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Happy Birthday, you're Fired! Disentangling the Youth Minimum Wage Wedge
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Happy Birthday, you're Fired! Disentangling the Youth Minimum Wage Wedge

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1. Introduction

One of the most common societal problems of our day is income inequality. The minimum wage is a typical policy strategy to address income inequality since it guarantees workers a fixed level of income. In fact, minimum wages have been the subject of considerable political attention in most developed nations over the past decades: out of the 38 OECD countries, 21 have successfully implemented a nation-wide statutory minimum wage (OECD, 2020). Advocates of minimum wages argue that they are a great tool for reducing inequality. Empirical analyses seem to support this claim. Dolton and Bondibene (2012) examined the correlation between the Kaitz-index (the magnitude of minimum wages relative to median wages) and the Gini-coefficient, a well-known measure of inequality in any given geographical area. A Gini-coefficient of 0 equates to total equality whereas a Gini-coefficient of 1 implies total inequality, with all the wealth being owned by one individual. They find that higher Kaitz-indexes are associated with lower Gini-coefficients. From this, Dolton and Bondibene (2012) conclude that minimum wages are successful in reducing inequality. On the other hand, opponents argue that minimum wages hurt low-wage sectors, through the consequent increase in disemployment (Todorovich & Ma, 2008). This makes it harder for labour market outsider to become labour market insiders.

While the public debate continues, the academic community is far less divided on the effects of minimum wages. One commonality in their research is that young individuals are relatively strongly affected by minimum wages, by both increasing their income and decreasing their employment level (Neumark & Wascher 1992; Kalenkoski & Lacombe 2007; Liu et al, 2016). One explanation for the latter occurring is that young individuals are, generally speaking, less experienced than their older counterparts with whom they compete in the labour market. The lack of bargaining power of young individuals resulting from this skills-gap is detrimental to younger individuals labour market outcomes as long as they cannot

simultaneously compete downwardly on wage level. The latter is prohibited by statutory minimum wages prohibit (Clemens and Wither, 2016). On the long run, the effects of a minimum wage can be detrimental to the lifetime earnings potential of young individuals as their entry to the labour market and on the job training can be delayed (Carcillo et al, 2015).

To offset some of the harm young individuals face due to the imposition of a minimum wage 11 OECD countries have complemented their minimum wages with a statutory youth minimum wage, set as a fraction of the overall minimum wage (Marimpi & Konign, 2018). This youth minimum wage is applicable only to teenagers and young adults, typically below the age of 21. These systems vary from a single minimum wage rate for all young individuals (e.g. Portugal, Ireland and Greece) to step-wise systems in which an individual's calendar age determines their wage rate (e.g. The Netherlands and Australia) (Marimpi & Koning 2018).

Opposed to the research on statutory minimum wages, the research on the effects of youth minimum wages is scarce and tends to have a national focus. Using a regression discontinuity design, Dickens et al. (2014) find positive youth employment effect resulting from a 20% increase in 22-year-olds minimum wage in the UK. Using the same methods analysing the same country, however, Fidrmuc and Tena (2013) find negative to no effects of a similar increase in the youth minimum wage rate on the employment of young individuals. Using difference in difference methods, Hyslop and Stillman (2013) analyse the employment results of New Zealand's young workers that experience changes in their relative minimum wage compared to young adults whose minimum wages remain unaffected. Their results indicate no significant employment effects for both groups on the short term, and only weak negative long term employment effects for those subjected to the change. Moreover, Olson (2011) performed a similar analysis in Australia and found no employment effects of a 10% increase in the minimum wage experienced by young adults between the ages 15-21. Most recently, Kabatek (2021) did research on the Dutch stepwise system and found dynamic results

with the employment rate being subject to an initial drop leading up to one's birthday that is gradually compensated for by the higher rates of post-birthday labour market entry. Research on statutory youth minimum wages that takes a single country as the unit of analysis thus is quite divided with authors some (Dickens et al, 2014; Kabatek 2021;) finding some negative employment outcomes of youth minimum wages, whereas other authors (Hyslop and Stillman, 2007; Olson 2011 Fidrmuc and Tena 2013) finding no significant effects of statutory youth minimum wages on youth labour market outcomes.

On a cross-national scale, Neumark and Washer (2004) analysed 17 OECD countries over the period 1975-2000. They showed that the existence of a youth sub-minimum wage in systems with statutory minimum wages reduce the disemployment effects caused by the presence of a statutory minimum wage. Moreover, they found significant variation in the effects that youth minimum wages have across countries. To account for this homogeneity Neumark and Washer (2004) look at collective bargaining though Unions. They find that the negative relationship between youth minimum wages and youth employment decreases as union density increases. Moreover, they find that active labour market policies and employment protection policies might offset the negative effects of youth minimum wages, although these findings were significant only to a limited degree.

One of the most important papers to date on the effects of youth minimum wages on youth labour market outcomes is by Marimpi and Koning (2018). Marimpi and Koning perform a cross-country analysis on the impact of the level of specific youth minimum wages on the labour market outcomes of young individuals over 30 OECD countries between 2000 and 2014. They find that increases in the level of (youth)minimum wages exert a substantial negative impact on the employment rate for young individuals (Marimpi & Koning; 2018). Taking a closer look at the data however, there appears to be quite some heterogeneity in these effects. When the dataset is split between North-Western and South-Eastern European countries, we

see that an increases in (youth)minimum wages yield opposite effects in these groups of countries[1]. This implies that whilst the overall trend across countries is significant, the analysis omits variables that might be able to explain the variation in the effects (youth)minimum wages. The omission of these variables is only briefly discussed in the conclusion: "more detailed analyses that incorporate other institutional settings may help in deepening our understanding of minimum wage systems and their effect on youth labour markets. This particularly applies to labour standards, the design of education systems, opportunities for part-time work, union coverage, and employment protection legislation. All these institutions may affect the extent to which individuals and employers respond to minimum wage settings" (Marimpi and Koning; 2018)

This study starts off by assessing the employment effects of youth minimum wages. There seems to be a lack of academic consensus surrounding this topic. More specifically, I am interested in the effects that youth minimum wages have on the labour market performance of young individuals. The research question that I ask is:

How do youth minimum wages affect the labour market performance of young individuals in

OECD Countries?

I do this by comparing youth labour market outcomes across minimum wage regimes. I examine this by constructing fixed effects linear models that regress both the type and intensity of (youth) minimum wages across 30 OECD countries between 2000 and 2019. Previous cross-country research only extends up to 2014 (Marimpi & Konign, 2018). Including the post-recession-pre-pandemic period into this analysis is one of the contributions this paper aims to make.

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[1] See appendix A for more details.

Next, we turn out attention to the heterogeneity within these minimum wage effects. As discussed above, one shortcoming in research on youth minimum wages is that factors causing heterogeneity in the effects on youth minimum wages on youth labour market outcomes have received relatively little attention. This paper aims to identify the underlying causes of this heterogeneity, thereby adding to the works of Neumark and Washer (2004) and Marimpi and Koning (2018). The second research question is:

To what extent can labour market institutions explain the heterogeneous effects that statutory youth minimum wages have on youth labour market outcomes across OECD countries?

To do so, I will focus the role of collective bargaining trough unions, active labour market programs (ALMP's), passive labour market programs (PLMP's), employment protection (both for temporary and long-term contracts) and education. Moreover, I will assess whether differences youth minimum wage schemes affect labour market outcomes differently (uniform youth wage versus stepwise systems). The data of which are all derived from OECD databases, using data ranging from 2000-2019.

Looking ahead, Chapter 2 will provide a theoretical framework to the academic discussion on the link between youth minimum wages and youth labour market outcomes. On the basis of this framework, hypotheses will be formulated. Chapter 3 delves into the research design of this study. The focus will lie on the used data, the variables and the models constructed to test the hypotheses. Chapter 4 will consist of the analyses using the constructed models, as well as the interpretation of their results. Chapter 5 will do some robustness checks to assess how resilient the outcomes of the models are. Chapter 6 will discuss the main results of the analysis and what implications these results have for policymakers. Finally, Chapter 7 concludes.

2. Theoretical framework

This section will provide theoretical on youth minimum wages and the effects they have on labour market outcomes. We start if by reviewing the literature surrounding uniform minimum wages. Thereafter, we review the literature surrounding youth minimum wages. After that I will formulate some hypotheses based on the literature.

2.1 Minimum wages and the young worker - literature review

Minimum wages are policy measures that set a minimum hourly wage rates that workers receive in return for their labour. Employers are not allowed to pay their employees an amount lower than the established minimum wage. As briefly discusses in the introduction, the research on the topic of minimum wages is vast. The most seminal works on minimum wages are arguably those by Card and Krueger (1992; 1994). They examined the effects of a minimum wage on the teenage labour market following the introduction of minimum wage statues in the US between 1989-1990. In this study, no negative effect of minimum waged on teenage labour market outcomes. Card and Krueger argued that employment losses should be concentrated among low wage states, providing a test that changes in employment among these workers when faced with an increase in minimum wage should be attributable to the change in wage rate. To test this hypothesis, Card and Krueger surveyed 410 fast food restaurants in New-Jersey and eastern Pennsylvania before and after a federally mandated minimum wage increase from $4.25 to $5.05. The conclusion they reached is the increase in minimum wage had no effects in this sector. It must be noted however that this study only looked at one specific sector, the fast-food industry, rather than nation-wide teenage employment. More recent research has reached similar conclusions. Ferraro et al. (2018) did a case study on the minimum wage increases in Estiona between 2013 and 2016. Using difference-in-differences, they found that

minimum wage had insignificant effects on employment retention across sexes and demographics. However, as they note, it is reasonable to suspect that employment-outsiders

However, upon replication of the 1994 Card and Krueger study Wessels (2007) found results opposite to those derived from the initial analysis in 1994: The increase in minimum wage significantly lowered teenage employment, especially in highly affected states (i.e. states with average low wages). Wessels (2007) does not stand alone in the school of thought that hypothesises minimum wages to have detrimental effects to youth labour market outcomes (Todorovic & Ma, 2008). Bazen & Marimoutou, (2002), for instance note that the model used by Card and Krueger does not find significant effects because it fails to capture the cyclical nature of teenage employment. Moreover, the empirical data used by the Card and Krueger (1994) study only covers a relatively short time span (1989-1990). When looking at a longer time span and taking the cyclical nature of teenage employment into account the estimated long run effect of a rise in the minimum wage is found to be statistically significant and fairly stable – a 10% increase in real terms with real average wages held constant leads to reduction in teenage employment of 2–3%. Moreover, William and Mills (1999) argue that the state level analysis suggested by Card and Krueger (1992) were not robust across the 1990-1991 and 1996-1997 minium wage increases. Using national level data, they find significant disemployment effects for both men and women resulting from minimum wage increases (William and Mills; 1999). Burkhauser et al. (2000) found similar results. Using the Survey of Income and Program Participation (IPP) and the Current Population Survey (CPS) to estimate the effects that minimum waged have on vulnerable groups of people. Their analysis runs from 1979-1997 in the United States, although their estimates for differences between groups are done within different subsets of these years due to some data not overlapping properly. The consistently find that employment is most adversely affected by minimum wages

within the most vulnerable groups: young adults without a high school degree, young black adults, teenagers and black teenagers, the latter of which being the most negatively affected.

There also appears to be a school of thought that deems minimum wages to have positive effects on employment. The most important work in this body of literature appears to be that of D.R. Lee (2004). Lee argues that employers are able to offset the increase in wage costs by reducing fringe benefits workers receive. The small disemployment effect that remains due to the increase in wage costs is more than compensated for the increase in labour market participation by young adults due to the rise in wages. Thus, while minimum wages yield positive employment effects, workers are harmed by reduced benefits that accompany their jobs (Lee, 2004). De Fraja's (1999) analysis of minimum wages concludes similarly, while minimum wage increases yield positive effects on overall employment, it is accompanied by worsened working conditions for workers that score on the lower end of the productivity hierarchy (De Fraja; 1999). McClure & Harold (1994) argue, similarly, that whilst effects on total levels of employment are positive, worker utility decreases with minimum wage increases.

It must be noted however that all the studies residing in the school of thought that hypothesises positive employment effects, are exclusively theoretical works of research. This stands in sharp contrast to the research covered in the previous paragraphs, that are almost entirely empirical in nature. Whilst the extent to which these theories will hold up in the real world remains questionable, this body of literature succeeds more than anything is disentangling the employment effects of minimum wages. Whereas other bodies of literature look at (un)employment rates and leave it at that, authors in this school also look at benefits and worker conditions. This disentangling of labour market outcomes is an important topic to which I will return shortly.

The results of the above national level studies appear to be inconclusive, in which three apparent camps emerge[2]. Those that find no significant employment effects (Card & Krueger, 1993, 1994). Those who find negative employment effects resulting from minimum wages (Wessels, 2007; William and Mills; 1999; Burkhauser et al, 2000; Bazen & Marimoutou, 2002) And finally, those who find minimum wages to have positive employment effects (Lee, 2004; De Fraja; 1999; McClure & Harold, 1994). The inconclusiveness of these results implies the existence of more complicated relationships that are not caught by national level research. Because national level research did not end up with satisfactory results, the overall trend in research in the late 2000's early 2010's shifted from national to international comparative research to explain the afore mentioned differences in outcomes.

In this body of literature, the most important is arguably that by Neumark and Washer (2004). They analysed 17 OECD using a pooled cross-section, time series data set ranging from 1975-2000. Their finding is consistent with the view that minimum wage causes employment losses, specifically among young workers. Moreover, they find labour market regulations to be a considerable mediating factor. Youths in countries with less regulated labour markets are more adversely affected by minimum wages than youths in countries with highly regulated labour markets. This effect, however, is heterogeneous across countries, suggesting the existence of mediating nation specific variables.

