reflected. In addition, I include year effects T_t and country-fixed effects I_i .
- The vector G'_{it} includes a set of control variables. In particular, it contains lagged GDP growth by one period to control for business cycles and the recession. The population cohort as a supply control variable to control for supply changes and a set of labor market indexes to control for time variant labor market policies and institutions.

The model captures the long term effects of the minimum wage on employment; which are expected to be negative for groups with low educational attainment or who are young in age (excluding the ones that have acquired tertiary education).

To avoid a spurious regression, a panel unit root test, is conducted individually to all the variables³⁴. The variance and auto covariance of a non-stationary variable are independent of time which can distort the results in favour of statistically significant results when in fact no relationship exists. The results can be found in Appendix C Table 13.

Finally, heteroskedasticity is expected to be present in our model as standard errors can be different across the countries. The reason is that is impossible to measure and capture all factors that affect employment in a cross-section level. Therefore, we ensure robust standard errors by using Cross-

³³ Fixed effects model has been validated by using Hausman test.

³⁴ Levin, Lin & Chu t* test is used which assumes common unit root process.

Section (PCSE)³⁵ method proposed by Beck and Katz (1995) to handle the expected cross sector correlation.

4.3 Endogeneity

The way the minimum wage should be measured and used in a regression has caused much controversy in the literature. In particular, due to concerns that using the level of the minimum wage at the right-hand side of the regression may cause biased results, arising from correlation between the minimum wage and economic events that affect wage levels. Governments often decide to increase minimum wage in periods of growth and high employment to mitigate the impending negative effects on employment. If this is the case, the minimum wage is positively correlated with the level of employment making more challenging for the researchers to find negative employment effects, Dolton & Rosazana (2013).

In order to mitigate the endogeneity problem, researchers use the Kaitz index (Kaitz 1970) - which usually refers to the ratio of the minimum wage to average wages. A “relative minimum wage” index measures the bind of the minimum wage in the income distribution. Following the theory, a minimum wage increase will have an impact on employment only if the minimum wage is above the clearance level of the labor market. Therefore, the impact of the minimum wage will be always relative to the wage level and Kaitz index effectively captures the relative effect between minimum wage and wages.

Notwithstanding the benefits of utilizing the index, issues may arise in terms of interpreting results. The average wages based Kaitz index is heavily influenced by changes in the average wage. The average wage is consistently biased by the higher layers of income distribution, presenting a false image of the strength of the minimum wage. By using median, instead of mean, wages earnings it is possible to mitigate the bias arising from domestic income inequality. Furthermore, median Kaitz index accounts for differences in earnings dispersion across countries and therefore is more suitable for international comparisons than using the minimum wage level or Kaitz index based on average wages. This is vital as the European countries examined have different wage distribution as well as significantly variant minimum wage levels.

Finally, by using the Kaitz index we incorporate the real minimum wage effect. Generally, labor supply and demand respond to changes in real wages and the use of nominal minimum wage rate seems to violate the standard homogeneity assumption, Neumark and Wascher (1992). Therefore,

³⁵ Panel-Corrected Standard Errors

dividing the nominal minimum wage with the nominal median wage provides a solution to get the real effect of the minimum wage change.

$$\frac{\textit{Nominal Minimum Wage}}{\textit{Nominal Median wage}} = \frac{\frac{\textit{Real Minimum wage}}{\textit{Price}}}{\frac{\textit{Real Mean wage}}{\textit{Price}}} = \frac{\textit{Real Minimum wage}}{\textit{Real Median Wage}}$$

In this paper, the minimum wage to median earnings is used as the main variable. However, I re-estimate the results using the minimum wage to average wages to check for robustness as well as the level of real minimum wage.

Another advantage of using the “relative measure” over the actual level of the minimum wage is that it can capture dis-employment effects when the minimum wage rate is not adjusted properly by authorities. The Kaitz index measures how strong the minimum wage is in the income distribution, rather than merely a pure variation of the minimum wage rate. Therefore, there are two means by which the Kaitz index can be influenced, either by an increase in the real minimum wage or by an increase in the real median wage. When an exogenous demand factor is expected to increase the cost of production, for example, employers will generally try to compensate the expected increase in production cost by adjusting future production, wage rates and potentially employment. In particular, the anticipation of higher costs will be translated into a declined ability to take on new employees or even decrease the current work force. If the authorities do not adjust the minimum wage rate to the future market downturn, the policy will be relatively higher than the market-clearing wage rate than it was before and dis-employment effects will be generated. By focusing on measuring the effect of the minimum wage only when it is adjusted, the adverse effects of the policy will be neglected.

Finally, trying to measure the exact effect of the minimum wage policy with panel data would not be advisable. Econometric models can capture a part of the reality, but the more you expand your analysis, the more you should expect to omit. Studying labor markets is a complex topic as there are direct links with a country’s culture, general economy and legislative framework, as well as international market trends. All of which are difficult to capture in a single model. By focusing only on European countries and using a fixed effect model, the ‘omitted variables bias’ issue can be reduced somewhat, because of the partial integration of European states. The aim of this dissertation is not to measure the correct dis-employment effect of minimum wage policy, but to shed some light on the dis-employment differences within and between the examined age groups.

4.4 Education Enrolment & the Employment-Unemployment Tradeoff

As briefly discussed in Chapter 2.1, there is something of a consensus within the literature that the employment rate is superior to the unemployment rate when the aim is to unveil dis-employment effects from a minimum wage policy, Abowd and Killingsort (1981); Betsey and Dunson (1980), Boschen and Grossman (1981), Brown (1982). The reason for this is that the employment rate captures the loss of job opportunities resulting from the increase of the labor supply. In particular, it is expected that labor supply will increase with an increase in the minimum wage relative to the income distribution. As additional individuals enter the labor force to search for the now more attractive jobs, employment will decrease $S(w_m) - E^*$ as in Figure 1, Brown (1982).

However, when the employment rate is used as a dependent variable, caution should be exercised in interpreting the results, especially when discussing policy implications for younger individuals. The reason for this is that younger age groups are more routinely faced with the choice of participating in further education. Therefore two possible scenarios will be considered following a minimum wage hike. Firstly, the situation in which the individual is already in education and has the choice of either pursuing further education or joining the workforce. Secondly, the situation in which the individual is part of the workforce and, following a minimum wage hike, has been dismissed. Here the young individual has to make a decision between investing further in education, or remaining within the workforce to pursue a now higher wage³⁶.

Situation One: The Choice of Dropping Education

There is extensive literature studying the effects of the minimum wage variable on educational enrolment. The primary focus tends to be on teenagers, and diverse results have been reported. The main assumption that has driven these studies is that a higher minimum wage encourages teenagers to drop-out of school in order to join the workforce and try to acquire the new higher wage, increasing their labor supply³⁷. Notably, U.S studies tend to find a negative relationship between minimum wage variations and school enrolment, Neumark and Wascher (1995), Landon (1997), Chaplin et al (2003), Neumark and Wascher (2003). Pacheco and Cruickshank (2007) studied the New Zealand labor market, finding a negative effect on the school enrolment rate from minimum wage variations and no effect on education enrolment for young adults. By contrast, Campolieti et. al (2005) found that school enrolment was not impacted by the minimum wage policy in Canada over the period 1993-

³⁶ In addition, individuals have the choice to work part time and continue schooling or drop schooling and join the underground economy, Freeman (1996), cases that will not be discussed in this dissertation.

³⁷ As discussed throughout this dissertation, a decrease in the school enrolment will be captured from the model and translated as an excess labor supply and therefore as dis-employment effect.

1999. Whilst Bakis (2015) & Sutch (2010) actually found a positive relationship between minimum wage variation and education enrolment; though the causes of this positive relationship remain unspecified. Bakis et al. (2015) studied the 24.3% increase in the minimum wage in 2004 in Turkey, finding that the educational enrolment increased in young people and the labor supply reduced over the next three years. They attribute their results to the fact that the minimum wage might lift the financial barriers to education and people were able to afford further education³⁸.

