

# Looking at a cross-country analysis of past experiences, is the imposition of the National Minimum Wage likely to decrease employment in the United Kingdom?

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**Abstract:** Minimum Wages have long been an economic phenomenon, governing many a debate. In April 1999 the National Minimum Wage was introduced in Britain. This paper looks at whether the minimum wage has had a detrimental effect on employment across a number of different OECD countries and relates this to the UK situation. Using longitudinal data, primarily from OECD databases, my results suggest that the minimum wage does indeed have a negative effect on employment but only to a small degree. It is more likely that other variables will have a much greater effect on the total number of employed people in the UK.

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## **1. Introduction**

Wage floors have been the cause of furious debate within both economic and political circles for many years. Implemented supposedly to redistribute earnings towards low-wage workers, academics have often questioned the whether the motive of a minimum wage is driven by political or economic aims. Traditional economic theory teaches us that minimum wages set above market rates will create unemployment by distorting market equilibrium wage level yet new the new economics of recent years has questioned this.

There have been numerous studies looking at the effect of minimum wages on unemployment within a particular country over a period of time but less work on evaluating a cross country analysis. Using longitudinal data this paper will conduct a cross-country analysis, and attempt to predict if the recently implemented National Minimum wage imposition in the UK is likely to decrease employment. By using a longitudinal analysis instead of a time series approach, I propose to realise the impact of the minimum wage at a particular over time across countries rather rely on movements in the minimum wage within one country<sup>1</sup>. Section 2 gives a brief background of the minimum wage in UK before Section 3 discusses what economic theory teaches us about the impact of minimum wages on employment. A brief summary of the early years of the minimum wage in the UK succeeds in Section 4 followed by identification of the predominant economic factors creating variation in employment across countries in Section 5. Within Section 6 and 7 respectively a model is developed assessing whether minimum wages across countries decrease employment and analysis of the results of the three models produced are divulged. Section 8 provides a critique of the model specified and Section 9 suggests directions of further study in the area. Section 10 concludes the findings of the paper.

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<sup>1</sup> Note that a time series analysis would be practically impossible to do due to the minimum wage only being implemented four years ago.

## **2. Brief background on the National Minimum Wage in the UK.**

In April 1999, partly motivated by the Labour government's pledge to reduce poverty and reverse the trend of rising wage inequality over the previous twenty years, the national minimum wage was introduced.<sup>2</sup> The initial rate was set at £3.60 for those aged 22+. In addition, there was a development rate of £3.00 for those aged 18-21 and £3.20 for those 22 and over receiving accredited training at the beginning a new job. Today the main and development rates of the national minimum wage stand at £4.20 and £3.60 respectively. These rates are set by the Low Pay Commission, an independent body who also monitor the minimum wage and assess its effects. My intention is to aid the study of the LPC and of other academics who have assessed the minimum wages. However, I intend to add a different dimension to previous studies by focussing on a cross-country analysis and minimum wages interaction with other variables that effect employment especially total labour market related expenditure and the size of unemployment benefits. By introducing the New Deal and replacing Family Credit by the Working Families' Tax Credit (WFTC), the minimum wages interaction with these two policies will be particularly relevant when evaluating its overall impact in the UK.

## **3. Economic Theory behind Minimum Wages**

### **3.1 Disemployment Effects (Traditional "textbook" economic theory of minimum wage)**

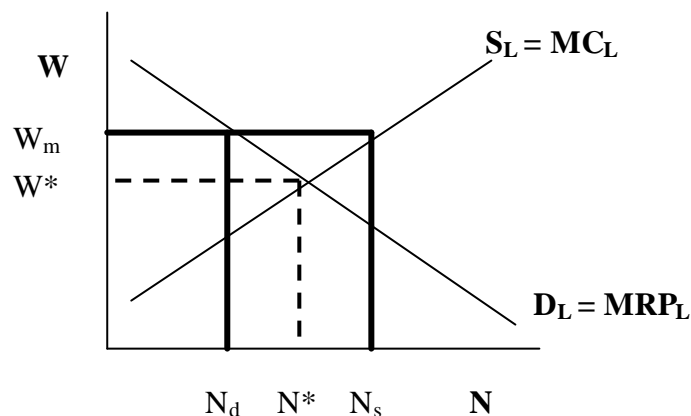
Standard neo-classical economic theory of the minimum wage assumes that markets are perfectly competitive and that the employers have a downward sloping labour demand. In addition, it predicts that labour is homogenous and both employers and employees have perfect information. Figure 1 shows the supply and demand curves for a particular kind of labour. Note that it shows the bottom end of the labour market i.e. where wages are low. When using this type of analysis of the labour market, problems often arise when attempting to define units.<sup>3</sup> A competitive firm always sets  $MRP_L$  (Marginal Revenue Product of Labour) equal to  $MC_L$  (Marginal Cost of

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<sup>2</sup> Dickens and Manning (2002).

<sup>3</sup> Chalkley (1994)

Labour). This is because the firm wants to hire workers just up until the point where the additional revenue gained from that employee equals the amount it costs the firm to hire him. The diagram below shows how the wage equilibrium ( $W^*$  per hour) is determined by the intersection of  $MRP_L$  and  $MC_L$ .  $N^*$  represents the quantity of labour supplied in ‘man’ hours. If it is assumed that all employees work a standard week, any movement to the left on the horizontal axis represents a reduction in employment.



**Figure 1: Impact of a Minimum Wage on a Perfectly Competitive Market for Labour**

The imposition of a minimum wage of  $W_m$  in such a market is to cause disequilibrium. At the minimum wage the quantity of labour the employers wish to hire ( $D_L$ ) is less than the quantity supplied ( $L_S$ ). The adverse employment effect is the distance  $N_d - N_s$ . This is known as the “disemployment effect”. The difference between  $N_s$  and  $N^*$  measures the number of workers who have been attracted into the market by a higher wage but are nevertheless unable to find employment. Those who lose employment from the imposition of the minimum wage tend to be the workers that the policy is attempting to benefit.