Saget (2001) performed a similar analysis on 30 developing countries across Asia, Africa and Latin America. Using regression analyses, Saget found that of minimum wages do not affect the poorest population groups, but rather the upper levels of the low-income population. Moreover, minimum wage size relative to either median wages or average manufacturing wages did not significantly affect the levels of youth employment. Although, it must be noted that it is well possible that the sizes of the informal economies within these

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[2] For a comprehensive summary of these bodies of literature   Todorovich & Ma (2008)

developing nations cloud the results the regression analysis gives us, as there is little valid data on informal economies (Saget, 2001). Limitations withstanding, the research provides support to the idea that the minimum wage may bring positive results in poverty alleviation by improving the living conditions of workers and their families, while having no negative effects in terms of employment.

To briefly summarize, while some disagreements persist, the academic consensus is that within developed countries young individuals are relatively strongly affected by minimum wages. Minimum wages both increase the income and decrease the employment level of young individuals (Neumark & Wascher 1992; Kalenkoski & Lacombe 2007; Liu et al, 2016). This has lead policy makers to different avenues to mitigate some of the harm minimum wages cause to young people.

2.2. Youth minimum wages in developed nations

Over de past decades, policy makers have become increasingly convinced that minimum wages do in fact yield negative labour market outcomes for young individuals. A common tool to mitigate this harm is the youth minimum wage: a statutory minimum wage set as a fraction of the total minimum wage only available to young workers, typically those between 15 and 21 (Marimpi & Koning, 2018). Out of the 21OECD countries with nation-wide statutory minimum wages, 11 have implemented additional youth minimum wage systems (OECD, 2015). The rationale behind this is relatively straight forward. Within labour markets with a statutory minimum wage older workers have a competitive edge because they tend to be more experienced. Young workers often lose this battle because their competitive edge, the ability to compete downwardly on wage level, is taken away by the statutory wage rate (Clemens and Wither, 2019). To give young workers a competitive edge, an additional lower minimum wage is implemented to which only young individuals are eligible. These youth minimum wage

systems vary from a single minimum wage rate for all young individuals (e.g. Portugal, Ireland and Greece) to step-wise systems in which an individual's calendar age determines their wage rate (e.g. The Netherlands and Australia) (Marimpi & Koning 2018).

The body of academic literature on these complementary youth minimum wages is far less developed that than its counterpart on regular minimum wages. In the UK, Fidmuc & Tena (2013) analysed the effects of age-related increases in the minimum wages. The UK has a system in which workers aged 16 and 17 are entitled to a children's minimum wage. Upon Turning 18, workers are entitled to the so-called development rate. At the age of 22, workers are entitled to the adult minimum wage rate. The ratio between the adult rate and the development rate has been approximately 1.2 while the ratio between the development rate and the 16/17 rate has been approximately 1.35. This means that young works earning the National Minimum Wage are subjected to considerably sharp increases in wage at two points, turning 18 and turning 22. Fidmuc & Tena (2013) use a regression discontinuity design to measure the employment effects of these increases around the cut-off. They find significant negative employment effects for male workers who are about to turn 22, which is believed to be an anticipation effect. Moreover, they find significant negative employment effects for both men and women upon turning 18. Using the same methods however, Dickens et al. (2014) find positive employment effects for low-skilled UK workers upon turning 22. Dickens et al. (2014) argue that upon turning 22 years of age, young workers find work more attractive compared with when they were 21 years old. This induces them to increase participation in the labour market, or to increase their job search intensity. These findings are directly at odds with what Fridmuc & Tena (2013) found a year previous.

In New Zealand, Hyslop and Stillman (2005) analysed the effects of the 2001 minimum wage reform. Prior to this reform, the youth minimum wage system entitled 16–19-year-olds to 60% of the adult minimum wage. The subsequent reform lowered the eligible age from 20

to 18, resulting in a 69% minimum wage increase for 18- and 19-year-olds. Secondly the reform raised the youth minimum wage in two annual steps from 60% to 80% of the adult minimum and resulted in a 41% increase in the minimum wage for 16- and 17-year-olds over a two year period. Using a difference-in-differences design, Hyslop and Stillman (2005) compared the labour market effects of young workers to those experienced by 20–25-year-olds in the same period. They find no evidence of adverse effects on youth labour market effects directly after the minimum wage reform and only weak evidence for long term negative labour market outcomes for young workers. It must be noted however that this latter conclusion might be influenced by an additional increase in both the youth minimum wage and the adult minimum wage of 6,3%. This increase might confound the quasi-experimental setting that the difference-in-differences design in based on.

In the Netherlands Kabatek (2021) did research on the Dutch stepwise system in which the youth minimum wage increases with age. Kabataek (2021) found dynamic results with the employment rate being subject to an initial drop leading up to ones birthday that is gradually compensated for by the higher rates of post-birthday labour market entry. However, this research does not focus on the overall effects of youth minimum wages on youth labour market outcomes relative to adult minimum wages.

Although that the national level research on the effects of youth minimum wages are fairly limited, some disagreements persist. Out of these disagreements, camps emerge that are similar to those present in the minimum wage debate. Some researchers hypothesize that higher youth minimum wages have negative effects on youth labour market by diminishing young peoples competitiveness on the labour market (see Fidmuc & Tena, 2013; and to some extent Kabatek, 2021). Contrastingly, other researchers hypothesize that higher youth minimum wages increase the propensity of young individuals to participate in the labour market, thus enhancing labour market outcomes for young individuals (see for instance Dickens et al, 2014).

Then there are also authors that do not find evidence for a youth minimum wage effect in any direction (Hyslop and Stillman, 2005).

One of the first international comparative researches to include youth minimum wages was the Neumark en Washer (2004) article mentioned earlier. They analysed 17 OECD countries using a pooled cross-section, time series data set ranging from 1975-2000. Neumark and Washer (2004) find that the negative effects that minimum wages have on youth labour market outcomes are significantly lower in countries that also have sub minimum wages designated for youths. In this effect, Neumark and Washer (2004) find considerable heterogeneity of minium wage effects across countries. For instance, they find that the negative relationship between minimum wages and youth employment decreases as union density increases. Moreover, they find that active labour market policies and employment protection policies might offset the negative effects of minimum wages, although these findings were significant only to a limited degree. In the Neumark and Washer (2004), youth minimum wages are treated like mediating factors alongside union density, active labour market programs and labour market regulation. What has not been tested in this study design is the extent to which union density, active labour market programs and labour market regulation affect the effects that youth minimum wages have on youth labour market outcomes. This leaves considerable room open for research.

The most important recent contribution to the international comparative research on youth minimum wages was done by Marimpi and Koning (2018), who performed a cross country level analysis on the impact of the level of specific youth minimum wages on the labour market performance of young individuals. In their analysis, the authors distinguish OECD countries that have no minimum wages, only one statutory minimum wage and countries that have both youth and adult minimum wage rates. Interestingly, Marimpi and Koning find that the employment levels of young individuals under 25, relative to older workers in countries

with youth minimum wages are close to the relative employment levels of young individuals in countries with no minimum wages at all. Looking at the smaller set of countries with statutory youth minimum wages, the authors find that increases in youth minimum wages relative to the countries median wage (referred to as a Kaitz-index), exert negative impact on the employment rates for young individuals.

What Marimpi & Koning (2018) neglect to analyse is the considerable heterogeneity in the employment effects of youth minimum wages across different groups of countries. Appendix A performs a replication of the analyses performed by Marimpi & Koning and adds a data split between North-Western European Countries (NWEC) and South-Eastern European Countries (SEEC).

2.3 Youth Minimum wages across OECD Countries

Regarding (youth) minimum wages, OECD Countries can be assigned to four different groups. Groups. Group 1 consists of countries that have statutory minimum wages. Group 2 consists of countries without statutory minimum wages. Group 1A consists of groups that have both statutory minimum wages and the complimentary youth minimum wage. Group 1B consists of countries that have a statutory minimum wage but lack the complementary youth minimum wage. Table 1 Gives a comprehensive overview of these groups of OECD Countries. Note that some countries are assigned to multiple groups. This is because somewhere during the duration of this analysis their laws surrounding minimum wages shifted. Greece for instance introduced youth rates in 2012 whereas Belgium partially phased out some youth rates during 2013-2015 (Marimpi and Koning, 2018; OECD, 2015). These shifts in classification over time are accounted for in the data.

2.4 Hypotheses

At this point a lot has been said about the possible disemployment effects of youth minimum wages. Based on the literature surrounding youth minimum wages, his section aims at formulating some hypotheses. In this, I will start are the most general level comparing different groups of countries on the bases of their minimum wage institutions and their corresponding youth labour market circumstances. After that, I will zoom in on the counteracting supply and demand effects of relative size of youth minimum wages, resulting in what I call the minimum wage wedge. Subsequently, I will delve into some labour market institutions that can account for some of the heterogeneity of minimum wage effects that have been observed in prior research.

To investigate the employment effects of youth minimum wages, we need to make comparisons between youth labour market outcomes in different groups of countries along the lines of their minimum wage institutions. For an overview of these groups, I refer to Table 1. Firstly, I expect young individuals of countries with only one statutory minimum wage (1B) to be worse off than young individuals in countries with both adult and youth minimum wage rates (1A). The specific effect I hypothesize here is taken from the work of Walter and Clemens (2016): Within labour markets with a statutory minimum wage, older workers have a competitive edge because they tend to be more experienced. Young workers often lose this battle because their competitive edge, the ability to compete downwardly on wage level, is taken away by the statutory wage rate. To combat this problem, youth minimum wages are introduced. These youth minimum wages have the capacity to offset the disemployment effects of statutory minimum wages by making young labour more affordable for employers. This effect has been observed in both national as cross-country level research (Marimpi & Koning, 2018) Following hypothesis is thus:

Hypothesis 1: *Young individuals in countries with both adult and youth minimum wage rates will experience better labour market outcomes that young individuals in countries with only one statutory minimum wage rate.*

Following from this hypothesis, and in line with the findings of Neumark and Washer (2004) and of Dolton and Bondibene (2012) I expect that labour market outcomes of young individuals in countries with both adult and youth minimum wage rates will be rather similar to the labour market outcomes of young individuals. That is to say; I expect that the labour market outcomes of groups 1A and 2 will be quite similar. This is because the disemployment effects that minimum wages pose on young individuals is absent in countries with no minimum wages at all. Note that this degree of similarity between these groups, ceteris paribus, should be a measure of how well youth minimum wage rates combat the disemployment effects a sole statutory minimum wage poses on young individuals. This ceteris paribus condition is something that will be discussed at length during the research design section of this study. The hypothesis is thus:

Hypothesis 2: labour market outcomes of young individuals in countries with both adult and youth minimum wage rates will be similar to the labour market outcomes of young individuals in countries with no minimum wages at all.

Zooming in on Group 1A, we will turn our attention to the effects of the relative size of the youth minimum wage as compared to the average wage and the adult minimum wage rate. Here, I hypothesize a counteraction of the effects. Increases in youth minimum wages have a demand side effect that negatively affects youth labour market outcomes. Employers are only incentivised to hire young workers insofar as their lack of skill is outweighed by the cheapness

of their labour. Increases is youth minimum wages may cause employers to consider hiring older more skilled workers, thereby harming the ability of young individuals to compete, causing employers to consider hiring older, more skilled workers. The underlying assumption that I'm making here is that age and skill are strongly correlated[3]. Simultaneously, there is a supply effect that positively affects youth labour market outcomes. This effect is most prominently discussed by Dickens et al. (2014). Youth minimum wages may increase the propensity of young individuals to seek participation in the labour market, thus enhancing labour market outcomes for young individuals overall. The net result of these conflicting supply effects and demand effects can be considered a youth minimum wage wedge. With the data at hand, it is not possible to independently measure the size of both the demand and supply effects of youth minimum wage intensity. What can be measured however is the net effect of the youth minimum wage wedge. Considering the prior research by Marimpi & Koning (2018), I hypothesize this effect to be negative:

> **Hypothesis 3:** youth labour market outcomes in countries with both adult and youth minimum wages will deteriorate as youth minimum wages increase.

Next, we are interested in how the effects of youth minimum wage wedges vary over countries. More specifically, the aim here is to disentangle the effects of youth minimum wages from the labour market institutions in which they are embedded. In this, we focus on three kinds of labour market institutions: active labour market policies, passive labour market policies and union density.

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[3] For a comprehensive review of the connection between age and skill, see Pareliussen (2016). *Age, skills and labour market outcomes in Finland*

active labour market policies involve governmental investments in various aspects of the labour market, usually targeted at the unemployed. These investments include for instance the (re)training of individuals to position them better in the labour market, employment incentives, or sheltered employment assistance for people with a disability. In hypothesis 3 we anticipate that increases in youth minimum wages harm youth labour market outcomes. The underlying mechanism for this expectation is that is that while young individuals are less skilled, they are attractive to employers insofar as their lack of skill is outweighed by the cheapness of their labour. Increases in youth minimum wages harm this competitive edge that young individuals have by increasing the wage floor. As a result, youth labour market outcomes deteriorate as youth minimum wages increase. In this context it is reasonable to expect that governmental investments aimed at improving the labour market position of (young) unemployed individuals will be able to offset some of the disemployment effects caused by increases in youth minimum wages. Therefore, I expect that when we control for active labour market policies, the disemployment effects caused by youth minimum wages will decrease.

> **Hypothesis 4:** The disemployment effects caused by increases in (relative) youth minimum wages will decrease as we control for active labour market program expenditure.

In contrast, passive labour market institutions are aimed at protecting the employed rather than assisting the unemployed. Passive labour market institutions include employment protection for people with regular contracts, employment protection for people with temporary contracts or employment protection against collective dismissals. There are two counteracting effects that can be hypothesized here. On the one hand, employment protection legislation, especially for temporary contracts, make it harder for young labour market insiders to lose employment

because of higher youth minimum wages. On the other hand, employment protection legislation makes it more difficult for young labour market outsiders to gain employment. Again, we can only measure the net effect here. I hypothesize that net effect of stringent employment protection legislation will intensify the disemployment effects caused by higher youth minimum wages.

Hypothesis 5: The disemployment effects caused by increases in (relative) youth minimum wages will increase as we control for passive labour market policies.