Situation Two: The Choice Following Dismissal

The second scenario – i.e. the choice of pursuing further education following dismissal due to changes in the minimum wage – has not been given the same attention in the literature. A stronger minimum wage relative to the wage distribution is expected to generate unemployment. The dismissed young workers have two main choices: either they stay in the labor force, benefit from the unemployment insurance and seek further employment, or they pursue further education. In the case that the individual stays in the labor market, the individual is considered as unemployed and a minimum wage policy can be characterized as worsening his/her welfare. However, in the case that the individual decides, after being dismissed, to pursue further education they are no longer considered as part of the workforce. As such, the employment rate will remain the same after the dismissal, whereas the unemployment rate will decrease. By using the employment rate as a dependent variable, the dis-employment effects will be correctly captured by the model, but now the individual is “pushed” to better his/her life prospects by investing in human capital. Therefore, in this case the minimum wage policy can also be considered as an engineered shortage for low skilled labor, prompting young people to further invest in education to overcome their unemployment status, Peter Mattila (1981), Richard Sutch (2010). However, a significant assumption is made in order to reach this conclusion. Namely, that all young individuals have similar access to the education system and that they can easily bear the cost of it. Since this dissertation cannot control for this effect, the interpretation of the results will be approached cautiously.

In conclusion, there are also drawbacks when using the employment rate, especially when results are considered for their policy implications. Dismissed individuals, usually younger in age, may decide to pursue further education in expectation of higher future earnings and a better standard of living, temporarily exiting the labor force. Although using the employment rate allows the model to correctly capture dis-employment effects for these groups (either they are in education or in the work force), it

³⁸ Another possible explanation for the positive relationship, proposed by Sutch (2010), is that the younger peers still in education will see the dis-employment effects of a minimum wage hike on the same cohort group currently in the workforce and will decide to invest further in education in order to ensure a future employment status. Therefore they will be risk averse, deterred from dropping education to join the workforce.

is important to bear in mind that there are other social implications which flow from a minimum wage policy which must be considered when policy evaluation is taking place. Comparisons based only on the dis-employment effects among the groups can be made.

4.5 Data

The panel includes 16 European Countries: Belgium, Czech Republic, Estonia, France, Greece, Hungary, Ireland, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, and United Kingdom over the period 1998-2013 with annual data³⁹.

The ratio of minimum wages to median earnings of full-time employees as well as the minimum wage to average wages is available from OECD. Employment rates by sex, age and highest level of education attained are from the EU Labour Force Survey (LFS), Eurostat. The range of the population included in the survey based on various countries varies between 0.2% and 33%.

The first of the two of the control variables is the employment protection legislation ('EPL') for regular contracts, including collective dismissals measuring the strictness of regulation on dismissals. The second measure is employment protection for fixed-term and temporary work agency contracts as well. The indicator measures the rigidity of labor standards in legislated working time rules, labor market flexibility to use employment contracts and workers' rights. Both indicators are constructed from OECD and available in the employment policies section.

The two additional variables to control for labor market policies that affect employment are the expenditures on labor market policies (LMP) as a percentage of GDP both found at OECD's database. First, the level of public expenditure in active labor market policies (ALMP) as a percentage of GDP designed to help workers to find employment. Secondly, the level of expenditure on passive labor markets policies (PLMP) such as the gross unemployment benefit as a percentage of GDP. A final OECD indicator is trade union density measured by the number of wages and salary earners that are trade union members divided by the total number of wage and salary earners.

As supply side control, the relative size of each cohort is used. In particular, the population of the age-education group divided with the total population in working age. Aggregated population data were found in Eurostat drawn by the LFS study. The demand variable to account for the recession and

³⁹ Latvia and Greece were dropped from the model due to the lack in Institutional observations. For Greece the main problem was the active polices as % of GDP. Combining the missing data from a Eurostat dataset did not improve the model

generally the business cycle is the actual GDP growth while the unemployment rate is used for business cycle robustness check. The data are available from Eurostat.

Information for the minimum wage legislation and sub-minima are drawn from the International Labor Organization (ILO) and Eurostat. However, dummy variables are dropped from the model when using fixed effects as they do not vary across time.⁴⁰

The data are cut in eight different groups based the employment rate. Thus, eight different employment rates based on two criteria are used as dependent variable. The first criterion is age, teenagers who are 15 to 19 years old, young adults from 20 to 24 years old and adults from 25 to 64. A separate analysis is conducted for elderly adults aged from 65 to 69. The second criterion is the educational attainment which is structured as it is defined by ISCED⁴¹. ISCED level 0 to 2 are individuals that have attained primary and lower secondary education. Level 3 and 4 are individuals with upper secondary and post-secondary education but non-tertiary education. Finally, people who have a short-cycle tertiary, bachelor or equivalent, master or equivalent and doctoral or equivalent education belong to Levels 5 to 8. Naturally, people who belong to the first age group are divided to two categories since is extremely rare to have participate in level 5-8. The rest age groups are divided in three categories as we can see in Table 5. A separate analysis is conducted for elders aged (65 -69).

Education attainment	ISCED(1-2) ^a	ISCED(3-4)	ISCED(5-8)
Age			
Teenagers (15-19)	Group 1	Group 2	-
Young Adults (20-24)	Group 3	Group 4	Group 5
Adults (25 - 64)	Group 5	Group 6	Group 7
Elders (65-69)	Group 8	Group 9	Group 10

Note: Classification on education is based on ISCED stands for International standard classification of education

5. Results of the empirical analysis

In this section the results of the empirical analysis are presented. Analysis will focus mainly on the diverse employment effects of the minimum wage, and other possible factors that may affect labor market, on different age and educational groups.

⁴⁰ The variable is used to a pooled specification in the Appendix C

⁴¹ ISCED stands for International standard classification of education are analyzed in debt in Appendix A.

As previously explained, the analysis is conducted using eight OLS fixed period and fixed time approach on a panel data set of 14 countries. The time period is from 1998 to 2013. Each regression incorporates a different age and skill group. First, there will be a discussion on age level as it is compared with previous findings. Each group will initially be analyzed individually.

Country specific effects and period effects seem to be necessary, as expected, after conducting the Durbin–Wu–Hausman test. Cross-section fixed effects may capture omitted variables that are correlated with the variables in the regression or with the dependent variable and vary only across countries. Such variables may be government policies as well as cultural or other institutional factors that vary across countries and influence employment or wages. Finally, period fixed effects control for omitting variables that are constant across countries and change over time such business cycle trends which impacted European economy in general.

5.1 Discussion on the results

As discussed earlier, caution should be exercised when interpreting the results. The Kaitz index measures how strong the minimum wage is in the income distribution rather than an increase of the minimum wage. What is important here is to reveal which groups are more vulnerable to a minimum wage policy, rather than measuring the exact effect on employment by a minimum wage hike. Therefore, a higher Kaitz coefficient is considered to show the vulnerability of the examined group to the labor market policy when income distribution and minimum wage rate are fluctuating. Lastly, a significant Kaitz coefficient is expected to appear for groups in the labor market who earn the minimum wage or their wages are closest to the minimum wage rate⁴², Neumark et al. (2009).

Table 6 shows results before dividing the groups based on their acquired level of education while Table 7 and Table 8 examine each age group based on the acquired education level. Table 7 presents results for the teenager group aged from 15 to 19 and young adults aged 20-24, whilst Table 8 shows the results for adults aged 25 to 64. For each age group there are three regression analyses based on their educational attainment, tertiary, upper-secondary and up to lower secondary education. The educational attainment level of an individual is the highest ISCED level successfully completed. Therefore, teenagers with tertiary education have been excluded from the analysis since the percentage of the population with such characteristics is extremely rare in the European education system⁴³. Finally, a separated analysis is conducted for individuals aged 65- 69. The reason for this is

⁴² The so called “bind to the minimum wage”

that, due to the lack of observations and the frequency of the breaks in the series, the panel is restricted to 11- 12 countries, meaning comparisons may not be appropriate.

Table 6. Fixed effects estimates of the Minimum Wage model, Kaitz Index

Dependent Variable – Employment rate based on age (1998-2011)			
Variable	Teens(15-19)	Youth(20-24)	Adults (25-65)
	(1)	(2)	(3)
Kaitz index (L)	-0.24*** (-0.06)	-0.37*** (-0.1)	-0.12*** (0.04)
GDP_Growth (L)	0.12 (0.12)	0.47*** (0.16)	0.25*** (0.064)
Population Cohort	-0.02 (0.48)	0.46 (0.038)	0.89*** (0.16)
Empl. Prot.	0.09*** (0.028)	0.13*** (0.038)	0.11*** (0.017)
Labor Rigidity	0.004 (0.007)	-0.03*** (0.033)	-0.008* (0.004)
Act. Policies	0.09 (2.6)	9.52** (3.9)	-0.74 (1.5)
Pass. Policies	-5.12*** (-0.77)	-6.64*** (1.38)	-3.53*** (0.05)
Union Density	0.21** (0.08)	0.52*** (0.15)	0.08 (0.05)
Constant	-0.02 (0.08)	0.22* (0.13)	0.3** (0.13)
R-squared	0.98	0.94	0.94
Observations	143	142	142
Cross-Section effects	Y	Y	Y
Period effects	Y	Y	Y

Note: . *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

Hungary is dropped in column 3

The main findings in Table 6 suggest that in all groups there is a negative and significant effect of the minimum wage on employment. In particular, the Kaitz coefficient for young adults and teenagers is significant at 1% while for adults at 5%. Since regressions also incorporate the possibility of direct effects on employment from other labor market policies and institutional factors: active policies, passive policies, union density and employment protection, this eliminates the risk of omitted variable bias. The evidence suggests that a higher bite of the minimum wage to the income distribution decreases the employment for all groups. This result is in line with theoretical literature and supports recent findings by Dolton and Bondibene (2012). Due to Europe's stricter labor market policies and

regulations than other OECD countries we find higher Kaitz coefficients in magnitude than studies which considered bigger panels, Neumark & Wascher (2004).

Notably, the Kaitz coefficient in the teenage regression appears lower in magnitude than for young adults, which contrasts with the literature examined in section 2. Literature that finds teenagers to be more vulnerable in the labor market from a minimum wage increase than young adults focused on the U.S labor market or on OECD countries including non EU countries. However, my result is aligned with previous panel study focused only in Europe, Laporsek (2013) studies minimum wages in European Union over the period 1996 to 2011 and she finds higher dis-employment effects for young adults than teenagers.

Examining the results in Table 7 and Table 8 gives similar results, with the difference that now young adults have a lower Kaitz coefficient in magnitude by 0.02. Young adults and teenagers combined have an average coefficient of -0.28 which is slightly higher than that found by Dolton and Bondibene (2012). Kaitz coefficient on their paper for workers aged 16 years old to 24 for 33 OECD countries over the period 1979 2009 is -0.264 while Neumark and Wascher (2004) found a Kaitz coefficient of -0.27 for the same age group.

Minimum wage policy is found to have no significant effect on adult employment, with an average Kaitz coefficient close to zero at -0.008 which is also in accordance with Dolton and Bondibene (2013). Therefore, evidence suggests that teenagers and young adults are binding on minimum wage policy with a negative coefficient of the “relative minimum wage”. A negative relationship can be shown for adult employment since the overall effect is negative. However, the adverse effects of a minimum wage policy are weak since the coefficient is close to zero.

5.1.1 Teenagers

Regression group 1 is consisted by two regressions. Column 1 of Table 6 presents results for teenagers who have attained up to lower secondary education while Column 2 focuses on teenagers who have attained post-secondary education.

In Column 1, the results indicate that teenagers with educational attainment from 0 to 2 ISCED levels do bind on the minimum wage. The Kaitz coefficient is negative at -0.15, showing the correct negative sign and is significant at 5% level. In column (2), we see that teenagers with post-secondary education are particularly vulnerable when it comes to minimum wage policy, with a Kaitz coefficient of -0.39 being the highest of all the examined groups and significant at 1% level.

Based on existing theory and my initial assumptions, it could be predicted that the least skilled group would be most affected by a minimum wage policy, which would be translated to a higher in

magnitude Kaitz coefficient. A high in magnitude and significant Kaitz coefficient is expected for the least skilled, as they are less flexible in the labor market than individuals with additional education or work experience. Therefore, it was expected that teenagers with the lowest educational attainment would experience higher dis-employment effects and, consequently, the magnitude of the Kaitz index would have been the highest of all groups. In contrast with these expectations, teenagers with the lowest educational attainment seem to experience lower in magnitude dis-employment effects from the bite of the minimum wage policy than teenagers with the second lowest education. In fact, the former group has a Kaitz coefficient of -0.23 percentage points higher than teenagers with the lowest education.

There is an argument to be made that the model fails to predict the expected coefficients, perhaps, because of omitting the subminimum rates. As discussed in the previous chapter, the independent variable used does not take into consideration the subminimum rates. Eight out of the fourteen countries considered in the panel do set a subminimum for ages up to 22 years old. Rates presented in Table 4, section 3.4.

This argument is undermined, however, by the fact that subminimum is set as a percentage of the national minimum wage. An increase in the minimum wage will result to the same percentage increase in the subminimum rate for teenagers. Therefore, the variation of the independent variable should have been the same. In addition, if that was the case, teenagers with secondary education would not be binding on the minimum wage either, as rates are based on age and there are the same for both groups. To test the hypothesis that the subminimum information is omitted from the model, I ran a pooled regression in the Appendix C, adding for both teenage groups a dummy variable taking the value of 1 if the country sets a different rate for young workers. In Table 14, we see that the subminimum variable for teenager with secondary education, column 1, is not statistically significant while for teenagers with post-secondary educations is significant at 1% level. The findings support the conclusion that subminimum variable that subminimum variable is not creating the disjuncture between theory and my results.

A possible explanation of why the results seem to be inconsistent with theory is that teenagers, with the lowest “acceptable by law” education level, who used to work for the minimum wage will be more “willing” to switch to the uncovered sector when displaced from the covered sector earning a wage lower than the national minimum. Individuals with the lowest experience and education are expected to have a lower “reservation wage” than other more skilled individuals. Therefore, teenagers with the lowest education attainment might be “willing” to work for the uncovered sector where they will still be recorded as employees, offering a possible explanation for why the magnitude of the Kaitz coefficient is not as strong as expected. Kampelmann et.al (2013) showed that the incidence of

employment that are uncovered or in violation of existing rules indeed exist across Europe, being particularly prominent in France, UK and Ireland.

Table 7. Fixed effects estimates of the Minimum Wage model, Kaitz Index

Dependent Variable – Employment rate based on age and education attainment (1998-2013)					
Variable	Teens(15-19)		Youth(20-24)		
	(1) ISCED (0-2)	(2) ISCED (3-4)	(3) ISCED (0-2)	(4) ISCED (3-4)	(5) ISCED (5+)
Kaitz index (L)	-0.155** (0.065)	-0.39*** (0.12)	-0.27*** (0.093)	-0.36*** (0.13)	-0.24 (0.14)
GDP_Growth (L)	-0.005 (0.12)	0.6*** (0.21)	0.47** (0.09)	0.6*** (0.18)	0.47 (0.29)
Rel. Pop	0.59 (0.63)	-1.66 (1.5)	-1.56 (1.5)	0.8 (1.1)	-11.59*** (3.17)
Empl. Prot.	0.09*** (0.02)	-0.123** (0.054)	-0.005 (0.06)	0.1* (0.055)	0.33*** (0.09)
Labor Rigidity	0.006 (0.007)	-0.04*** (0.01)	0.012 (0.017)	-0.057*** (0.01)	-0.04* (0.023)
Act. Policies	4.28 (2.6)	3.694 (5.1)	1.49 (3.9)	11.26** (4.87)	8.51 (6.29)
Pass. Policies	-4.9*** (0.67)	-5.9*** (1.6)	-10.27*** (1.28)	-5.1*** (1.8)	-7.16*** (1.8)
Union Density	-0.1 (0.08)	0.88*** (0.24)	0.08 (0.17)	0.63** (0.24)	0.83*** (0.29)
Constant	-0.03 (0.08)	0.05 (0.14)	0.68*** (0.18)	0.26 (0.17)	-0.11 (0.28)
R-squared	0.98	0.96	0.97	0.94	0.87
Observations	139	143	143	143	142
Cross-Section effects	Y	Y	Y	Y	Y
Period effects	Y	Y	Y	Y	Y

Note: Heteroskedasticity adjusted standards errors are in parenthesis. *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

Latvia and Greece were dropped from the model

In conclusion, teenagers with the lowest education may be pushed out from the legitimate labor market, induced to work in the uncovered sector and earn a wage that is not adequate for a decent standard of living. Teenagers with the second lowest education remain in the covered sector, but they experience significantly higher dis-employment effects. Therefore, there is a “dis-employment effect” tradeoff, raising questions of fairness which are difficult to make the subject of comparison, but which most certainly should be a subject of focus for further labor market improvements.