Finally, we turn our attention to the role of unions. As briefly discussed earlier, Neumark & Washer (2004) discovered that that the negative relationship between minimum wages and youth employment decreases as union density increases. The mechanism underlying hypothesized here is that unions have the ability to bridge an information asymmetry that exists when deciding on appropriate minimum wage level: unions have a better sense than legislators of what constitutes a relevant market wage for their members (Neumark & Washer, 2004). Assuming that stronger unions have more bargaining power in the policy process, stronger unions might be able to steer the minimum wage to a level that is more market appropriate, thereby decreasing the possible disemployment effect of minimum wages. Indeed, their analysis shows that minimum wage coefficient is negative to a lesser degree as union strength increases. A similar analysis for youth minimum wages, however, has not yet been performed. Following the analysis of Neumark & Washer (2004), I hypothesize here that:

Hypothesis 6: The disemployment effects caused by increases in (relative) youth minimum wages will decrease as we control for union density

After controlling for these labour market institutions, we want to assess the influence of variations in labour market institutions on the on the size of the (dis)employment effects caused by higher relative levels of youth minimum wages. As will become clear in chapter 4, this will be done by measuring the interaction terms of the relative size of youth minimum wages and labour market institutions. Starting with active labour market programs, I hypothesize that the disemployment effects of higher relative youth minimum wages are less profound in countries with higher active labour market program expenditure.

Hypothesis 7: The disemployment effects caused by increases in (relative) youth minimum wages are less profound in systems with higher levels of active labour market program expenditure.

As for passive labour market policies, I hypothesize the opposite. More stringent labour protection laws wills strengthen the disemployment effects of higher youth minimum wages, as employment protection legislation makes it more difficult for young labour market outsiders to gain employment.

Hypothesis 8: The disemployment effects caused by increases in (relative) youth minimum wages are more profound in systems with more stringent passive labour market policies.

Lastly, I hypothesize that the disemployment effects of youth minimum wages are less profound as union density increases. The underlying mechanism here, borrowed from Neumark and Washer (2004), unions have the ability to bridge an information gap that exists when deciding on appropriate minimum wage level: unions have a better sense than legislators of

what constitutes a relevant market wage for their members (Neumark & Washer, 2004). If stronger unions have more bargaining power in the policy process, stronger unions might be able to steer the minimum wage to a level that is more market appropriate, thereby decreasing the possible disemployment effect of minimum wages

> **Hypothesis 9:** The disemployment effects caused by increases in (relative) youth minimum wages are more less in countries with higher union densities.

3. Research design

This section of the paper aims to elaborate on the specific design choices made for testing the hypotheses of the previous chapter. In this, I will delve into the specific data, the variables used to operationalise the concepts used in the hypotheses and the models used to subsequently test these hypotheses.

3.1 Data

To assess the effects of youth minimum wages on youth labour market outcomes, this research uses data derived from the official OECD Data warehouse, the central database of the OECD (OECD, n.d.). The data in this database contains aggregate level data on all kinds of economic factors across countries over time. I have complemented the OECD data with data provided by national governments concerning the relative levels of youth minimum wage rates[4].

Across Units, I include most but not all OECD countries. While the OECD has national standards for data collection on specific variables, some later members only adhered to these standards from the point of joining the OECD onward. This causes large gaps in data on numerous variables, making comparisons with these countries virtually impossible. Out of the current 38 OECD member states, 30 are included in the analysis. Table 1 provides an overview of these countries and their respective minimum wage regimes. Group 1 consists of countries that have statutory minimum wages. Group 2 consists of countries without statutory minimum wages. Group 1A consists of groups that have both statutory minimum wages and the complimentary youth minimum wage. Group 1B consists of countries that have a statutory minimum wage but lack the complementary youth minimum wage. Note that some countries are assigned to multiple groups. This is because somewhere during the duration of this analysis their minimum wage regime shifted. Greece for instance introduced youth rates in 2012

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[4] For an overview of these additional sources of data I refer to appendix A.

whereas Belgium partially phased out some youth rates during 2013-2015 (Marimpi and Koning, 2018; OECD, 2015). These shifts in classification over time are accounted for in the data.

Table 1: *Classifications of countries on minimum wage regimes (2000-2019)*

Group 1*: Countries with Statutory minimum wages* (N_1= 21)		Group 2*: Countries without Statutory minimum wages* (N_2= 9)
Australia	Korea	Austria
Belgium	Luxembourg	Denmark
Canada	Netherlands	Finland
Czech Republic	New Zealand	Germany
Estonia	Poland	Iceland
France	Portugal	Italy
Germany	Slovak Republic	Norway
Greece	Spain	Sweden
Hungary	Turkey	Switzerland
Ireland	UK	
Japan	USA	

Classification of Group 1 depending on youth rates

Group 1A*: Countries with Statutory minimum wages & youth rates* (N_{1A}= 11)		Group 1B*: Countries with Statutory minimum wages without youth rates* (N_{1B}= 12)	
Australia	New Zealand	Belgium	Hungary
Belgium	Portugal	Canada	Japan
Greece	Slovak Republic	Czech Republic	Korea
Ireland	Turkey	Estonia	Poland
Luxembourg	UK	France	Spain
Netherlands		Greece	USA

Across time, I analyse at the period between 2000 and 2019. Previous comparative research on youth minimum wages extends only up to 2014. One limitation on this period is that the years leading up to 2014 were characterised by strong economic recession and the following partial recovery thereof among most OECD countries. The years after 2014, in most developed nations, can be characterised by large numbers of economic growth. Covering both periods of economic bust and boom allows us to assess the degree to which the market cycle contributed to youth minimum wage effects. The year 2020 is excluded from this analysis because of obvious reasons. The emergence the global coronavirus pandemic and the subsequent policy measures have undoubtedly affected all economies and labour markets across the globe. While there is an emerging field of literature on the economic consequences of covid policies, it is far beyond the scope of this research to add to that discussion.

3.2 Variables

This section of the paper delves into the different variables that are used in the forthcoming linear models. First, we discuss the dependent variables. Second, we discuss the main independent variables as well the dummy variables necessary to test the first X hypotheses. After that, I will delve into independent variables used to account for the heterogeneity of youth minimum wage effects.

3.2.1 dependent variables

In the end we want estimate how different minimum wage regimes affect youth labour market outcomes. This study measures youth labour market outcomes in three ways: unemployment rate, labour force participation and unemployment rate. Employment rate measures the share of people employed relative to the total population of a country in a given year. The labour force participation rate consists of all employed people plus all people actively seeking

employment, relative to the total population of a country. The unemployment rate measures the share of unemployed people relative to the labour force participation rate.

In a perfect world, we would measure these variables per age per year so that differences in youth minimum wage eligibility criteria could go accounted for. However, the available data does not account for such a level of specificity. The data, borrowed from the OECD Employment Outlook report (2020), measures unemployment rates, labour force participation rates and employment rates as unweighted averages of 5-year age intervals. When looking at youth labour market outcomes, we focus primarily on the age groups 15-19 and 20-24.

3.2.2 Independent variables

Next, if we wish to analyse the effects of youth minimum wages on the dependent variables described above, we need to construct variables that aptly capture youth minimum wages, both in presence and in intensity. To that end I have constructed the following variables:

i. A dummy variable that indicates minimum wage regime. This variable is assigned the value of 1 for all age categories per year per country that are eligible for a youth minimum wage. The variable is assigned the value of 0 for all age categories that are not eligible for youth minimum wages. This value can be zero for one of two reasons: it can be zero in countries with youth minimum wages for ages that exceed the eligibility criteria, or it can be zero because the respective country does not have youth minimum wages.

ii. A dummy variable that assigns a value of 1 to countries with minimum wages, and a 0 to countries without minimum wages. In combination with the first dummy variable, this will be used to test the second hypothesis.

iii.   The level of (youth) minimum wage as compared to the average wage rate in a country. Because of currency differences and inflation that affects countries differentially, all wage values are calculated in terms of 2020 PPP US dollar values[5]. In countries with youth minimum wages, age groups above the youth minimum wage eligibility criteria display the level of adult minimum wage as compared to the average wage. In all fairness, the median wage rate (resulting in a Kaitz Index) would allow for even better comparisons by discarding wage outliers. Unfortunately, OECD data does not report median wages, so average wages will have to do.

iv.   The level of youth minimum wage relative to the adult minimum wage. This value equals 1 for all age categories eligible for the adult minimum wage rate as well as all age categories in countries with only one statutory minimum wage rate. In countries without minimum wages this value is absent.

For the second and third variable that aim express the *intensity* of youth minimum wages either as compared to average wages or adult minimum wage rates, we run into an issue. Some countries in group 1A have step wise systems of determining the youth minimum wage rates that increase per age. The challenge here is to express the intensity of minimum youth wage in one value to per age groups 15-19 and 20-25. I do this by expressing the youth minimum wage as an average of youth minimum wages earned by individuals in those age groups. An implicit assumption I am making here is that

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[5] PPP stands for Purchasing Power Parity. This is a widely used measure that calculates the value of a currency in one point and time to the amount of 2020 US Dollars that would be of equal utility in terms of purchasing power.

3.2.3 Mitigating variables

We also want to assess the extent to which the labour market institution in which youth minimum wages are embedded affect the effects of youth minimum wages. To this end, we look at (1) active labour market policies, (2) passive labour market policies and (3) union density.

Active labour market policies refer to active investments and programs that aim to stimulate the labour market. The OECD measures these active labour market policies across countries relative to that years GDP. Whilst there is a vast array of ALMP expenditure aimed at improving labour market conditions, I have chosen to only include those that are at least partially aimed at young individuals (excluding for instance expenditure aimed at retirees). Included in the analysis are the following types of expenditure:

i. Public Employment Services (PES) refer to al government expenditure aimed at connecting unemployed individuals to prospective employers. This includes referral services, job brokerage or financial assistance to cover the costs of job search. Also included in PES expenditure is the administration costs of these benefits. Other categories do not include administrative costs.

ii. Employment Incentives are types of expenditures direct at employers rather than the unemployed. These types of expenditures include recruitment incentives where the costs of recruiting certain groups of people is (partially) covered by the government or employment maintenance services aimed at facilitating continued employment.

iii. Training refers to all types of expenditure aimed at improving the skills of both employed and unemployed individuals. These expenditures are mainly focussed on four typed of training. Institutional training refers to training where more than 75% of the time spent training is done in institutions (schools, colleges, training centres etc.) Workplace training refers to training where more than 75% of the time spent training

is done in the workplace. Alternate training refers to training where time training is split evenly between institutions and the workplace. Lastly, special support for apprenticeships is included in training expenditure.

iv. Sheltered and supported employment and rehabilitation consists of subsidies for the productive employment of people with permanent or long-term reduced capacity to work.

v. Job creation refers to programs that create additional jobs – usually aimed to benefit the community or be socially useful in other ways. Most of this expenditure is aimed at the public and non-profit sector, although private sector organisations may also be eligible.

vi. Total spending: refers to the sum of all ALMP expenditure. This includes spending on ALMP expenditure categories that are not individually included in the analysis.

As for passive labour market policies we look at policies aimed enhancing the position of employed individuals in the labour market. This is mainly done through employment protection legislation. To measure this, the OECD compiles and weight the stringency of employment protection across sectors, across time, across countries to construct an indicator score between 0-6 for different types of employment protection (OECD, 2020). The types of employment protection included in the analysis are employment protection for regular contracts, employment protection against collective dismissals and employment protection for temporary contracts.

Lastly, we turn our attention to the role of labour unions. The measure we use to this end is the OECD's measure of Union Density, one of the most widespread indicators to measure union bargaining strength. Specifically, union density looks at the (weighted) percentage of employees that are member of a trade union. (OECD, 2022).

3.3 Model specifications

To assess the effects of youth minimum wages on youth labour market outcomes, we begin by investigating the effects of statutory minimum wages and statutory youth minimum wages on the labour market outcomes of young individuals below the age of 25. We compare these to the labour market outcomes of individuals between 25 and 35. We make this comparison across three groups of countries: countries with both adult and youth minimum wages (Group 1A), countries with one statutory minimum wage rate (Group 1B) and countries without minimum wages at all (Group 2). The linear model that estimates this comparison reads as follows:

$$y_{ijt} = \beta_0 + \beta_1 \; UMWD_{jt} \times I(i \leq 2) + \beta_2 \; YWD_{jt} \times I(i \leq 2) + AGE_i +$$
$$COUNTRY\_YEAR_{jt} + \varepsilon_{ijt}$$

(1)

In this model y_{ijt} stands for the labour market outcomes that we're interested in (employment rate, labour force participation rate and unemployment rate) for age category i in country j in year t. The first one of two dummy variables indicating minimum wage regimes is $UMWD_{jt}$. This variable assigns a 1 to countries with one uniform minimum wage and a 0 to countries with youth minimum wages as well as countries with no minimum wages at all. The second dummy included in the model is YWD_{jt} assigns countries with a value of 1 if they employ a specific youth minimum wage in year t and a 0 otherwise. 0 thus includes both countries with minimum wages and without minimum wages. Using these two dummies the model can delineate between groups 1A, 1B and 2.

The coefficient used in model (1) are β_1 and β_2. β_1 describes the impact of having just one uniform minimum wage on the labour market outcomes of people in the first two age groups. These groups are isolated in this model by $I(i \leq 2)$, and consists of people between 15-20 and 21-25. β_2 describes the labour market outcomes for the same age groups in countries

with statutory youth minimum wages. The values of β_1 and β_2 thus can be interpreted as the relative labour market performance of young individuals in countries with one uniform minimum wage (β_1) and the relative labour market performance of young individuals in countries with youth minimum wages (β_2) as compared to the labour market performance of young individuals in countries with no minimum wages at all.

Moreover, included in the model is COUNTRY_YEAR$_{jt}$, an interaction of fixed country effects and fixed year effects. There is a plethora of variables that might affect the labour market performance of young individuals in a given year that have little to do with the presence or intensity of (youth) minimum wages. Some of these variables we can observe. Think for instance of the effects that active labour market programs or union density might have on youth employment. Other variables we cannot observe. Think for instance of the cultural norms regarding studying and working. In some cultures, this might be encouraged whereas other cultures expect their students to focus solely on their studies. While this likely to influence youth labour market performance this is difficult to observe empirically and even harder to quantify. Ideally, we want our model to control for all variables, observable or otherwise. Fixed country effects and fixed year effects allow us to do that to a certain extent.