5.1.2 Young adults

Column 3,4 and 5 of Table 6 presents the results for young adults aged from 20 to 24 with low secondary education, upper-secondary and tertiary education respectively. On average the Kaitz coefficient is -0.29.

Minimum wage to median wage estimates is negative and significant at 1% level for young adults with low secondary and post-secondary education. However, young adults with post-secondary education seem to be more vulnerable by minimum wage policy. The Kaitz coefficient for this group is fairly large in magnitude at -0.36 while the same age group with a lower level of education is -0.27.

Hypothesis 1, made in section 4.1, predicts that the individuals of the same age group with lower educational attainment will experience more adverse employment effects by an increase of the minimum wage than those with higher education. However, despite the fact that both groups are significant at 1% level, young adults with lower education background have a smaller Kaitz coefficient by 0.09 percentage points.

Tables 11 and 12 in the Appendix, presents the compulsory age of starting school in European countries and the Duration of Compulsory Education in Europe respectively. Compulsory education in Europe does not vary significantly. The weighted average of compulsory education of the examined group is 10 years. This means that teenagers in Europe can start working from 15 years old on average. Therefore, young adults with lower secondary education may attain working experience that allows them to be more flexible in the labor market than young adults who enter in the labor market without such experience, providing a possible explanation of why we found a lower binding level for the former group. It is possible to argue that in early age, working experience is of greater value than average education to the employers, providing a slight advantage to the former group.

The third subgroup of this analysis, are young adults with a tertiary education. The Kaitz coefficient is -0.26 but only statistically significant at 10% level which indicates that the group is not binding to the minimum wage. The results are consistent with the initial hypothesis 1 and as expected. Structure of earnings survey 2012 (SES), conducted every four year from Eurostat, states that employees with tertiary level of education earn per hour almost twice as much as those with the next lower level of education.⁴⁴

⁴⁴Eurostat “SES” Survey 2012: http://ec.europa.eu/eurostat/statistics-explained/index.php/Earnings_statistics
Author: Bezzina Eusebio

Table 8. Fixed effects estimates of the Minimum Wage model, Kaitz Index

Dependent Variable – Employment rate based on age and education attainment (1998-2013)			
Adults (25-26)			
Variable	(1) ISCED (0-2)	(2) ISCED (3-4)	(3) ISCED (5+)
Kaitz index (L)	-0.14** (0.069)	-0.1** (0.048)	-0.012 (0.03)
GDP_g (L)	0.18 (0.137)	0.36*** (0.09)	0.22*** (0.066)
Rel. Pop	0.44* (0.005)	-0.16 (0.15)	0.34* (0.18)
Empl. Prot.	0.11*** (0.035)	0.065*** (0.02)	0.07*** (0.15)
Labor Rigidity	-0.006 (0.009)	-0.015** (0.006)	-0.006* (0.004)
Act. Policies	-0.8 (2.6)	1.08 (2.19)	1.23 (1.48)
Pass. Policies	-3.38*** (0.98)	-3.36*** (0.74)	-1.99*** (0.47)
Union Density	0.12 (0.126)	0.03 (0.036)	0.18*** (0.05)
Constant	0.322*** (0.114)	0.59*** (0.084)	0.56*** (0.048)
R-squared	0.97	0.92	0.85
Observations	143	143	143
Cross-Section effects	Y	Y	Y
Period effects	Y	Y	Y

Note: Heteroskedasticity adjusted standards errors are in parenthesis. *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

Latvia and Greece were dropped from the model

5.1.3 Adults

Table 8 presents the estimation results of the effects of the policy on employment for the adult age group from 25 to 64. Column 1, 2 and 3 show the result for adults with lower secondary education,

post-secondary and tertiary respectively. On average the coefficient for adults is -0.084 which is in line with Dolton's and Bondibene's (2012) results.

Column 1 presents the results for adults with lower secondary education and a Kaitz coefficient of -0.117 significant at 10% level. In Column 2, the Kaitz coefficient for adults with post-secondary education attainment is -0.1 which is lower than adults with lower education and surprisingly significant at 5% level which can be questioned. Smaller and negative Kaitz coefficients could indicate that adults can experience spillover effects on their wage rates. Dolado et al.(1996); Checchi and Lucifora (2002); Neumark et.al(2004) demonstrate that a minimum wage hike will induce wage increases higher up in the wage distribution and are likely to depend on country-specific institutions such as the employment protection legislation and union density. Results for adults with tertiary education in Column 8 show no minimum wage effect on adult employment with a coefficient of 0.007 close to zero and not significant. Finally, in column 3 we do not find disemployment effects for adults with tertiary education as the relative minimum age coefficient is zero and not significant.

An interesting result is that the Kaitz coefficient is decreasing in magnitude when the education attainment is increased. This validates hypothesis 1 for adults, higher educational attainment provides flexibility in the labor market. Adults with less education may experience more adverse effects when the minimum wage is going to increase its bind in the income distribution than adults with higher education.

In conclusion, age used as a proxy for skills and experience determines if the individual will be affected by a minimum wage policy. We find less adverse effects on average by moving forward from teenagers to young adults. Therefore, we could say that Hypothesis 2 in section 4.1 is validated by this paper. Previous literature has been based on this assumption and the fact that my results validate it confirms the validity of the analysis as well.

Negative employment effects are expected to be found for individuals who earn the minimum wage, but also for those whose wage is close to the minimum wage due to the spillover effect. Previous literature tends to find negative employment effects for young adults and sometimes for adults. In this paper adults and young adults with tertiary education do not bind in the minimum wage. In fact the Kaitz coefficient is not statistically significant at all. Hypothesis 3 made in sub-chapter 4.1 is validated by these results, employment for individuals with tertiary education is not affected by the minimum wage policy as their wages are far from the minimum wage rate.

As for the assumption that individuals with higher education and same age will be less prominent to the minimum wage policy, it is proven only for adults. It is important to consider more closely why this might happen. For the teenage group, I have suggested that the individuals with lower education

attainment value their reservation wage less than people with a higher education; therefore, they may prefer to work for the uncovered sector over the alternative of remaining unemployed. Regarding young adults experience and skills can outweigh education level for some minimum wage sectors that price education less.

5.1.4 Elderly Workers

A further analysis is conducted for workers close to retirement age. Elderly workers seem not to be under the spectrum of minimum wage literature, at least as far as I concern.

Individuals close to retirement may also be a subject of a minimum wage policy. There are two basics transitions from work to retirement. First, it is a transition from paid work to retirement and second it is a gradual move from full-time regular work to progressively “easier” jobs, Alexander Samorodov (1999).

It should be noted that the population cohort for elders with post-secondary educational attainment has a unit root. In order to get bias results we transform the variable by using a first difference specification. An additional control variable was added into the model, the early retirement schemes expenditures as a % of the GDP.

Table 9 presents the estimation results of the effects of the policy on employment for the adult age group from 65 to 69. Column 1, 2 and 3 show the result for elders with lower secondary education, post-secondary and tertiary respectively. On average the coefficient for individuals close to retirements is -0.06.

Column 1 presents the results for elders with lower secondary education and a Kaitz coefficient of -0.01 and not statistical significant. In Column 2, the Kaitz coefficient for elders with post-secondary education attainment is -0.14 which is lower than elders with lower education and significant at 10% level. Finally, elders with tertiary education have a Kaitz coefficient of -0.03 but not statistical significant, Column 3. In general, despite the fact that the Kaitz coefficient shows the correct negative sign for all groups the results indicate that there is no significant dis-employment effect of a minimum wage policy and therefore the elder population is not binding in the minimum wage policy.⁴⁵

⁴⁵ At least with the current model specification

Table 9. Fixed effects estimates of the Minimum Wage model, Kaitz Index, Elder population, alternative specification

Dependent Variable – Employment rate based on age and education attainment (1998-2013)

Variable	Adults (65-69)		
	(1) ISCED (0-2)	(2) ISCED (3-4)	(3) ISCED (5+)
Kaitz index (L)	-0.01 (0.09)	-0.14* (0.08)	-0.03 (0.22)
GDP_g (L)	0.018 (0.4)	0.09 (0.09)	-0.19 (0.16)
Rel. Pop ^a	-1.59* (3.5)	-2.4*** (0.04)	-4.04 (6.21)
Empl. Prot.	-0.004 (0.11)	-0.32 (0.04)	0.0 (0.13)
Labor Rigidity	-0.02 (0.007)	-0.08 (0.009)	-0.009 (0.01)
Act. Policies	-6.6** (2.6)	0.22 (2.6)	-0.8 (5.06)
Early_Retirement	10.0*** (2.2)	3.5* (1.9)	5.7 (4.9)
Unemployment_Benefit	-0.16 (0.68)	-0.34 (0.7)	-0.8 (1.5)
Union Density	-0.26* (0.14)	-0.21 (0.16)	-0.7*** (0.3)
Constant	0.23 (0.52)	0.1 (0.12)	0.4** (0.19)
R-squared	0.98	0.96	0.90
Observations	106	91	111
Cross-Section effects	Y	Y	Y
Period effects	Y	Y	Y

Note: Heteroskedasticity adjusted standards errors are in parenthesis. *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

Column 1 & 3 excludes: Greece, Latvia, Slovakia, Luxemburg while Column 2 excludes Portugal as well

^a For column (2) first differences are used to correct for stationarity

5.2 Discussion of the control variables

As discussed, an analysis of the effects of minimum wage policy on employment must take into consideration other labor market institutions, as they are often highly correlated with the employment rate. I incorporate a vector of labor market institutional factors to control their effect on employment. Furthermore, I use the lagged one period gross domestic product as a business cycle control and the population cohort as a supply control.