While the theory and mathematical proof behind fixed effects is perhaps too long and complex to discuss at length here, I will go into it briefly[6]. The idea behind fixed effects is that by sweeping away all variations across groups we control for all variables that are fixed across countries. This is done by isolating mean differences of our X and our Y per country and subtracting them out. The same can be done along the temporal dimension. What remains is a model that controls for everything that is unique about a country over time. This also means that inflation and fluctuations in currency values across countries over time are automatically

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[6] For those interested in how fixed effects work, I recommend Chapter 13 of Huntington-Klein (2021) The Effect: An introduction to research design and causality.

controlled for. In essence, this is the same as controlling for observed variables explicitly only now we control at the within unit level as opposed to the across unit within variable level.

At first glance, this appears to be a panacea. Fixed effects however come with two downsides. Critics like Hills et al (2019) and Longhi and Nandi (2014) argue that, because using fixed effects is such a rigorous method of controlling for variation, we run the risk of 'washing out' correlations between (youth) minimum wages and youth labour market outcomes that the model (wrongly) attributes to variation cross groups or across time. Correlations between our X and our Y must be rather strong to be picked up by models with fixed country and time effects. In other words, we risk type II errors where we don't observe a relationship that does in fact exist . Second, if we are also interested in if and why variation in the relationship between youth minimum wages and youth labour market outcomes might occur, fixed effects can't help us as this is exactly the variation that fixed effects washes out of the estimation. For these two reasons, the third model will not include fixed effects.

Finally, there is an error term ε_{ijt}. The error term will consist of everything that causes y_{ijt} that isn't captured by either β_1, β_2 or the interacted fixed time and country effects. I assume the error term to be identically and independently distributed. More specifically, I assume (1) that the error term ε_{ijt} is normally distributed with a mean of 0 and (2) that the variance of error term ε_{ijt} Is independent from X. This latter condition is also referred to as homoskedasticity. During the regression I cluster standard errors. The main argument for this is that treatment – individuals having a youth minimum wage – occurs clustered at the country level. Even with fixed time and country effects, the rule of thumb is to cluster standard errors, which I adhere by (McKenzie, 2017).

In our second model, we turn our attention to only those countries with minimum wages to estimate the effect of the level of youth minimum wage as compared to either the average wage or the adult minimum wage rate (see section 3.2.2). Leaving out countries without

minimum wages, we thus compare between groups 1A and 1B. The linear model (2) that estimates these effects on youth labour market outcomes is:

$$y_{ijt} = \beta_0 + \beta_1 \ YMD_{ijt} + \beta_2 \ YMW_{ijt} + AGE_i + COUNTRY\_YEAR_{jt} + \varepsilon_{ijt} \tag{2}$$

Once again, y_{ijt} stands for the labour market outcomes that we're interested in (employment rate, labour force participation rate and unemployment rate) for age category i in country j in year t. YMD_{ijt} is a dummy variable that assigns a value of 1 to age groups that receive a youth minimum wage in the respective countries that have youth minimum wages, and assigns 0 otherwise. YMW_{ijt} is a variable that expresses the intensity of youth minimum wages either as a percentage of the average wage of that country in that year, or as a percentage of the adult minimum wage rate. What this variable allows us to explore is whether the employment effects caused by youth minimum wages are in anyway proportional to their relative size. This model once again employs the same fixed effects as used in model (1). Lastly, identical to model (1), this model allows for standard errors that are clustered across countries.

Moving on, our next objective is to establish what factors might mitigate the effects that we observe with models one and two. In other words, we want to disentangle the employment effects of youth minimum wages from the labour market institutions in which they are embedded. In this, we use the mitigating variables identified earlier: ALMP's, PLMP's and union density. The model that renders these estimations reads as follows:

$$\begin{aligned} y_{ijt} = \ & \beta_0 + \beta_1 \ YMD_{ijt} + \beta_2 \ YMW_{ijt} + ALMP_{jt}(t-1) + PLMP_{jt} + UD_{jt} + \ AGE_i \\ & + COUNTRY\_YEAR_{jt} + \varepsilon_{ijt} \end{aligned} \tag{3}$$

Again, y_{ijt} stands for the labour market outcomes that we're interested in (employment rate, labour force participation rate and unemployment rate) for age category i in country j in year t. YMD_{ijt} is a dummy variable that assigns a value of 1 to age groups that receive a youth minimum wage in the respective countries that have youth minimum wages, and assigns 0 otherwise. YMW_{ijt} is a variable that expresses the intensity of youth minimum wages either as a percentage of the average wage of that country in that year, or as a percentage of the adult minimum wage rate.

We add an additional control for different kinds of active labour market program spending using variable ALMPjt. To account for administrative lag (t-1) is applied to all types of active labour market program expenditure. For instance, if we estimate the effect of YMW_{ijt} in 2014, we control for this using active labour market program expenditure data from 2013. Then, we control for passive labour market policies using $PLMP_{jt}$. Because $PLMP_{jt}$ consists of weighted index of a year's active employment protection laws, $PLMP_{jt}$ does not include a lag. Similarly, we control for the union bargaining strength using variable UD_{jt}. Most prominently, we will be looking at how the coefficient of YMW_{ijt} changes as we control for these different kinds of labour market institutions.

In our last model, we do not simply control for different labour market institutions. Rather, we interact our main coefficient (YMW_{ijt}) with our labour market institutions of interest. The goal here is to obtain interaction effects that tell us how the employment effects of relative youth minimum wages differ at different levels of other labour market institutions. From this we can defer whether the employment effects of youth minimum wages are in fact conditional on other labour market institutions. The subsequent model following from this, reads as follows:

$$y_{ijt} = \beta_0 + \beta_1 \, YMD_{ijt} + \beta_2 \, YMW_{ijt} \times ALMP_{jt}(t-1) + AGE_i + COUNTRY\_YEAR_{jt}$$

$$+ \, \varepsilon_{ijt}$$

$$y_{ijt} = \beta_0 + \beta_1 \, YMD_{ijt} + \beta_2 \, YMW_{ijt} \times PLMP_{jt} + AGE_i + COUNTRY\_YEAR_{jt} + \varepsilon_{ijt} \qquad (4)$$

$$y_{ijt} = \beta_0 + \beta_1 \, YMD_{ijt} + \beta_2 \, YMW_{ijt} \times UD_{jt} + AGE_i + COUNTRY\_YEAR_{jt} + \varepsilon_{ijt}$$

Once again, y_{ijt} stands for the labour market outcomes that we're interested in (employment rate, labour force participation rate and unemployment rate) for age category i in country j in year t. $YMD_{ijt\ is}$ a dummy variable that assigns a value of 1 to age groups that receive a youth minimum wage in the respective countries that have youth minimum wages, and assigns 0 otherwise. Here however, YMW_{ijt} is interacted with $ALMP_{jt}$ (t-1), $PLMP_{jt}$ and UD_{jt} denoted as $YMW_{ijt} \times ALMP_{jt}$ (t-1) , $YMW_{ijt} \times PLMP_{jt}$ and $YMW_{ijt} \times UD_{jt}$ respectively. The output values of these interacted effects should tell us whether the effect of relative youth minimum wages changes at different levels of active labour market programs, passive labour market programs and union density. Similar to the previous models, this model includes interacted fixed country and year effects ($COUNTRY\_YEAR_{jt}$), as well as fixed age effects (AGE_i). Moreover, the model allows for the clustering of standard errors at the level of countries. Lastly it must be noted that although we're dealing were three separate formulas here I condiser them to be part of the same model for the sake of structural consistency.

To briefly sum up: Model (1) compares labour market outcomes of individuals between 25 and 35 across groups 1A and 1B. Model (2) looks at the relative level of youth minimum wages and their effects on youth labour market outcomes. Model (3) controls for several labour market institutions. Finally, Model (4) uses interaction terms to assess the influence of variations in labour market institutions on the on the size of the (dis)employment effects caused youth minimum wages

4. Empirical Findings

This section of the paper delves into the empirical findings. We start of by displaying the descriptive statistics surrounding (youth) minimum wages among OECD countries and the corresponding labour market performance of different age groups in these countries. Next, I will analyse and interpret each of the models presented in section 3.3. I will compare the results of which to the mechanisms hypothesized in section 2.3.

4.1 Descriptive statistics

Figure 1 gives an overview of the average employment rates of different age groups during the timespan of this research (2000-2019). In this it distinguishes between the employment rates in group 1 (countries with minimum wages) and group 2 (countries without minimum wages). As we can see, the employment rates of young individuals (ages 15-19 and 20-24) in countries without minimum wages far exceed the employment rates of their peers in countries with statutory minimum wages.

Figure 1: Employment rate average per age category (group 1 & group 2)
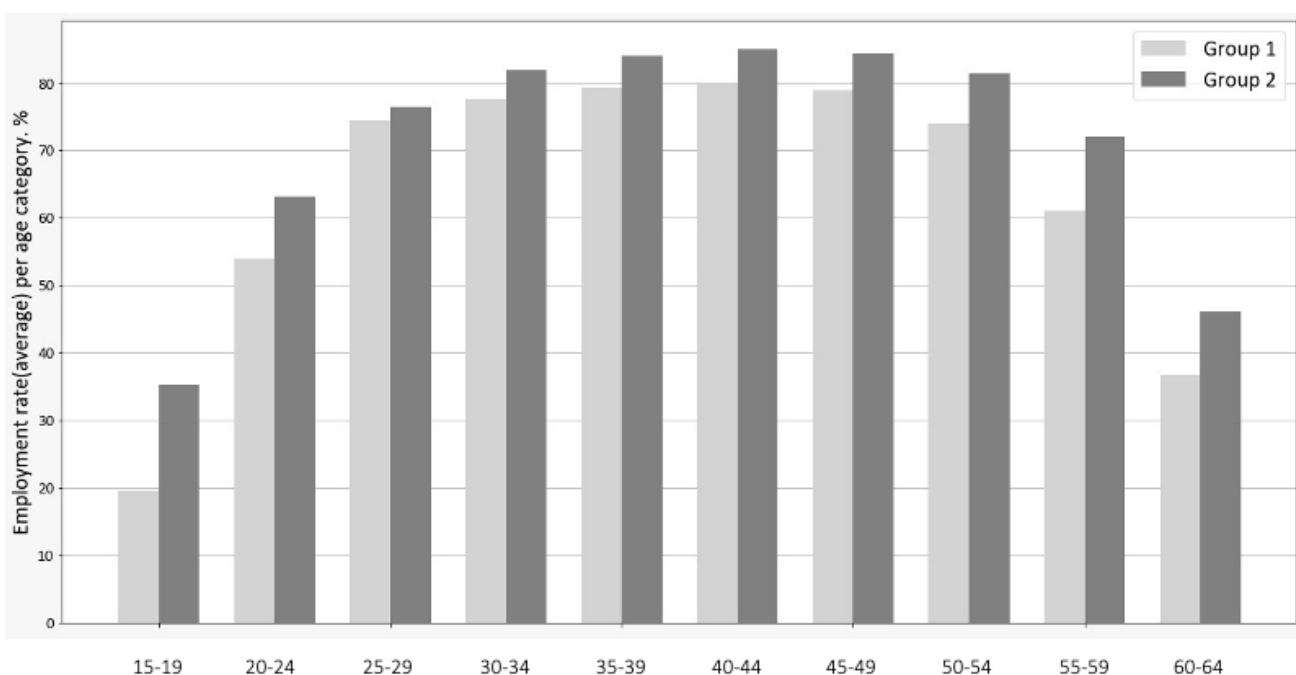
Because these employment rates are measured relative to the population in the same age groups, we know that these statistics are not skewed by differences in demographics. At a glance, figure one seems to corroborate our hypothesis that minimum wages have adverse effects on youth employment. Moreover, it is interesting to note that employment rates in all age categories in group 2 exceed those in group 1.

Figure 2 compares these same employment rates between countries that have additional youth minimum wages (group 1A) versus countries that have only one uniform minimum wage rate (group 1B). Here we see that youth employment rates in countries with an additional youth rate far exceed the youth employment rates in countries with one uniform minimum wage rate. This lends preliminary evidence for the expectation that the presence of an additional youth minimum wage rate can offset the youth disemployment effects caused by minimum wages. The difference in employment rates is especially high among the youngest workers (15-19) and quite marginal among the 20-24 age group. Finally, it is worth noting that older age groups in group 1B perform better than their peers in group 1A.