First, the gross domestic product growth should have a large explanatory power on employment. For most of the young in age groups, up to 24, an additional 1% point increase in GDP Growth will increase the next year's young employment by 0.42 whilst adult employment will increase by 0.25.

Employment protection legislation index ('EPL') for regular contracts, including collective dismissals measures the strictness of regulation on dismissals. Higher EPL strictness value is associated with a high degree of protection while low values are associated with relative ease in dismissing employees. Labor rigidity is another EPL variable for fixed-term and temporary work agency contracts where higher the index more difficult is for employees to make use of temporary contracts. Although, the direct effect of EPL is ambiguous; I tend to find a positive effect on employment from EPL when labor rigidity is not significant or close to zero. A significant labor rigidity coefficient means that the examined group tends to work with temporary and fixed terms contracts and a higher value of labor rigidity may act as an obstacle to such an agreement taking place. Another notable finding is that labor rigidity coefficient for all age groups with post-secondary education is statistically significant and negative, indicating a trend of employment for fixed term employment.

A noteworthy result is teenagers with post-secondary education who enter in the labor market and it is expected to find work under a temporary employment contract. In this case both EPL and Labor rigidity indices are negative, meaning that there is a trade – off between regulating temporary employment and permanent. A higher labor rigidity index will decrease teenage employment with post-secondary education as employees will find it difficult to make use of temporary contracts. A higher EPL will be an obstacle for employees to fire the existent work force and substitute it with teenagers with post-secondary education under short term contracts, offering employees the ability to adjust their labor costs more frequently if need exists. Therefore, there is a trade of disemployment effects between low-wage adults and low wage teenagers, Brown,(1988) p.142, by regulating the protection of fixed terms and regulating the use of temporary employment.

Active labor market policies are only significant for young adults with post-secondary education with a fairly large coefficient. Passive Labor market policies are negative and significant for all the groups as expected, with young adults having the most adverse effects on employment. Higher unemployment benefits can prolong the job search period decreasing the employment turnover and eventually increasing unemployment. Finally, Union density coefficients are significant and positive for the more educated groups. Theory predicts negative effects but my results are in accordance with Dolton & Rosazana (2013).

5.2 Robustness Check

In this subsection, the robustness checks of the minimum wage variable are presented. In Table 10 the results are presented when we use the minimum wage to average wages as the independent variable.

Sarah Lemos (2005) conducts a robustness check on different minimum wage variables concluding that while the sign of the estimates is not sensitive the magnitude is. She attributes the differences in magnitude to the fact that different minimum wage variables measure different spillover effects. For example the level of the real minimum wage it will capture dis-employment effect only for minimum wage workers while the relative minimum wage variable, Kaitz index it will take into consideration all spillover effects that may occur in the income distribution. Other researchers have also tried to prove robust results by using different minimum wage variables.

Therefore, in order the robustness check to be comparable we will conduct it only with the minimum wage to average wages ('MWA'). Indeed, findings in table 13 are similar as before with however a bit lower in magnitude coefficients. The reason for this is that now the relative minimum wage variable is biased from higher layers of the income distribution and income inequality distorts the results. Therefore, the minimum wage appears to be weaker in the income distribution than before when we used the minimum wage to the median index.

Findings in Table 10 validate the Hypothesis 3 made in section 4.1. In particular, individuals with tertiary education are not affected by a minimum wage policy – MWA coefficient is not significant. Furthermore, within the groups we see differences in magnitude for all groups with most adverse effects for young adults and teenagers with post-secondary education. For the adult group, there is a clear decrease in magnitude of the MWA coefficient for individuals with lower education to higher education attainment.

Table 10. Robustness Fixed effects estimates of the Minimum Wage model, Kaitz Index

Dependent Variable – Employment rate based on age and education attainment (1998-2013)

Variable	Teens (15-19)		Youth (20-24)			Adults (25-26)		
	(1) ISCED (0-2)	(2) ISCED (3-4)	(3) ISCED (0-2)	(4) ISCED (3-4)	(5) ISCED (5+)	(6) ISCED (0-2)	(7) ISCED (3-4)	(5) ISCED (5+)
Kaitz index (L) mean	-0.14** (0.12)	-0.32** (0.14)	-0.29*** (0.15)	-0.294** (0.15)	-0.21 (0.18)	-0.157** (0.072)	-0.08* (0.05)	-0.001 (0.04)
Observations	139	143	143	143	143	143	143	143
R-square	0.98	0.95	0.97	0.94	0.87	0.97	0.92	0.85
Year Effects	Y	Y	Y	Y	Y	Y	Y	Y
Country effects	Y	Y	Y	Y	Y	Y	Y	Y

Note: Heteroscedasticity adjusted standards errors are in parenthesis. *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

Note that regressions for the real minimum wage level are over the period 2000 to 2013

Greece and Latvia were dropped from the model

6. Conclusions and Policy Implications

In this dissertation, the relationship between the strength of minimum wage in the income distribution and employment is captured, through the division of the data into groups based on age and educational attainment. The analysis is done with fixed effects on a panel of 14 EU countries with statutory minimum wages over the period of 1998 – 2013.⁴⁶ This specification is based on the fact that education offers a greater flexibility in the labor market and yields higher future earnings. Therefore, differences within age groups with different educational attainment were expected. Finally, a vector of labor market institutions and regulations is incorporated in order to control for the diverse legislative framework and labor market policies that exist across Europe. Prior studies conclude that teenagers and young adults are the most vulnerable group when it comes to the minimum wage policy effect on employment, while they find negative but close to zero or no effect for adults. However, with new specification differences within the groups are revealed.

The overall finding of this dissertation is that the negative effects of the minimum wage policy vary significantly within the same age groups when education is taken into consideration. The hypotheses made in chapter 4 are validated by the results as a declining in magnitude for the minimum wage coefficient was found in most cases the older the group is and when within the same age group educational attainment increases. Notably, Hypothesis 2 is not validated by the results for young adults with up to secondary education: in early age it seems working experience is of greater value than average education to the employers. Finally, groups with tertiary education are not binding by a minimum wage policy

Considering the results in greater detail, there are four salient points to consider when discussing policy implications. Firstly, teenagers with up to secondary education have a smaller relative minimum wage coefficient than teenagers with post-secondary education. I attribute this result to the fact that teenager's "reservation wage" is often lower than the minimum wage rate, therefore, they may resort to the uncovered sector. Even after controlling for a subminimum wage policy, teenagers with up to secondary education is the most vulnerable group considered in this study as they work in the uncovered sector.

⁴⁶ The lack of data for the institutional variables did not allow extending the studied time period.

Secondly, young adults with tertiary education are not binding in the minimum wage at all. The fact that they have acquired higher education gives them the flexibility even if they work for the minimum wage to switch to a more competitive market in the case of being dismissed.

Thirdly, it is concluded that adults experience negative effects on employment arising from a minimum wage policy. Whilst there is a clear small negative effect for adults with up to post-secondary education, this effect is not present for adults with tertiary education.

Fourthly, there is an apparent tradeoff in dis-employment effects between low-wage adults and low wage teenagers, by regulating the protection of fixed terms and regulating the use of temporary employment.

The minimum wage is a policy of fairness and equality providing security to low-skilled employees and a decent standard living, or at least this is the aim. In my opinion, the policy provides a way to fix an imperfection within the bargaining game of the low-paid labor market. As such, those who are most vulnerable to a minimum wage policy should not then be punished by using this vulnerability as a justification for letting the markets determine uncontrollably the lowest wage rate. Instead, energy should be focused on deriving more efficient policies to protect individuals in vulnerable situations. This dissertation sheds some light on to which groups are in most need of further assistance.

The literature suggests that younger individuals are most vulnerable in the labor market. The subminimum is a popular supplementary policy adopted by governments to reduce the dis-employment effects for younger labor groups. However, this policy fails to secure a decent standard of independent living, as it pays less than the national agreed lowest acceptable wage. As the results of this dissertation show that educational level plays a significant role in the dis-employment effect of a minimum wage policy. It is suggested that future policies aimed to support the minimum wage policy should instead focus on the source of the problem; the lack of education or specialized skills.

As economists we have the responsibility to explore solutions for the source of the problem and by implementing fundamental changes, to eliminate inequalities, structuring the economic system in such a way to be vital by itself. Recent studies have shown that a minimum wage policy can be efficient if the government values redistribution towards low wage workers. Lee & Saez (2012) conclude that “when low-skilled labor supply is driven by the extensive margin, as empirical studies suggest, a minimum wage should always be associated with in-work subsidies whether rationing is efficient or not”.

Therefore, minimum wage policy could not go on forever; making living “easier” is not a solution. It is imperative to balance out these human capital inequalities and offer opportunities to individuals - or

at least for the next generation- to escape from the minimum wage trap. As the results prove, minimum wage bite is highly dependent on education, therefore subsidies related with child support for education or accompanied with obligatory participation to active labor policies of individual's choice may ensure the acquisition of skills which are going to provide prospects for a better independent living standard.

The discussion in chapter 4.4 should also be taken into account. Namely, the expectation that young individuals should interpret a minimum wage policy as an engineered shortage for low skilled labor, prompting further investment in education to overcome unemployment status. Serious questions can be asked regarding the appropriateness of unemployment status as a means of communicating the benefits of investing in human capital. It would be preferable for society to promote education at an earlier stage, ensuring also that the education system is easily accessible to everyone.

As affirmed at the end of the subchapter 4.3, this study does not attempt to measure the exact dis-employment effect of a minimum wage policy and it cannot support direct policy implementation. Indeed, a panel study can only provide a direction regarding labor market policies, rather than hard and fast solutions. This dissertation proves that within age groups, disparities exist when taking into account the acquired education level. I strongly believe that this topic should be studied on a microeconomic level in country-specific cases: in order to give a clear view of how minimum wages affect employment on low-skilled groups. In addition, we could derive income redistribution policies for the most vulnerable groups with the use of DSGE model, maximizing societal welfare or policies which motivate people to invest further in education. Last but not least, ensuring more accessible education should be prioritized as a means of mitigating the potential dis-employment effects of minimum wage policy.

APPENDIX A

ISCED 0: Pre-primary education

Pre-primary education is defined as the initial stage of organized instruction. It is school- or center based and is designed for children aged at least 3 years.

ISCED 1: Primary education

This level begins between 5 and 7 years of age, is compulsory in all countries and generally lasts from four to six years.

ISCED 2: Lower secondary education

It continues the basic programs of the primary level, although teaching is typically more subject focused. Usually, the end of this level coincides with the end of compulsory education. —

ISCED 3: Upper secondary education

This level generally begins at the end of compulsory education. The entrance age is typically 15 or 16 years. Entrance qualifications (end of compulsory education) and other minimum entry requirements are usually needed. The typical duration of ISCED level 3 varies from two to five years.

ISCED 4: Post-secondary non-tertiary education

These programs straddle the boundary between upper secondary and tertiary education. They serve to broaden the knowledge of ISCED level 3 graduates. Typical examples are programs designed to prepare pupils for studies at level 5 or programs designed to prepare pupils for direct labor market entry.

ISCED 5: Tertiary education (first stage)

ISCED 5 pre-requires the successful completion of ISCED level 3 or 4. This level includes tertiary programs with academic orientation (type A) which are largely theoretically based and tertiary programs with occupation orientation (type B) which are typically shorter than type A programs and geared for entry into the labor market.

ISCED 6: Tertiary education (second stage)

This level is reserved for tertiary studies that lead to an advanced research qualification (Ph.D. or doctorate).

Source: International Standard Classification of Occupations, 1988 (ISCO-88)

APPENDIX B

Table 11. Compulsory age of starting school in European countries, 2007

Starting year	Country
Five	United Kingdom
Six	Belgium, Czech Republic, France, Greece, Hungary, Ireland, Luxembourg, Netherlands, Portugal, Slovakia, Slovenia, Spain,
Seven	Estonia, Latvia, Poland

Source: Eurydice <http://www.nfer.ac.uk/nfer/Eurydice/>

Table 12. Compulsory age of starting school in European countries, 2007

Years	Country
Seven	Slovenia
Nine	Estonia, Greece, Latvia, Poland, Portugal
Ten	Czech Republic, Ireland, Luxembourg, Hungary, Slovakia
Eleven	France, Spain
Twelve	United Kingdom

Source: Eurydice <http://www.nfer.ac.uk/nfer/Eurydice/>

APPENDIX C

Unit root test to ensure that the variables are stationary and do not follow a random walk:

$$y_{it} = \theta y_{it-1} + e_{it} \quad , \text{ where } \theta = 1$$

Table 13. Unit Root Test : Levin, Lin & Chu t*

Null hypothesis: Variable has a common unit root

Variables	Statistic	Probability	Cross-sections	Observations
E_T_1	-3.46	0	16	222
E_T_2	-4.35	0	16	232
E_Y_1**	-0.79	0.0	16	244
E_Y_2	-2.23	0.01	16	249
E_Y_3	-5.66	0	16	249
E_A_1*	-2.63	0	16	249
E_A_2*	-2.138	0.01	16	249
E_A_3	-2.06	0.01	16	249
E_E_1*	-2.85	0.002	14	200
E_E_2*	-2.84	0.002	13	175
E_E_3*	-5.9	0	15	186
Mw_Median *	-2.12	0.01	16	231
Mw_Mean*	-3.02	0	16	252
PLMP	-5.40	0	16	247
ALMP	-5.082	0	16	208
Union*	-41.52	0	15	229
GDP_G	-5.47	0	16	265
Pop_ch_t_1*	-2.473	0	16	246
Pop_ch_t_2*	-10.71	0	16	246
Pop_ch_y_1*	-2.38	0	16	246
Pop_ch_y_2*	-2.18	0	16	246
Pop_ch_y_3	-1.17	0.1	16	246
Pop_ch_a_1	-3.02	0	16	246
Pop_ch_a_2	-1.1	0	16	246
Pop_ch_a_3	-84.7	0	16	269
Pop_ch_e_1*	-4.92	0	16	247
Pop_ch_e_2**	0.9	0.8	16	247
Pop_ch_e_3*	-2.17	0.01	16	247

Note: * Individual effects and Individual linear trends are used, while for the rest only individual intercept has been incorporated in the test.