Figure 2: Employment rate average per age category (group 1A & group 1B)
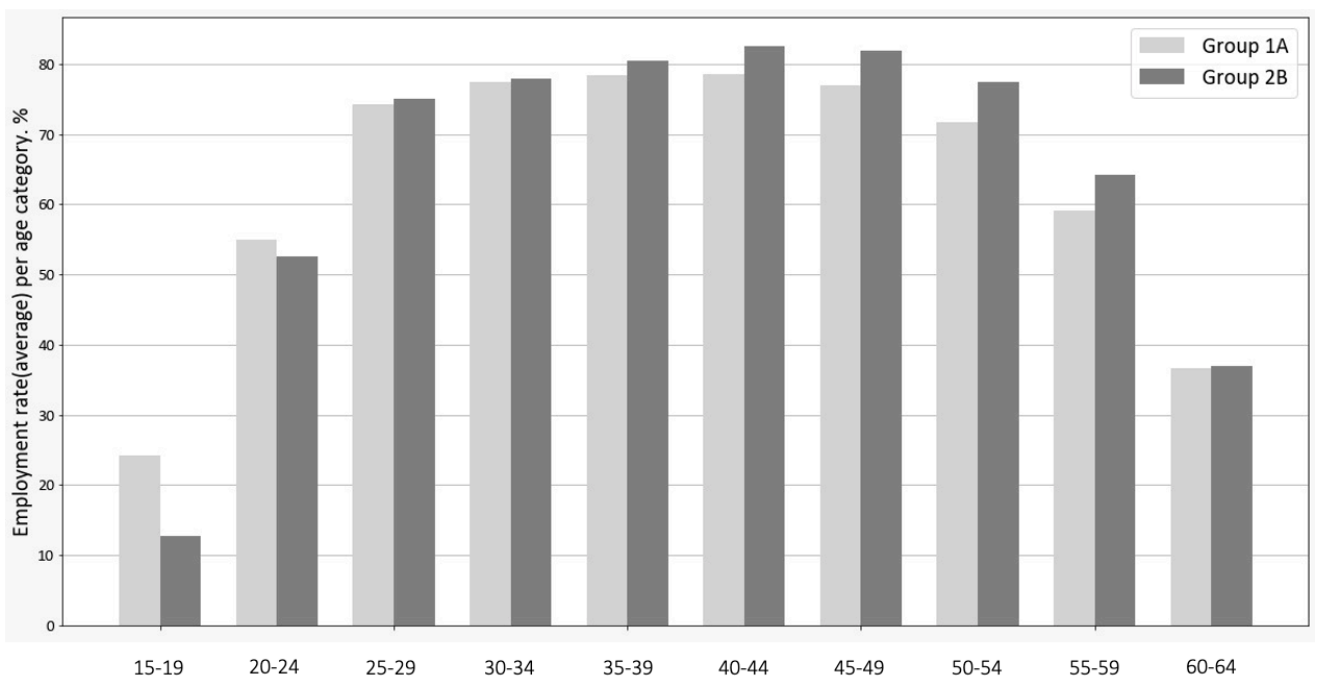
4.2 Analysis model 1

The results of model 1 for employment rate, labour force participation and unemployment rate are presented in Table 3 below. Because this model does not use relative youth wages, all country groups were included in the analyses.

The results suggest several things. First, we find that young individuals under 25 in countries with one uniform minimum wage rate have significantly worse labour market outcomes compared to their counterparts in countries without statutory minimum wages (group 2). We find for instance that young individuals in countries with a uniform minimum wage rate score 13.85 percentage points lower in employment rate, and 15.86 percentage points lower in labour force participation. Both these results are highly significant at levels of 1% and 5% respectively. Moreover, these estimations are accompanied by high R^2 values of 0.96 and 0.94 respectively. This entails that for employment rate for instance, 96% of the observed variability

Table 2: Estimation results model (1) N = 2400

	Employment rate	Labour force participation rate	Unemployment rate
Uniform minimum wage and age below 25 (Group 1B)	-13.85*** (1.66)	-15.86** (5.19)	2.2 (3.31)
Youth minimum wage and age below 25 (Group 1A)	1.5 (3.35)	2.22 (3.57)	-0.62 (2.54)
Country-year Fixed effects	YES	YES	YES
Age Dummies	YES	YES	YES
Intercept	43.05*** (2.21)	46.72*** (2.54)	15.25*** (1.75)
R^2	0.96	0.94	0.86

Note: Standard errors are shown in parentheses. Standard errors are clustered at the level of countries

*/**/*** indicates significance at levels of 10%/ 5%/ 1% respectively

can be explained by the model. We can thus confidently and accurately state that, the youth labour market outcome of young individuals in group 1a are significantly worse than the labour market outcomes of young individuals in group 2. These findings are in alignment with the works of Wessels (2007), William and Mills (1999) Burkhauser et al. (2000) and Bazen & Marimoutou (2000), all of whom asserted the negative employment effects of uniform minimum wages.

As for unemployment rate, the results are less robust. It appears that young individuals under 25 score 2.2 percentage points higher on unemployment rate as compared to their peers in countries with no statutory minimum wages. This result however is not statistically significant at a level that meets scientific convention. Moreover, this result is accompanied by a sizable standard error of 3.31, making even the direction of the correlation uncertain. Considering that unemployment rate is to some degree the conceptual counterpart of employment rate, it is likely that youth unemployment rates are in fact higher in uniform minimum wage regimes. However, with the data at hand we cannot confidently draw this conclusion.

Second, the findings suggest that we cannot distinguish between the labour market performance of young individuals under 25 in countries with youth minimum wage rates and the labour market performance of young individuals in countries without statutory minimum wages. Young individuals subject to youth rates thus seem to perform equally well as their peers in working in the absence of statutory minimum wages. In other words, the labour market outcomes of young individuals in group 1a are statistically equal to the labour market outcomes of young individuals in group 2.

From this, it logically follows that if youth labour market outcomes in group 2 are greater than youth labour market outcomes in group 1B, and youth labour market outcomes in group 2 are equal to youth labour market outcomes in group 1A, then youth labour market

outcomes in group 1a are greater than youth labour market outcomes in group 1B. This confirms the expectations of Hypothesis 1: Young individuals in countries with both adult and youth minimum wage rates will experience better labour market outcomes that young individuals in countries with only one statutory minimum wage rate.

Moreover, the results of model 1 seem to confirm the expectations of hypothesis 2: labour market outcomes of young individuals in countries with both adult and youth minimum wage rates will be similar to the labour market outcomes of young individuals in countries with no minimum wages at all. These findings give some credence to the notion that youth minimum wage rates are in fact a potent tool in countering the youth disemployment effects caused by uniform minimum wage rates, thereby confirming parts of the works by Neumark & Washer (2004) and Marimpi and Koning (2018)

4.3 Analysis model 2

Moving on, table 3 presents the results of model 2: a fixed effects model that gauges the effect of the relative size of youth minimum wages on youth labour market outcomes. The results are surprising for several reasons. It seems that higher youth minimum wages have enormous positive effects of youth labour market outcomes. Starting at employment rate it seems that a 10% increase in youth minimum wage relative to the adult wage rate is associated with a 6,9% increase in the youth employment rate (see employment rate regression i). Moreover a 10% increase in the youth minimum wage relative to the adult minimum wage is associated with an employment rate increase of 2,7%. The same holds for labour force participation: a 10% increase in youth minimum wages relative to the adult minimum wage rate would increase youth labour force participation by 11%. (See labour force participation regression ii). These effects are all significant at the highest level with minimal standard errors. For instance, the

Table 3: Estimation results model (2) N = 1700

	Employment rate				Labour force participation rate				Unemployment rate			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy (For whom it applies)	7.46 (5.31)	7.46 (5.31)	7.46 (5.31)	7.46 (5.31)	8.60 (6.22)	8.60 (6.23)	8.60 (6.23)	8.60 (6.23)	1.27 (2.89)	1.27 (2.89)	1.27 (2.89)	1.27 (2.89)
Relative youth minimum wage (% of the adult wage rate)	–	68.56*** (0.00)	–	417.67*** (0.00)	–	111.15*** (0.00)	–	395.36 (0.00)	–	39.75*** (0.00)	–	-84.12*** (0.00)
Relative youth minimum wage (% of average wage)	–	–	26.61*** (0.00)	-135.56*** (0.00)	–	–	43.16*** (0.00)	-110.36 (0.00)	–	–	15.44*** (0.00)	48.10*** (0.00)
Country-year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Age dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Intercept	26.07*** (3.99)	-18.15*** (3.99)	18.06*** (3.99)	-200.56 (3.99)	29.58*** (4.61)	-42.10*** (4.62)	16.60*** (4.62)	19.39*** (2.67)	-6.25**	14.75*** (2.67)	14.75*** (2.76)	59.18*** (2.76)
R^2	0.93	0.93	0.93	0.93	0.91	0.91	0.91	0.91	0.84	0.84	0.84	0.84

Note: standard errors are shown in parentheses. Standard errors are clustered at the level of countries
*/**/*** indicate statistical significance at levels of 10%/5%/1%

standard error on labour force participation regression ii is 4.78e-09. Moreover, these results are all accompanied by high R^2 values, meaning that that a relatively large amount of the observed variation can in fact be explained by the model.

These findings disconfirm the expectations of hypothesis 3, in which it was expected that youth labour market outcomes in countries with both adult and youth minimum wages will deteriorate as youth minimum wages increase. We observer the opposite. Higher relative youth minimum wages are associated with higher rates of youth employment. This implies that the the supply effects of youth minimum wages outweigh the demand effects of youth minimum wages.

There are reasons, however, to doubt the accuracy of the findings displayed above. For one, unemployment rates seem to rise simultaneously with employment rate (except in the first half of unemployment rate regression iv). It seems highly unlikely that rises youth employment rates and rises in unemployment rates are both associated with higher relative youth minimum wages. Although, it must be noted that the unemployment rate results are counter intuitive throughout all subsequent models. This causes me to suspect inaccuracies in the data surrounding youth unemployment rates.

Moreover, when we look at the employment rate regression iv and labour force participation rate regression iv, we see that higher youth minimum wages relative to the average wage rate and higher youth minimum wages relative to the adult minimum wage have contradictory effects. Higher youth minimum wages relative to the average wage rate is associated with higher employment rates and labour force participation rate. On the contrary a higher youth minimum wages relative to the adult minimum wage is associated with lower employment rates and labour force participation rates.

Lastly, the incredibly low standard errors also arouse suspicion. To have standard errors approximating 0 in a regression with 1700 observations of 30 different countries over 19 years

is unlikely to say the least. The reason as to why these low standard errors occur are difficult to pinpoint. As noted by Collischon & Eberl (2020), fixed effects models are black boxes to a large extent because we do not know which information or which biases are eliminated. Therefore, it is difficult to assess what specifically causes this problem.

To address the concerns outlined above I have experimented with alternating model parameters. The challenge here was to construct a model with reasonable standard errors that has statistically significant results accompanied by acceptable R^2 values throughout the model. The most preferable model parameters appear to use clustering at the level of countries, year fixed effects and age group fixed effects (year and age fixed effects are not interacted). Contrary to the previous models, this model abstains from country fixed effects altogether. Table 4 reports these findings. Going forward, all models use these specific parameters.

The results suggest that higher relative youth minimum wages are associated with adverse labour market outcomes for young individuals. For instance, an increase in youth minimum wages of 10% relative to the adult minimum wage rate is associated with a decrease in employment rate of 3.2%. Surprisingly, the statistical significance of the measure that relates youth minimum wages to the adult minimum wage rate remains significant throughout the model, whereas the measure relating minimum wages to the average wage is only significant when looking at unemployment rates. The unemployment rate estimations, however, all have low R^2 values, yielding them to be inaccurate. The R^2 values of the employment rate and labour force participation rate estimations are persistently above 0.80. What also comes unexpected is that both relative measures (that is: % of adult wage rate or % average wage) in the (iv) regressions on both employment rate and labour force participation yield opposite results. This is interesting because both measure an increase in youth minimum wage. It must be noted again here that the relative to average wage estimations are statistically insignificant.

Table: 4 Estimation results model (2) Without country fixed effects N = 1700

	Employment rate				Labour force participation rate				Unemployment rate			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy (For whom it applies)	6.92 (5.50)	-0.72 (4.94)	5.80 (4.32)	-0.69 (5.06)	9.46 (5.54)	3.90 (5.05)	9.24 (5.89)	3.95 (5.19)	2.89 (3.94)	8.94 (4.35)	5.07 (4.32)	8.94 (4.34)
Relative youth minimum wage (% of the adult wage rate)	—	-32.72*** (8.27)	—	-40.26*** (10.35)	—	-23.73** (7.00)	—	-32.78** (9.30)	—	25.82** (8.13)	—	24.03 (9.16)
Relative youth minimum wage (% of average wage)	—	—	14.69 (25.59)	23.57 (25.45)	—	—	-2.86 (21.33)	28.30 (21.13)	—	—	28.44*** (15.48)	5.60 (16.87)
Age dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects & age group fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country fixed effects	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Intercept	17.20*** (3.84)	49.60*** (8.89)	84.90*** (8.22)	22.22 (9.94)	20.49*** (4.16)	43.99*** (7.59)	21.47 (8.65)	43.29*** (7.39)	22.72*** (3.28)	-2.84 (8.29)	13.01 (6.75)	-2.98 (8.46)
R²	0.82	0.84	0.81	0.84	0.83	0.84	0.82	0.84	0.41	0.48	0.44	0.48

Note: standard errors are shown in parentheses. Standard errors are clustered at the level of countries
*/**/*** indicate statistical significance at levels of 10%/5%/1%

Nevertheless, the results are telling. Higher youth minimum wages are associated with adverse labour market outcome for young individuals. This is in line with the expectations of hypothesis 3: youth labour market outcomes in countries with both adult and youth minimum wages will deteriorate as youth minimum wages increase. While youth minimum wages have positive effects on youth employment (table 2), these gains are diminished as the intensity of youth minimum wages (measured relative to the adult wage rate) increases. This is because the demand effects of higher youth minimum wages are stronger than its supply effects. This renders the youth minimum wage wedge to have net negative effects on youth employment, youth labour force participation and to a lesser extent youth unemployment rates.

4.4 Analysis models 3

The analyses of models 3 is displayed in tables 5, 6 and 7 for employment rate, labour force participation and unemployment rate respectively. the first three columns look at active labour market program expenditure. Columns 4, 5 and 6 look at passive labour market programs. Columns 7, 8 and 9 looks at the role of union density. Lastly, columns 10, 11 and 12 look combines all these labour market institutions.