**When the test is conducted without intercept and without trend e_y_1 is stationary.

Table 14. Fixed effects estimates of the Minimum Wage model, Subminimum check

Dependent Variable – Employment rate based on age and education attainment (1998-2013)		
Variable	Teens(15-19)	
	(1) ISCED (0-2)	(2) ISCED (3-4)
Kaitz index (L)	-0.01 (0.15)	-0.24** (0.12)
GDP_Growth (L)	0.31 (0.38)	-0.10 (0.51)
Rel. Pop	-5.04*** (0.57)	4.95*** (1.7)
Empl. Prot.	0.11*** (0.02)	0.06** (0.02)
Labor Rigidity	-0.08*** (0.01)	-0.11*** (0.01)
Act. Policies	41.7*** (4.3)	45.39*** (5.00)
Pass. Policies	-6.5*** (2.10)	-11.21*** (2.91)
Union Density	-0.1 (0.07)	-0.0001 (0.109)
Subminimum	0.02 (0.02)	0.06*** (0.02)
Constant	0.11 (0.09)	0.07 (0.11)
R-squared	0.74	0.79
Observations	136	141

Note: Heteroskedasticity adjusted standards errors are in parenthesis. *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

APPENDIX D

Abbreviations

Variables	Full Name
E_T_1	Employment rate for ages 15-19 with ISCED 0-2 level acquired
E_T_2	Employment rate for ages 15-19 with ISCED 3-4 level acquired
E_Y_1	Employment rate for ages 20-24 with ISCED 0-2 level acquired
E_Y_2	Employment rate for ages 20-24 with ISCED 3-4 level acquired
E_Y_3	Employment rate for ages 20-24 with ISCED 5+ level acquired
E_A_1	Employment rate for ages 25-64 with ISCED 0-2 level acquired
E_A_2	Employment rate for ages 25-64 with ISCED 3-4 level acquired
E_A_3	Employment rate for ages 25-64 with ISCED 5+ level acquired
E_e_1	Employment rate for ages 65-69 with ISCED 0-2 level acquired
E_e_2	Employment rate for ages 65-69 with ISCED 3-4 level acquired
E_e_3	Employment rate for ages 65-69 with ISCED 5+ level acquired
Mw_Median	Minimum wage rate to median earnings
Mw_Mean	Minimum wage rate to mean earnings
PLMP	Passive labor market policies as a % of GDP
ALMP	Active labor market policies as a % of GDP
Un_benefit	Unemployment benefits as a % of GDP
Early retirement	Expenditures of Early retirement schemes as a % of GDP
Union	Union density
GDP_G	Gross domestic product growth
Pop_ch_t_1	Population cohort for ages 15-19 with ISCED 0-2 level acquired
Pop_ch_t_2	Population cohort for ages 15-19 with ISCED 3-4 level acquired
Pop_ch_y_1	Population cohort for ages 20-24 with ISCED 0-2 level acquired
Pop_ch_y_2	Population cohort for ages 20-24 with ISCED 3-4 level acquired
Pop_ch_y_3	Population cohort for ages 20-24 with ISCED 5+ level acquired
Pop_ch_a_1	Population cohort for ages 25-64 with ISCED 0-2 level acquired
Pop_ch_a_2	Population cohort for ages 25-64 with ISCED 3-4 level acquired
Pop_ch_a_3	Population cohort for ages 25-64 with ISCED 5+ level acquired
Pop_ch_e_1	Population cohort for ages 65-69 with ISCED 0-2 level acquired
Pop_ch_e_2	Population cohort for ages 65-69 with ISCED 3-4 level acquired
Pop_ch_e_3	Population cohort for ages 65-69 with ISCED 5+ level acquired

REFERENCES

Addison, J. T., & Ozturk, O. D. (2011). Minimum wages, labor market institutions, and female employment Institute for Advanced Studies, Economics Series: 278.

Abowd, John and Killingsworth, Mark R. "Structural Models of the Effects of Minimum Wages on Employment by Age Groups,' in Report of the minimum wage study commission, volume V. Washington, D.C.: U.S. Government Printing Office, 1981, pp. 143-69.

Badescu M , Beatrice D' Hombres & Villalba Ernersto , 2011, "Return to education in European countries. Evidence from the European Community Statistics on Income and Living Conditions (EU-SILC), European Commission, Joint Research Centre-Institute for Protection and Security of Citizen.

Baker, Michael, Dwayne Benjamin, and Shuchita Stanger. 1999. "The Highs and Lows of the Minimum Wage Effect: A Time Series-Cross Section Study of the Canadian Law." *Journal of Labor Economics*, Vol. 17, No. 2, pp. 318-50.

Bakış, O., Hisarcıklılar, M., Filiztekin, A., (2015), "The Impact of a Minimum-Wage Increase on Employment and School Enrollment: Evidence from Turkey," Koç University EAF Conference Paper.

Bazen. Stephen & Marimoutou, Velayoudom. 2002. "Looking for a Needle in a Haystack? A Re-examination of the Time Series Relationship between Teenage Employment and Minimum Wages in the United States," *Oxford Bulletin of Economics and Statistics*, Department of Economics, University of Oxford, vol. 64(s1), pages 699-725, 08

Beck N, Katz JN (1995). "What To Do (and Not To Do) with Times-Series-Cross-Section Data in Comparative Politics." *American Political Science Review*, 89(3), 634-647.

Betsey, Charles L. and Dunson, Bruce H. "Federal Minimum Wage Laws and the Employment of Minority Youth." *Papers and Proceedings of the American Economic Association*. 93rd Annual Meeting, Denver, September 5-7, 1980, pp. 379-84

Bezzina Eusebio, 2012. "In 2010, 17% of employees in the EU were low-wage earners". *Eurostat Statistics in Focus* 48/2012, data based on Structure of Earnings Survey (SES). Issue number 48/2012.

Borjas (2005) "Labor Economics" McGraw-Hill/Irwin, The University of Michigan.

Boschen, John F. and Grossman, Herschel I. "The Federal Minimum Wage, Employment, and Inflation," in Report of the minimum wage study commission, volume VI. Washington, D.C.: U.S. Government Printing Office, 1981, pp. 19-43

Buchele, R., & Christiansen, J. (1999). Employment and productivity growth in Europe and North America: The impact of labor market institutions. *International Review of Applied Economics*, 13(3), 313-332.

Brown, C., Gilroy, C., & Kohen, A. (1982). The effect of the minimum wage on employment and unemployment: A survey National Bureau of Economic Research, Inc, NBER Working Papers: 0846.

Brown, C. (1988). Minimum wage laws: Are they overrated? *Journal of Economic Perspectives*, 2(3), 133-145.

Brown, C. (1999). In Ashenfelter O., Card D., eds (Eds.), "Minimum wages, employment, and the distribution of income" *Handbooks in Economics*, vol. 5. Chapter 32 Amsterdam; New York and Oxford: Elsevier Science, North-Holland. Daniel S.

Burns, Arthur F. "The management of prosperity". New York: Columbia Univ. Press, 1966.

Card, David & Krueger, Alan B. 1993. "Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania," NBER Working Papers 4509, National Bureau of Economic Research, Inc.

Card, David, Lawrence F. Katz, and Alan B. Krueger. 1993. "An Evaluation of Recent Evidence on the Employment Effects of Minimum and Subminimum Wages." NBER Working Paper No. 4528

Card, David. 1992a. "Using Regional Variation in Wages to Measure the Effects of the Federal Minimum Wage". *Industrial and Labor Relations Review*, Vol. 46, No. 1 (October). pp. 22-37

Card, David, Katz, Lawrence F. and Krueger, Alan B (Apr., 1994) Comment on David Neumark and William Wascher, "Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws" *Industrial and Labor Relations Review*, Vol. 47, No. 3 (Apr., 1994), pp. 487-497

Card, David and Krueger, Alan B. (1995) "Myth and Measurement: The New Economics of the Minimum Wage", Princeton University Press, Princeton

Chaplin, D. D., Turner, M. D., & Pape, A. D. (2003). Minimum wages and school enrollment of teenagers: A look at the 1990's. *Economics of Education Review*, 22(1), 11-21.

Dolton, P., & Rosazza Bondibene, C. (2012). "The international experience of minimum wages in economic downturn". *Economic Policy* 27, 99-142.

Dorn, James A. Cato Institute, commentary, "The Minimum Wage Delusion, and the Death of Common Sense", 2013.

Douglas K Adie, and Lowell, Gallowel. "Teenage Unemployment and Real Federal Minimum Wages." *J. Polit. Econ.*, March/April 1973, 81, p. 435-41.

Douglas K. Adie "The Lag in Effect of Minimum Wages on Teenage Unemployment." *Proceedings of the Industrial Relations Research Association. 24th Annual Meeting, New Orleans, Dec. 27-28, 1971*, pp. 38-46

Eurostat (2015) "National minimum wages in the EU Monthly minimum wages in euro varied by 1 to 10 across the EU in January 2015". News Release 35/2015 – 26 February 2015

Fairchild, D. J. (2005). Does the minimum wage help the poor? *Forum for Social Economics*, 34(1-2), 31-42.

Fisher, Alan A. "The Minimum Wage and Teenage Unemployment: A Comment on the Literature," *Western Econ. J.*, December 1973, 1, p.514-24

Folk, Hugh. "The Problem of Youth Unemployment," *The transition from school to work. A report based on the Princeton manpower symposium, May 9-10, 1968*, pp. 76-107.