Active labour market expenditures seem to have quite significant effects on youth labour market outcomes. Especially Public Employment Services (PES) have a large significant effect on both employment rate and labour force participation. Looking at table 5 for instance, an increase of 10% in government expenditure on PES is associated with an increase of between 4,5% and 5,5% in youth employment rate (depending on the model). A similar effect of between 4% and 4,5 is present when we look at the labour force participation rate in table 6. Looking at the unemployment rates, we see that PES is insignificantly correlated. It must be noted here that a 10% increase relative to GDP would be a labour market

Table 5: Estimations models 3, 4, 5 and 6 on employment rate   N = 1700

	No controls			ALMP Model (3)			PLMP Model (4)			Union Density Model (5)			Models Combined (6)		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
Relative youth minimum wage (% of the adult wage rate)	-32.72*** (8.27)	—	-40.27*** (10.33)	-18.53*** (4.05)	—	-22.85** (7.38)	-19.60 (10.07)	—	-26.83** (10.03)	-30.79** (9.12)	—	-46.81*** (7.74)	-4.77 (9.64)	—	-14.81
Relative youth minimum wage (% to the average wage)	—	-14.66 (25.59)	23.62 (25.42)	—	-23.08 (11.49)	12.38 (16.68)	—	-3.49 (17.71)	21.15 (18.05)	—	-1.52 (24.18)	12.58 (24.16)	—	3.61 (15.88)	28.05 (20.72)
ALMP: PES (t-1)	—	—	—	47.98*** (10.76)	55.43*** (12.64)	44.95** (13.05)	—	—	—	—	—	—	50.89*** (12.69)	50.56** (14.61)	44.43** (14.57)
ALMP: Training (t-1)	—	—	—	13.39 (12.10)	19.32 (14.69)	11.79 (11.49)	—	—	—	—	—	—	21.28 (10.40)	23.07 (11.22)	20.37 (9.69)
ALMP: Incentives (t-1)	—	—	—	3.13 (2.96)	4.14 (3.29)	2.92 (2.74)	—	—	—	—	—	—	20.40 (10.92)	22.06 (10.69)	23.02 (11.51)
ALMP: Sheltered (t-1)	—	—	—	12.81 (10.36)	17.27 (11.78)	12.60 (10.59)	—	—	—	—	—	—	31.43 (11.61)	35.07 (12.63)	30.82 (12.41)
ALMP: Job creation (t-1)	—	—	—	-3.76 (6.49)	-1.81 (6.15)	-5.07 (5.81)	—	—	—	—	—	—	-2.91 (5.54)	-3.11 (6.49)	7.54 (6.86)
ALMP: total (t-1)	—	—	—	-5.26*** (0.96)	-5.95*** (1.31)	-5.19*** (0.90)	—	—	—	—	—	—	-4.88** (1.35)	-5.16** (1.53)	-4.78*** (1.23)
PLMP: Employment protection regulation regular contracts	—	—	—	—	—	—	-1.06 (1.88)	-1.17 (2.16)	-1.33 (1.78)	—	—	—	-3.77* (1.22)	-3.98** (1.53)	-3.77** (1.23)
PLMPL Employment protection collective dismissals	—	—	—	—	—	—	-0.77 (0.93)	-0.91 (1.02)	-0.82 (0.89)	—	—	—	-1.35 (1.13)	-1.42 (1.13)	-0.77 (1.24)
PLMP: Employment protection temporary contracts	—	—	—	—	—	—	-3.23** (1.06)	-3.83* (1.39)	-3.00*	—	—	—	-1.96 (1.10)	-2.23 (1.17)	-2.39 (1.24)
Union Density	—	—	—	—	—	—	—	—	—	-0.01 (0.15)	0.06 (0.15)	-0.10 (0.15)	-0.06 (0.06)	-0.05 (0.06)	-0.11 (0.09)
Year fixed effects & age group fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Intercept	49.60*** (8.88)	22.21 (9.94)	49.01*** (8.71)	31.94*** (4.11)	20.18*** (5.85)	32.54*** (3.78)	46.22*** (10.22)	29.56*** (7.93)	46.43*** (9.42)	49.01*** (10.12)	17.20 (9.72)	49.98*** (8.73)	32.24*** (8.12)	26.80*** (6.03)	33.43*** (7.34)
R²	0.83	0.81	0.84	0.88	0.87	0.88	0.86	0.85	0.86	0.83	0.81	0.84	0.89	0.89	0.89

Note: standard errors are shown in parentheses. Standard errors are clustered at the level of countries.
*/**/*** indicate statistical significance at levels of 10%/5%/1%

Table 6: Estimations models 3, 4, 5 and 6 on labour force participation.   N = 1700

	No controls			ALMP Model			PLMP Model			Union Density Model			Models Combined		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
Relative youth minimum wage (% of the adult wage rate)	-23.74 ** (7.00)	–	--32.79 ** (9.29)	-11.98 *** (4.04)	–	-11.39 (7.27)	-11.99 (8.96)	–	-21.09 ** (9.00)	-21.58 ** (7.45)	–	-36.56 ** (11.48)	0.64 (7.26)	–	-4.05 (8.35)
Relative youth minimum wage (% to the average wage)	–	-2.84 (21.33)	28.33 (21.11)	–	-19.37 (10.77)	-1.69 (16.87)	–	7.26 (14.02)	26.64 (13.44)	–	6.61 (21.21)	47.47 (23.26)	–	6.42 (15.16)	13.11 (17.76)
ALMP: PES (t-1)	–	–	–	45.20 *** (9.65)	45.20 *** (9.65)	39.98 *** (10.57)	–	–	–	–	–	–	41.17 *** (8.04)	39.83 *** (8.10)	38.15 *** (8.76)
ALMP: Job creation (t-1)	–	–	–	-10.51 (6.29)	-10.51 (6.29)	-12.14 (6.20)	–	–	–	–	–	–	-12.85 (4.80)	-13.80 ** (4.95)	-15.01 ** (4.93)
ALMP: Sheltered (t-1)	–	–	–	5.74 (9.78)	5.74 (9.78)	3.42 (9.27)	–	–	–	–	–	–	16.46 (6.88)	17.34 (6.97)	16.17 (7.23)
ALMP: Incentives (t-1)	–	–	–	-1.40 (3.77)	-1.40 (3.77)	-2.01 (3.59)	–	–	–	–	–	–	13.20 (9.12)	14.16 (9.16)	14.43 (9.49)
ALMP: Training (t-1)	–	–	–	7.88 (11.82)	7.88 (11.82)	4.13 (11.42)	–	–	–	–	–	–	9.70 (6.00)	10.01 (6.18)	9.27 (6.18)
ALMP: total (t-1)	–	–	–	-1.84 (1.58)	-1.84 (1.58)	-1.46 (1.74)	–	–	–	–	–	–	-0.23 (0.74)	-0.29 (0.76)	-0.18 (0.75)
Employment protection regulation regular contracts	–	–	–	–	–	–	-0.88 (1.69)	-1.09 (1.86)	-1.22 (1.57)	–	–	–	-3.20 ** (1.01)	-3.26 ** (0.96)	-3.20 ** (1.02)
Employment protection collective dismissals	–	–	–	–	–	–	-0.25 (0.94)	-0.39 (0.95)	-0.32 (0.90)	–	–	–	-1.00 (0.60)	-0.91 (0.76)	-0.73 (-0.84)
Employment protection temporary contracts	–	–	–	–	–	–	-3.12 * (1.01)	-3.48 * (1.17)	-2.83 ** (0.89)	–	–	–	-2.64 * (1.04)	-2.80 ** (1.09)	-0.73 (1.10)
Union Density	–	–	–	–	–	–	–	–	–	-0.01 (0.15)	0.05 (0.15)	-0.07 (0.16)	-0.129 (0.09)	-0.13 (0.09)	-0.15 (0.11)
Year fixed effects & age group fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Intercept	44.00 *** (7.59)	21.46 (8.65)	43.29 *** (7.39)	28.83 *** (6.11)	22.58 *** (4.59)	28.74 *** (3.78)	38.76 *** (2.46)	26.77 *** (7.10)	40.04 *** (8.35)	43.37 *** (8.62)	18.67 (9.10)	44.28 *** (7.40)	30.51 ** (8.70)	29.25 *** (7.28)	31.07 *** (8.11)
R^2	0.84	0.82	0.84	0.86	0.86	0.86	0.86	0.85	0.86	0.82	0.81	0.83	0.87	0.87	0.87

Note: standard errors are shown in parentheses. Standard errors are clustered at the level of countries.
*/**/*** indicate statistical significance at levels of 10%/5%/1%

49

Table 7: Estimations models 3, 4, 5 and 6 on unemployment rate   N = 1700

	No controls			ALMP Model			PLMP Model			Union Density Model			Models Combined		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
Relative youth minimum wage (% of the adult wage rate)	25.82* (8.13)	–	24.03*** (9.15)	17.85*** (4.07)	–	28.37*** (6.28)	21.02 (9.23)	–	19.30** (10.43)	25.31** (8.88)	–	29.92** (11.48)	10.01 (5.70)	–	21.18 (7.65)
Relative youth minimum wage (% to the average wage)	–	28.42 (15.47)	5.57 (16.85)	–	13.92 (10.09)	-30.10 (12.48)	–	22.77 (14.79)	5.04 (17.38)	–	18.84 (14.04)	-14.59 (12.86)	–	3.74 (13.91)	-31.19 (20.21)
ALMP: PES (N-1)	–	–	–	-27.88 (10.73)	-33.52*** (12.89)	-20.51 (12.75)	–	–	–	–	–	–	-33.14 (16.93)	-34.72 (16.18)	-25.95 (16.93)
ALMP: Training (N-1)	–	–	–	-21.71 (14.47)	-27.18 (17.95)	-17.84 (12.88)	–	–	–	–	–	–	-30.00 (14.37)	-27.15 (12.87)	-26.14 (14.97)
ALMP: Incentives (N-1)	–	–	–	-7.73** (2.48)	-8.75* (3.06)	-7.23** (2.30)	–	–	–	–	–	–	-19.70 (16.53)	-21.24 (16.06)	-22.61 (16.57)
ALMP: Job creation (N-1)	–	–	–	-11.86 (6.67)	-12.72 (7.93)	-8.66 (6.60)	–	–	–	–	–	–	-16.13 (8.29)	-17.33 (9.72)	-10.98 (10.26)
ALMP: Sheltered (N-1)	–	–	–	-15.72 (8.73)	-21.00 (11.13)	-15.21 (9.51)	–	–	–	–	–	–	-33.56 (12.68)	-38.97 (14.40)	-32.88 (13.42)
ALMP: total (N-1)	–	–	–	7.43*** (1.67)	8.19** (2.35)	7.24*** (1.36)	–	–	–	–	–	–	8.66*** (2.03)	9.09*** (2.39)	8.54*** (1.82)
Employment protection regulation regular contracts	–	–	–	–	–	–	1.55 (1.22)	1.37 (1.50)	1.48 (1.24)	–	–	–	3.02 (1.16)	3.32** (1.16)	3.02 (1.17)
Employment protection collective dismissals	–	–	–	–	–	–	1.66 (0.86)	1.71 (0.97)	1.65 (0.87)	–	–	–	1.58 (1.30)	1.86 (1.33)	0.94 (1.55)
Employment protection temporary contracts	–	–	–	–	–	–	0.22 (0.89)	0.87 (1.07)	0.27 (0.91)	–	–	–	-0.68 (1.16)	-0.44 (1.30)	-0.21 (1.30)
Union Density	–	–	–	–	–	–	–	–	–	-0.06 (0.04)	-0.02 (0.06)	-0.08 (0.05)	-0.09 (0.06)	-0.12 (0.07)	-0.03 (0.07)
Intercept	-2.84 (8.29)	13.01 (6.75)	-2.98*** (8.46)	6.95 (3.82)	20.82*** (4.41)	5.47 (3.99)	-7.09 (9.45)	5.09 (6.74)	-7.04 (9.53)	-3.65 (8.93)	17.01* (5.57)	-3.93 (8.71)	7.53 (5.24)	15.68*** (3.76)	6.20 (5.13)
Year fixed effects & age group fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.48	0.44	0.48	0.60	0.57	0.61	0.51	0.49	0.51	0.48	0.42	0.48	0.64	0.67	0.65

Note: standard errors are shown in parentheses. Standard errors are clustered at the level of countries.
*/**/*** indicate statistical significance at levels of 10%/5%/1%

investment of astronomical proportions, and thereby a costly way to increase labour market outcomes for young individuals.

Apart from employment incentives, which seem to be slightly correlated with lower unemployment rates, all other categories of active labour market program expenditure are not significantly correlated with youth labour market outcomes, with one exception. The variable that captures the total government expenditure on active labour market program expenditures is negatively correlated with employment rates and labour force participation rates. Moreover, it is positively correlated with unemployment rates. This finding seems counter intuitive. Looking at the source data, it appears that unemployment benefits also fall under active labour market programs. Considering that unemployment benefits form a sizable chunk of these expenditures, it is likely that more spending on unemployment benefits is correlated with lower employment and labour force participation rates and higher unemployment rates. Naturally, if more people are unemployed, there are more benefits to be paid. On the other hand, more generous unemployment benefit schemes also might induce people to seek unemployment. However, the direction of the causality here cannot be answered with the data at hand, nor is it the aim of this paper to answer that question.

What we are more interested in here, is how the relative youth minimum wage coefficient changes as we control for these active labour market programs. We do this by comparing the relative youth minimum wage coefficients on the ALMP model to the relative youth minimum wage coefficients of the first three rows, which form a replication of model 2. As we can see, when we control for these different kinds of ALMP expenditures, the youth minimum wage coefficient decreases drastically, whilst remaining statistically significant. Looking at the table 5, we see that a 10% increase in youth minimum wages relative to the adult rate is associated with a decline in youth employment rates of 1.8%, compared to a decline of 3.2% when we do not control for ALMP expenditure. The same holds true when we look at

labour force participation rates. A 10% increase in youth minimum wages relative to the adult rate is associated with a decline in youth labour force participation rates of 1.2%, compared to a decline of 2.3% when we do not control for ALMP expenditure. Even looking at unemployment, a 10% increase in youth minimum wages relative to the adult rate is associated with an increase in youth unemployment rates of 1.7%, compared to an increase of 2.5% when we do not control for ALMP expenditure. This confirms the expectation of hypothesis 4: The disemployment effects caused by increases in (relative) youth minimum wages will decrease as we control for active labour market program expenditure.

Moving on to passive labour market policies, we see that their individual effects youth labour market outcomes are far less profound than their 'active' counterparts. Here we see that only employment protection legislation on temporary contracts has significant effects youth employment rates and labour force participation rates. Interestingly though, this correlation is negative, suggesting that employment protection legislation harms labour market outsiders more that it benefits insiders. These effects turn insignificant when we look at unemployment rates.

Alas, we are more concerned with how the relative youth minimum wage coefficient shifts when controlling for these PLMP's than we are with the individual effects of PLMP's on youth labour market outcomes. Here we see that for youth employment rates, a 10% increase in youth minimum wages relative to the adult rate is associated with a decline in youth employment rates of 1.9%, compared to a decline of 3.2% when we do not control for PLMP's. The relative youth minimum wage coefficient when controlling for PLMP's is only significant to a limited extent and turns insignificant when looking at labour force participation and unemployment rates. All in all, there is very little reason to accept that the disemployment effects caused by increases in (relative) youth minimum wages will increase as we control for passive labour market policies. We therefore cannot convincingly confirm the 5th hypothesis

stating that the disemployment effects caused by increases in (relative) youth minimum wages will increase as we control for passive labour market program expenditure.

Next, we turn our attention to union density. The effects of union density on our youth labour market outcomes of interest are negligible in size (sub-0.1) and statistically insignificant. Moreover, comparing the coefficients of the regressions that control for union density to those regressions that don't control for union density don't provide us with new insights. The coefficients change only marginally and due to the size of the standard errors their 95% confidence range overlap largely. Thus, there is no reason to accept the 6th hypothesis.

Finally, looking at the last three columns of tables 5, 6 and 7, we see that once we control for all these labour market institutions, the relative youth minimum wage coefficients turn insignificant. ALMP: PES remains a highly significant and strong estimator of youth employment outcomes. Interestingly, when controlling for all labour market institutions employment protection on regular contracts becomes statistically significant whereas protection on temporary contracts loses its statistical significance. This is contrary to our findings when we isolated employment protection regulation.

4.5 Analysis models 4

Model four attempts to assess the influence of variations in labour market institutions on the on the size of the (dis)employment effects caused by higher relative levels of youth minimum wages. This institutional influence is measured through interactions of labour market institutions and relative youth minimum wages. The results of these analyses is presented in table 8, 9 and 10 for effects on employment rates, labour force participation rates and unemployment rates respectively. Column (i) shows the isolated effects of relative youth minimum wages (as % of the adult minimum wage). Column (ii) shows interaction effects of

Table 8: Estimation results model (3) N = 1470 – employment rates

	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy	-0.73 (4.93)	10.20 (5.33)	4.56 (4.63)	7.46 (5.59)
Relative youth minimum wage (% of the adult minimum)	-32.72*** (8.27)	-	-	-
Interactions with ALMP				
YMW_{ijt} * ALMP: PES (N-1)	-	55.41*** (15.15)	-	-
YMW_{ijt} * ALMP: Training (N-1)	-	14.45 (16.21)	-	-
YMW_{ijt} * ALMP: Incentives (N-1)	-	19.66 (21.99)	-	-
YMW_{ijt} * ALMP: Sheltered (N-1)	-	0.00 (omitted)	-	-
YMW_{ijt} * ALMP: Job creation (N-1)	-	-5.14 (6.86)	-	-
YMW_{ijt} * ALMP: Total (N-1)	-	-6.60*** (1.03)	-	-
Interactions with PLMP				
YMW_{ijt} * PLMP: regular contracts	-	-	-3.00 (1.77)	-
YMW_{ijt} * PLMP: collective dismissals	-	-	-1.76 (0.97)	-
YMW_{ijt} * PLMP: temporary contracts	-	-	-3.31 (1.30)	-
Interaction with Union density				
YMW_{ijt} * Union density	-	-	-	-0.01 (0.19)
Year Fixed effects	YES	YES	YES	YES
Age Dummies	YES	YES	YES	YES
Intercept	49.60*** (8.88)	13.90** (4.36)	33.99*** (5.59)	18.25*** (4.28)
R^2	0.83	0.86	0.86	0.81

Note: Standard errors are shown in parentheses. Standard errors are clustered at the level of countries
        */**/*** indicates significance at levels of 10%/ 5%/ 1% respectively

Table 9: Estimation results model (3) N = 1470 – labour force participation

	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy	3.90	11.67	8.35	10.04
	(5.05)	(5.41)	(4.86)	(5.64)
Relative youth minimum wage (% of the adult minimum)	-23.74**	-	-	-
	(7.00)			
Interactions with ALMP				
YMW$_{ijt}$ * ALMP: PES (N-1)	-	46.77**	-	-
		(13.14)		
YMW$_{ijt}$ * ALMP: Training (N-1)	-	6.78	-	-
		(13.50)		
YMW$_{ijt}$ * ALMP: Incentives (N-1)	-	10.91	-	-
		(17.55)		
YMW$_{ijt}$ * ALMP: Sheltered (N-1)	-	0.00	-	-
		(omitted)		
YMW$_{ijt}$ * ALMP: Job creation (N-1)	-	-13.37	-	-
		(7.56)		
YMW$_{ijt}$ * ALMP: Total (N-1)	-	-2.83	-	-
		(1.31)		
Interactions with PLMP				
YMW$_{ijt}$ * PLMP: regular contracts	-	-	-2.45	-
			(1.62)	
YMW$_{ijt}$ * PLMP: collective dismissals	-	-	-0.74	-
			(1.08)	
YMW$_{ijt}$ * PLMP: temporary contracts	-	-	-3.07	-
			(1.27)	
Interaction with Union density				
YMW$_{ijt}$ * Union density	-	-	-	0.03
				(0.20)
Year Fixed effects	YES	YES	YES	YES
Age Dummies	YES	YES	YES	YES
Intercept	44.00***	16.79***	32.65***	21.45***
	(7.59)	(4.33)	(5.80)	(4.79)
R^2	0.84	0.86	0.86	0.81

Note: Standard errors are shown in parentheses. Standard errors are clustered at the level of countries
*/**/*** indicates significance at levels of 10%/ 5%/ 1% respectively

Table 10: Estimation results model (3) N = 1470 – unemployment rate

	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy	8.94	-0.02	6.94	2.74
	(4.35)	(3.81)	(3.77)	(4.01)
Relative youth minimum wage (% of the adult minimum)	25.82*	-	-	-
	(8.13)			
Interactions with ALMP				
YMW$_{ijt}$ * ALMP: PES (N-1)	-	-29.96	-	-
		(13.79)		
YMW$_{ijt}$ * ALMP: Training (N-1)	-	-22.49	-	-
		(18.46)		
YMW$_{ijt}$ * ALMP: Incentives (N-1)	-	-17.72	-	-
		(16.54)		
YMW$_{ijt}$ * ALMP: Sheltered (N-1)	-	0.00	-	-
		(omitted)		
YMW$_{ijt}$ * ALMP: Job creation (N-1)	-	-10.79	-	-
		(7.49)		
YMW$_{ijt}$ * ALMP: Total (N-1)	-	8.17***	-	-
		(1.91)		
Interactions with PLMP				
YMW$_{ijt}$ * PLMP: regular contracts	-	-	3.02	-
			(1.25)	
YMW$_{ijt}$ * PLMP: collective dismissals	-	-	2.96	-
			(1.10)	
YMW$_{ijt}$ * PLMP: temporary contracts	-	-	0.24	-
			(1.07)	
Interaction with Union density				
YMW$_{ijt}$ * Union density	-	-	-	0.09
				(0.07)
Year Fixed effects	YES	YES	YES	YES
Age Dummies	YES	YES	YES	YES
Intercept	-2.84	23.72**	6.76	20.96***
	(8.29)	(4.56)	(4.63)	(3.82)
R^2	0.48	0.57	0.41	0.41

Note: Standard errors are shown in parentheses. Standard errors are clustered at the level of countries
*/**/*** indicates significance at levels of 10%/ 5%/ 1% respectively

relative youth minimum wages (again, as % of adult minimum wages) and active labour market programs. For some reason, the category ALMP: Sheltered is washed out by the fixed effects included in the model. Why only this category suffers from being omitted by the model is unclear to me. Considering that sheltered protection had no notable effects in previous models, I have decided to go forward with this model regardless. Column (iii) shows interaction effects with passive labour market programs that protect workers against layoffs in regular contracts, temporary contracts and against collective dismissals. Finally, column (iv) shows the interaction effect of union density and relative youth minimum wages.

Starting with active labour market programs, there is strong evidence of interactions between the effects of relative youth minimum wages and the intensity of active labour market program expenditure. The coefficients of the interaction terms YMW_{ijt} * ALMP: Total are notably higher than the isolated effect of youth minimum wages in tables 8 and 9. In table 10, we see that the coefficient of this interaction term is notably lower, this suggesting lower unemployment rates. These findings are statistically significant at levels of 1%-5% throughout the model. From this we can surmise that the disemployment effects of higher relative youth minimum wages diminish as active labour market program expenditure increases. Public Employment Services seem to be most important in influencing the youth minimum wage coefficient. Looking at the isolated interaction term YMW_{ijt} * ALMP: PES, we see that the coefficient even turns positive. Whilst higher youth minimum wages alone thus seem to have negative effects on youth employment, this effect can turn positive when youth minimum wages are embedded in institutional settings with high expenditure on active labour market programs, with public employment services being the most prominent driver of this shift. This corroborates the 7th hypothesis which states that he disemployment effects caused by increases in (relative) youth minimum wages are less profound in systems with higher levels of active labour market program expenditure.

Turning to the role of passive labour market policies, our results are less profound. There seems to be no evidence to indicate an interaction between the effects of relative youth minimum wages and the intensity of passive labour market policies. Although the coefficients of the interaction terms are in line with what has been hypothesized, these results are not statistically significant at acceptable levels. We therefore reject the 8th hypothesis stating that the disemployment effects caused by increases in (relative) youth minimum wages are more profound in systems with more stringent passive labour market policies.

Lastly, looking at the role of bargaining power and union density, there also appears to be no evidence for its interaction with the effects of youth minimum wages. In contrast to the results of 2004 Neumark and Washer study, interaction effects between union density and relative youth minimum wages are marginal in size and insignificant throughout the model. We therefore also reject the 9th hypothesis, stating that the disemployment effects caused by increases in (relative) youth minimum wages are more less in countries with higher union densities.

5. Discussion

The results suggest that uniform minimum wage rates have adverse effects on the labour market outcomes of young individuals. Young individuals in countries with one uniform minimum wage rate score, holding all things other equal, significantly lower in terms of employment rate and labour force participation than their peers in countries without minimum wages. Young individuals in countries with additional youth minimum wages, however, have labour marker performances that outperform those of their peers in countries with one statutory youth minimum wage. These finding are in line with (Neumark & Washer, 2004; Marimpi & Koning, 2018), suggesting that youth minimum wages are in fact an appropriate policy tool to combat the youth disemployment effects of uniform minimum wages.

Looking at the effects of the relative size of youth minimum wages, our findings largely confirm the findings of Marimpi and Koning (2018). Whilst youth minimum wages are able to offset the disemployment effects by a uniform minimum wage, higher youth minimum wages are in turn correlated with lower employment and labour force participation rates and higher unemployment rates among young individuals. Awareness of this mechanism is important. Setting a youth minimum wage rate that is too high can diminish the employment gains made by introducing a youth minimum wage rate in the first place. It appears thus that demand effects outweigh the supply effects within the youth minimum wage wedge.

Further analysis shows that understanding the labour market institutions in which minimum wage regimes are implemented is important. When we control for these labour market institutions in our regressions, we find that the effect of youth minimum wages on youth employment diminishes. Especially when controlling for active labour market expenditure, and passive labour market programs focussed on employment protections, we find that the relative youth minimum wage coefficients diminish in size greatly. By abstaining from including

labour market institutions in their analysis, it is possible that prior research overestimated the disemployment effects caused by youth minimum wages.

Moreover, It appears that these labour market institutions themselves also have profound effects on the labour market outcomes of young individuals. Although these effects are only tangentially related to the goals of this study, they do put the results of the empirical analyses in perspective. Active labour market program expenditure, specifically Public Employment Services, have far greater potential to impact youth employment levels. Employment protection legislation on the other hand only seems to marginally effect youth labour market outcomes.

By constructing interaction terms, the last model examined whether the effects of youth minimum wages on employment are mitigated by different intensities of labour market institutions. This seems to be the case, albeit to a limited degree. Active labour market program expenditure appears to strongly mitigate the direction of the youth minimum wage coefficient. This coefficient diminishes in strength as the total expenditure on active labour market programs increases. When we isolate the expenditure on Public Employment Services, this coefficient even turns positive.

As in previous models however, significant effects are only observed among the active labour market programs. Passive labour market policies focussed on employment protection have marginal and insignificant effects when interacted with the relative youth minimum wage coefficient. The same goes for the interaction terms involving union density. This latter point is one of the most surprising findings of this study, as the mitigating role of union density was one of the most prominent arguments put forward by the 2004 Neumark and Washer study. Several reasons for the absence of significant results can be hypothesizes here. It might well be possible that young workers are less effective in organising through unions. It might also be

possible that young workers are less likely to be a member of a union. With the data at hand however, this cannot be tested.

From a policy perspective, these results suggest several things. For one, youth minimum wages do in fact appear to be an apt policy instrument to combat the adverse effects that minimum wages have on youth employment. However, this measure only works in so far as the youth minimum wage rates are set at an appropriate level. Higher youth minimum wages relative to the adult minimum wage are strongly correlated with lower levels of employment rates, labour force participation rates and higher unemployment rates among young individuals. Whilst promises of increasing (youth) minimum wages levels are powerful political tools, policy makers must be aware that increasing these wage rates likely has negative effects on youth employment levels.

Moreover, it seems institutional setting in which minimum wages are embedded can play a role in directing the effects that youth minimum wages have on youth labour market performance. Active labour market program expenditure is the most important labour market institution among the institutional included in this study. Higher levels of active labour market program expenditure strongly mitigate the adverse employment effects caused by higher youth minimum wages. Public Employment Services seems to be the main driver of this phenomenon. Considering that labour market activity of young individuals can have large impacts on the lifetime earnings potential of these individuals, active labour market expenditure might be a way to maintain youth employment levels whilst simultaneously increasing the level of their wage.