Funk Lothar and Lesch Hagen (2005), "Minimum wages in Europe", Eurofound, European Observatory of Working Life, Eurwork 02 August 2005

Goldfarb, Robert S. "The Policy Content of Quantitative Minimum Wage Research" Proceedings of the Industrial Relations Research Association. 27th Annual Meeting, San Francisco, December 28-29,, 1974, pp 261-68

Gramlich, Edward, 1976. "Impact of Minimum Wages on the Other Wages, Employment and Family Income", Brookings Pap. Econ. Act, 1976,2, pp.409-51

Grant, J. H., & Hamermesh, D. S. (1981). "Labor market competition among youths, white women, and others" National Bureau of Economic Research, Inc, NBER Working Papers: 0519.

Hamermesh, 2002. "International Labor Economics," Journal of Labor Economics, University of Chicago Press, vol. 20(4), pages 709-732, October.

Hansjörg Herr, Milka Kazandziska, Silke Mahnkopf-Praprotnik. 2009. "The Theoretical Debate about Minimum Wages" Global Labour University Working paper no.6 http://www.global-labour-university.org/fileadmin/GLU_Working_Papers/GLU_WP_No.6.pdf

Hashimoto, Masanori and Mincer, Jacob. "Employment and Un-employment Effects of Minimum Wages." Working paper, NBER, Apr. 1970.

ILO (1992), Minimum wages. Wage-fixing machinery, application and supervision, Geneva.

Jaap de Koning, (2001) "Aggregate impact analysis of active labour market policy: A literature review", International Journal of Manpower, Vol. 22 Iss: 8, pp.707 – 735

Kahn-Freund, Otto (1977) Labour and the Law (2nd edn), London: Stevens & Sons.

Katz, Lawrence & Krueger, Alan 1992. "The Effect of the Minimum Wage on the Fast Food Industry," Working Papers 678, Princeton University, Department of Economics, Industrial Relations Section.

Kelly, Terrence. "Youth Employment Opportunities and the Minimum Wage: An Econometric Model of Occupational Choice." Working paper No. 3608-01, The Urban Institute, 1975.

Kelly, Terrence. "Two Policy Questions Regarding the Minimum Wage." Working paper No. 3608-05, The Urban Institute, 1976.

Koranchelian, T., & Fanizza, D. (2005). How does employment protection legislation affect unemployment in tunisia? A search equilibrium approach International Monetary Fund, IMF Working Papers: 05/92.

Landon, S. (1997). High school enrollment, minimum wages and education spending. Canadian Public Policy, 23(2), 141-163.

Laporšek, S. (2013). "Minimum wage effects on youth employment in the European Union", Applied Economics Letters, Volume 20, Number 14, 1 September 2013, pp. 1288-1292(5)

Lee, D., & Saez, E. (2012). Optimal minimum wage policy in competitive labor markets. Journal of Public Economics, 96(9-10), 739-749.

Lemos, Sara (2005). "How Do Alternative Minimum Wage Variables Compare?" Discussion Papers in Economics 05/6, Department of Economics, University of Leicester.

Lester, Richard A. 1947. "Marginalism, Minimum Wages, and Labor Markets." *American Economic Review*. Vol. 37, No. 1 (March), pp. 135-48.

Lovell, Michael. C "The Minimum Wage, Teenage Unemployment, and the Business Cycle" *Western Econ.J.* , Dec 1972., 10, pp 414-27.

Malinvaud Edmond 1977 "The Theory of Unemployment Reconsidered". Book Oxford 1994.

Marshall, Alfred. *Principles of Economics*. 1920. Library of Economics and Liberty.

Millard, S., 1996. "The Effect of Employment Protection Legislation on Labor Market Activity: A Search Approach" Bank of England Working Paper.

Millard, S., and D. Mortensen, 1997. "The Unemployment and Welfare Effects of Labor Market Policy: A Comparison of the US and UK". In *Unemployment Policy: Government Options for the Labor Market*, Edited by Dennis J. Snower and Guillermo de la Dehesa. Cambridge University Press

Neumark, David & Wascher, William. 1992. "Employment effects of minimum and subminimum wages: Panel data on state minimum wage laws," *Industrial and Labor Relations Review*, ILR Review, Cornell University, ILR School, vol. 46(1), pages 55-81, October.

Neumark, David & William Wascher, 1993. "Employment Effects of Minimum and Subminimum Wages: Reply to Card, Katz, and Krueger", *ILR Review* April 1994 vol. 47 no. 3 pp.497-512.

Neumark, D., & Wascher, W. (1995). Minimum wage effects on employment and school enrollment. *Journal of Business and Economic Statistics*, 13(2), 199-206.

Neumark, D., & Wascher, W. (2003). Minimum wages and skill acquisition: Another look at schooling effects. *Economics of Education Review*, 22(1), 1-10.

Neumark, D. and W. Washer (2004). 'Minimum wages, labor market institutions, and youth employment: a crossnationalanalysis', *Industrial and Labor Relations Review*, 57(2), 223-48

Neumark, D., & Wascher, W. (2006). Minimum wages and employment: A review of evidence from the new minimum wage research University of California-Irvine, Department of Economics, Working Papers: 060708

Neumark, D., Wascher, W. L., Wooden, M., & Wooden, M. (2009). Minimum wages.

Neumark, D., Salas, J. M. I., & Wascher, W. (2014). "Revisiting the minimum wage-employment debate: Throwing out the baby with the bathwater?" *Industrial and Labor Relations Review*, 67, 608-648.

Nickell, S. J., 1982. "The determinants of Equilibrium Unemployment in Britain" *Economic Journal*, No. 92.

OECD (1999). Making the most of the minimum: statutory MWs, employment and poverty. OECD Employment Outlook June 1999 Paris, ch. 2 pp 31-79.

OECD Employment Outlook (2006) Chapter 7, "Reassessing the Role of Policies and Institutions for Labour Market Performance: A Quantitative Analysis"

OECD Employment Outlook OECD 2004, Chapter 2 "Employment Protection Regulation and Labour Market Performance"

OECD, 1994. The OECD Job Study, OECD Publications.

Pacheco, G. A., & Cruickshank, A. A. (2007). Minimum wage effects on educational enrollments in new zealand. *Economics of Education Review*, 26(5), 574-587

Riihimäki Elisa 2004 Economic Integration and the Elasticities of Labour Demand: Econometric Evidence from Finland Department of Economics, University of Helsinki Discussion Paper No. 613:2005 ISBN 952-10-1545-4, ISSN 1459-3696

Rodrik, D. (1997): Has Globalization Gone Too Far? Institute for International Economics, March 1997, Washington DC.

Rutkowski, Jan (2003): "The Minimum Wage: Curse or Cure?" The World Bank, Human Development Economics

Rycx, François & Kampelmann, Stephan, 2013. "Who Earns Minimum Wages in Europe? New Evidence Based on Household Surveys," Working Papers CEB 13-002, ULB -- Université Libre de Bruxelles.

Samorodov, Alexander (1999), "Ageing and labour markets for older workers", Employment and Training papers International Labour Office Geneva, issue 33

Samuel, Howard (December 2000). "Troubled passage: the labor movement and the Fair Labor Standards Act". *Monthly Labor Review*. United States Bureau of Labor Statistics.

Schmitt, John 2013. "Why Does the Minimum Wage Have No Discernible Effect on Employment?", "CEPR Reports and Issue Briefs 2013-04, Center for Economic and Policy Research (CEPR).

Seager, H. Rogers (1913), "Theory of the Minimum Wage", American Association for Labor Legislation Rev. 81.

Stigler, George J. 1946. "The Economics of Minimum Wage Legislation." *American Economic Review*. Vol. 36, No. 3 (June), pp. 358-65.

Sutch, R. (2010). The unexpected long-run impact of the minimum wage: An educational cascade University of California at Riverside, Department of Economics, Working Papers: 201001.

Vaughan-Whitehead, Daniel (2010) "The Minimum Wage Revisited in the Enlarged EU", International Labour Office, Geneva Switzerland and Professor, Sciences Po, Paris, France.

Williams, Nicolas, and Jeffrey A. Mills. 2001. "The Minimum Wage and Teenage Employment: Evidence from Time Series." *Applied Economics*. Vol. 33, No.3 (February), pp. 285-300.

Wolfson P. & Belman D., 2004. "The Minimum Wage: Consequences for Prices and Quantities in Low-Wage Labor Markets," *Journal of Business & Economic Statistics*, American Statistical Association, vol. 22, pages 296-311, July.