However, it must be noted that there are several limitations to this study that might affect the degree to which its findings can be externally generalized. For one, the level of specificity in the data leaves much to be desired. In the data at hand, the trade of was between having higher specificity data of one or a few countries or having lower specificity data on a

large number of countries. Given the aims of this research, I have decided to choose the latter. Consequently, mechanisms resulting from the specific characteristics of youth minimum wage schemes such as the incrementality of wage increases and the age groups eligible for a youth minimum wage rate have received relatively little attention here.

Another limitation is that when we look at the youth minimum wage wedge, the data at hand could only measure the net effect of supply and demand effects. Whilst supply effects can hypothetically be measured by subtracting the employment rate from the labour force participation rate, this measure means very little if it cannot be compared to meaningful data on the effects of youth minimum wages on the demand for young workers in the labour market. This can also hypothetically be done by compiling data from lob listings. However, to do this across 11 countries is a task to vast for the purposes of this study. This would however be an interesting direction future research could go into on a smaller scale.

There are several other ways future research can contribute to the subject of youth minimum wages. Focussing on the (mitigating) role of labour market institutions other than included in this research can be fruitful avenues of inquiry. Labour market institutions that could be interesting in this regard include education, tax schemes, the possibilities for part time work, labour standards and the generosity of unemployment assistance. Whilst unincluded in this study, these institutions might well influence youth labour markets and the effects of youth minimum wages thereof. Lastly, this research only includes statutory minimum wages set by governments. Future research could also focus on the role of minimum wages resulting from collective bargaining through unions.

6. Conclusion

Minimum wages are a popular policy tool used to combat income disparity. Whilst the research on minimum wages is vast, research on youth minimum wages is few and far between. The previous pages have attempted to analyse the relationship between youth minimum wages and the employment of young individuals. In analysing this relationship, the main contribution that this study has tried to make is examining the extent to which this relationship is influenced by the institutional context in which these youth minimum wages are embedded. To do so, this paper compared and analysed the effects of (youth) minimum wages in 21 OECD Countries and compared these to 9 OECD Countries where minimum wages are absent altogether. Using OECD Data this paper analysed the effects of youth minimum wages relative to either the adult minimum wage or the average wage on the labour market outcomes of young individuals. These labour market outcomes, in turn, are measured in terms of employment rates, labour force participation rates and unemployment rates.

The results are telling. Youth minimum wages appear to be able offset the youth disemployment effects caused by uniform minimum wages. At the same time higher youth minimum wages appear to be correlated with adverse labour market outcomes. Higher wage floors for young individuals harm their ability to compete with older workers in the labour market. Considering that comparative analyses show that young individuals in countries with youth minimum wages perform similar to young individuals in countries without minimum wages, policy makers appear to be quite competent in deciding on market appropriate levels of youth minimum wages.

When considering the institutional context of youth minimum wages, the results challenge some of the findings from previous bodies of literature. When controlling for labour market institutions such as active labour market program expenditure, passive labour market policies focussed on employment protection and union density, the effect of youth minimum

wages on youth employment decreases greatly. By abstaining from controlling for these labour market institutions, it might well be possible that prior research has overestimated the size of the disemployment effects of youth minimum wages.

Finally, there seems to be evidence for the notion that institutional setting directly influences the relationship between youth minimum wages and youth labour market outcomes. Although, this mechanism is only observed in relation to active labour market program expenditure. Higher levels of active labour market program expenditure strongly mitigate the adverse employment effects caused by higher youth minimum wages. Awareness of these mechanism is important for policy makers. Deepening our understanding of the mitigating effects of institutional setting might assist policy makers in creating minimum wage regimes that combat income disparity whilst maintaining preferable levels of youth employment. Future research into other labour market institutions is vital in deepening this understanding.

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Appendix A

What Marimpi and Koning (2018) disregard in their analysis is the considerable heterogeneity of the negative employment effects caused by increases in youth minimum wages. Table 1 is a replication of the initial regression analysis performed by Marimpi and Koning using OECD data ranging from 2000 – 2014 from all countries with youth minimum wages. This analysis regresses the relative size of youth minimum wages on unemployment rates, labour force participation rates and employment rates in three different ways. Model (ii) measures youth minimum wages as the % of the adult wage rate. Model (iii) measures the size of the youth minimum wage as a percentage of the median wage rate (Kaitz index). Model (iv) includes both measurements used in models (ii) and (iii). As we can see, increases in the youth minimum wage exerts significant downwards effects on youth employment rates and youth labour force participation. These results maintain quite significant across models (ii), (iii) and (iv).

When we compare North-Western European countries (NWEC's) with South-Eastern European Countries (SEEC's) along the same lines, our perspective shifts. Among the NWEC's the observed effects are much stronger that the effects observed in the initial analysis. That is, the negative effects of increases in youth minimum wages in NWEC's are stronger across models (ii) and (iii) than the same effects observed over the 11 OECD countries with youth minimum wages. More interestingly, the effects that we observe for SEEC's are opposite to those observed in both the initial analysis and the analysis for NWEC's. When looking at the top part of model (iv), increases in youth minimum wages relative to the adult wage rate yields positive effects in terms of employment rate and labour force participation for young individuals. These differences in effects constitute an

Table 6 Estimation results of model (2) for countries with minimum wages (N=1200)

	Employment rate				Labour force participation rate				Unemployment rate			
	(i)	(II)	(iii)	(iv)	(i)	(II)	(iii)	(iv)	(i)	(II)	(iii)	(iv)
Youth minimum wage dummy, for whom it applies	7.87* (4.50)	1.60 (4.82)	3.26 (3.91)	1.74 (4.35)	9.58* (5.04)	1.08 (5.03)	3.85 (4.24)	1.23 (4.53)	-2.26 (2.74)	-0.26 (3.07)	-0.99 (2.73)	-0.30 (2.97)
Relative youth minimum wage (% of the adult wage rate)	-	-41.35*** (12.07)	-	-16.78 (15.60)	-	-56.07*** (13.42)	-	-28.98* (16.52)	-	13.18 (9.09)	-	7.62 (13.35)
Youth minimum wage (% of the median wage)	-		-72.20*** (17.12)	-56.12** (22.08)	-	-	-89.76*** (23.20)	-62.07** (25.62)	-	-	20.00 (11.67)	12.69 (16.78)
Country-year fixed effects (N=300)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Age dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Intercept	15.12** (2.06)	54.67*** (11.01)	46.10*** (6.53)	55.29*** (9.43)	19.48*** (2.65)	73.23*** (11.85)	58.00*** (8.88)	73.82*** (9.88)	28.37*** (1.86)	15.73* (8.05)	19.78*** (4.82)	15.61* (7.70)
R2	0.927	0.927	0.931	0.931	0.899	0.913	0.915	0.917	0.709	0.715	0.716	0.717

Note: Standard errors, which are clustered at the level of countries, are shown in parentheses

*/**/*** indicate significance of 10%/5%/1%

70

Table 7 Estimation results of model (2) for North/West countries with minimum wages (N=420)

	Employment rate				Labour force participation rate				Unemployment rate			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy, for whom it applies	8.31 (6.27)	2.16 (4.69)	4.55 (3.40)	-0.40 (6.13)	9.93 (6.89)	-2.64 (4.92)	5.52 (3.62)	-1.19 (7.18)	-3.06 (7.38)	-9.23 (11.34)	1.44 (2.33)	-2.87 (1.82)
Relative youth minimum wage (% of the adult wage)	-	-70.54*** (6.33)	-	-49.83 (30.73)	-	-84.69*** (6.63)	-	-67.63 (38.59)	-	-49.19 (65.90)	-	43.43 (12.38)
Youth minimum wage (% of the median wage)	-		-118.76** (32.52)	-41.45 (60.90)	-		-139.06 (40.23)	-34.15 (77.36)	-		25.31 (21.99)	-42.06 (14.61)
Age dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-year fixed effects (N=300)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Intercept	9.72* (3.51)	76.57*** (6.28)	63.71** (13.79)	75.78*** (6.52)	13.18 (4.30)	93.42*** (6.32)	76.39** (16.60)	92.78*** (6.65)	33.45*** (2.17)	82.06 (64.88)	17.23 (9.62)	6.70 (5.44)
R2	0.926	0.959	0.956	0.960	0.903	0.948	0.942	0.949	0.862	0.868	0.901	0.922

Note: Standard errors, which are clustered at the level of countries, are shown in parentheses

*/**/*** indicate significance of 10%/5%/1%

Table 8 Estimation results of model (2) for South/East with minimum wages (N=480)

	Employment rate				Labour force participation rate				Unemployment rate			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
Youth minimum wage dummy, for whom it applies	6.08 (7.71)	16.71 (13.11)	1.31 (5.53)	12.24* (9.83)	7.60 (8.48)	19.59 (14.62)	1.94 (6.07)	13.91 (10.91)	-3.06 (7.38)	-9.24 (11.34)	-0.23 (7.07)	-6.59 (10.16)
Relative youth minimum wage (% of the adult wage rate)	-	84.59 (54.04)	-	89.42* (44.38)	-	-59.46 (60.50)	-	101.60* (46.55)	-	-49.20 (65.90)	-	-52.06 (61.60)
Youth minimum wage (% of the median wage)	-	-	-53.80 (30.95)	-57.17* (27.56)	-	-	-68.89 (27.23)	-72.72* (24.48)	-	-	31.87 (19.63)	33.83 (22.25)
Country-year fixed effects (N=300)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Age dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Intercept	14.54*** (1.87)	-69.05 (53.01)	32.12 (10.81)	-55.14 (39.53)	16.74*** (1.92)	-77.58 (59.32)	39.25** (9.30)	-59.89 (43.70)	33.45*** (2.17)	82.06 (64.88)	23.04** (6.09)	73.83 (59.32)
R2	0.963	0.969	0.969	0.975	0.963	0.969	0.970	0.977	0.862	0.868	0.868	0.875

Note: Standard errors, which are clustered at the level of countries, are shown in parentheses

*/**/*** indicate significance of 10%/5%/1%

Appendix B

Table 14 further specification of youth minimum wage regimes across group 1

Country	Youth Minimum wages?	Youth rates	Sources and references	Remarks
Australia	Yes	15: 36% 16: 47% 17: 57% 18: 68% 19: 82% 20: 97%	Australian Government, Fair work ombudsman	Consistent throughout the reference period
Belgium	Yes	<16: 70% 17: 76% 18: 82% 19: 88% 20: 94%	National Labour Council of Belgium OECD Economic Surveys: Belgium 2015	Youth rates were phased out in 2013.
Canada	No		Canadian Government OECD Economic outlook 1998	Youth rates were abolished prior to 2000. Youth rates are reinstated federally as of April 1, 2022.
Czech Republic	No		OECD Economic Outlook 2020 Pavel Janicko (2012). Youth Employment in the Czech Republic. Friedrich-Ebert Stiftung: Czech Republic.	
Estonia	No		Estonian Governmental Statistics	No reduced rates
France	No		OECD Economic Outlook 2020	Some sectors have youth rates as a result from collective labour agreements. These are not considered statutory; therefore, France is not considered to have youth rates in our data.
Germany	No		German Government	Germany introduced minimum wages as of 2015
Greece	Yes	<25: 89%	OECD Economic Outlook 2020. Yannelis, C. (2014). The Minimum Wage and Employment Dynamics: Evidence from an Age Based Reform in Greece. Royal Economic Society Annual Conference. Annual Report on the Greek Economy and Employment 2013, Employment Institute GSEE (Η Ελληνική Οικονομία και Απασχόληση, Ετήσια Έκθεση 2013: ΙΝΕ ΓΣΕΕ)	Youth rates were only introduced after 2012; therefore, the data shows Greek youth rates from 2013 onwards.
Hungary	No		OECD Economic Outlook 2020. OECD Economic Surveys: Hungary 2014	

Ireland	<18: 70%		Citizens Information: Rights of young Workers OECD Economic Outlook 2020.	Consistent throughout the reference period
Japan	No		OECD Economic Outlook 2020.	
Korea	No		OECD Economic Outlook 2020 Republic of Korea, Minimum Wage Commission	Lower rates are associated with tenure, not with age
Luxembourg	Yes	15-16: 75% 17: 80%	The Official Portal of the Grand Duchy of Luxembourg OECD Employment Outlook 2020	Consistent throughout the reference period
Netherlands	Yes	15: 30% 16: 34% 17: 39% 18: 45% 19: 52% 20: 61% 21: 72% 22: 85%	Government of the Netherlands	The Netherlands uses an incremental system that increases each age. In our data we use averages per age category. 15-19: 40%. 20-24: 83%
New Zealand	Yes	Multiple rates over the years	Employment New Zealand	Before 2008, the adult rate was for everyone above 18. After 2008 this age shifted to 20.
Poland	No		OECD Economic Surveys: Poland OECD Economic Outlook 2020, 2015	No reduced rates
Portugal	Yes	<18: 75%	OECD Economic Outlook 2020, 2015, 2008	Consistent throughout the reference period
Slovak Republic	Yes	<18: 80% 18-21: 90%	OECD Economic Outlook 2020	Consistent throughout the reference period
Spain	No		OECD Economic Outlook 2020	Youth rates were abolished prior to 2000.
Turkey	Yes	<16: 85%	OECD Economic Outlook, 2000, 2015, 2008.	Turkey is the only country that sets an adult wage rate from 17 onwards.
UK	Yes	Multiple rates across time.	Gov.uk: National Minimum Wage and National Living Wage Rates Dickens, R., Riley, R., and Wilkinson, D. (2010). The Impact on Employment of the Age Related Increases in the National Minimum Wage. Report prepared for the Low Pay Commission. London: Low Pay Commission. Fidrmuc, J. and Tena, J. d. D (2013). National Minimum Wage and Employment of Young Workers in the UK." CESifo Working Paper, No. 4286.	
USA	Yes	<20: 58%	OECD Economic Outlook 2020	Wage rate is set federally.