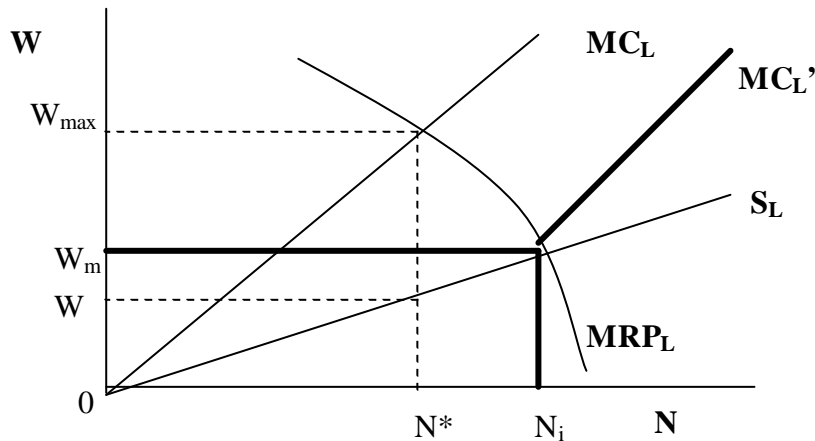
It is rare for the traditional textbook method to also acknowledge that if a decrease in employment is the result of the imposition of a minimum wage, then another result would be that if demand was to fall permanently in the industry, demand for labour (being a derived demand) would fall also. In a competitive market the market wage

would fall to a new equilibrium. However, with a minimum wage imposed, wages are rigid and prevented from falling creating even more job losses.

A consensus seemed to emerge in the 1980s that the effect of the minimum wage on employment in the United States was negative though probably very small.<sup>4</sup> Numerous economics textbooks (such as Anderson 1999) still argue against the imposition of minimum wages due to the disemployment effects associated. Empirical researchers are increasingly disagreeing with the traditional minimum wage theory. The neo-classical theory assumptions do not seem consistent with the labour markets of today, which are characterised by heterogeneous firms and workers and wage differentials even for those doing similar jobs.

### 3.2 Monopsony

If the labour market is not perfectly competitive, the predictions of the Figure 1 and may not be appropriate. A minimum wage set above market clearing rates may not lead to a decrease in employment. Indeed, considering a sole buyer of labour, where workers have little negotiating power, such as a monopsonist, it is possible that raising the wage rate can actually increase employment.<sup>5</sup>



**Figure 2: Considering the Imposition of a Minimum Wage on a Monopsony.**

<sup>4</sup> Stewart (2002).

<sup>5</sup> A monopsonist commonly referred to is the UK Ministry of Defence as the sole purchaser of weapon systems.

A monopsonist can affect the equilibrium wage depending on how many people they employ unlike a perfectly competitive firm, where the wage level is fixed. The monopsonist still equates  $MRP_L$  and  $MC_L$ . The  $MC_L$  is higher than the  $S_L$  in Figure 2 because if the monopsonist wants to raise wages to attract workers into the industry, they will not only have to increase the wage for new employees but also for existing workers also. The monopsonist does not have to pay a wage equal to  $MC_L$  but only  $S_L$ . With the imposition of a minimum wage, employment will increase up until the intersection of  $S_L$  with  $MRP_L$ . The minimum wage ( $W_{min}$ ) now becomes the  $MC_L$  up to where it intersects  $S_L$ . However, any wage above  $W_{max}$  will have an adverse effect on employment in the industry. Employment reaches its maximum at  $N_i$ .

The problem with the monopsony theory is that low paying sectors do not appear to be characterised the analysis. The lowest paid industries that the LPC claim the minimum wage helps such as; agriculture, restaurants, retail, hotel and catering, hospitality, cleaning and residential care are more likely to fit the competitive scenario.<sup>6</sup> It is therefore evident that the monopsonist argument within minimum wage sectors is extremely difficult to accept.<sup>7</sup> This was demonstrated by the famous Card and Krueger study in 1994 that claimed that the fast food industry in New Jersey and Pennsylvania possessed monopsonistic features.

*“The findings...suggest that the direct test posed by the minimum wage fails to confirm the predictions of the conventional model...We believe there is a need to reformulate the set of theoretical models that are applied to the low-wage labour market, taking into account the fact that increases in the minimum wage do not necessarily lead to decreases in employment...”<sup>8</sup>*

Although it achieved great notoriety and was cited by many advocates of the minimum wage including the Clinton administration, economists such as Neumark and Wascher (1995) and Miller (1995) have been quick to criticise and reject the idea of the presence of a monopsony in the fast food industry. It must be recognised that

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<sup>6</sup> LPC (Second Report).

<sup>7</sup> It should also be noted that in order for employment to rise after a wage increase, the price of the output product must rise in order to cover the increased costs imposed on the company. If this does not occur, the monopsony solution model is not coherent.

<sup>8</sup> Card and Krueger (1995).



this theory remains relevant even there is not a monopsonistic employer in the industry, just as though firms have some discretion in wage setting.

### **3.3 Elasticities**

Note that in Figure 1 the flatter the labour demand curve, the greater the effect will be on employment. In economic terms, the more elastic labour demand is, the larger will be the adverse effect of a minimum wage on employment of low wage workers. The biggest factor in the determining labour demand elasticity is time. As the time period gets longer, it allows more substitutions and adjustments to occur. In the competitive model, the same is true of supply i.e. the more elastic the supply curve of labour, the greater excess supply of labour created by the minimum wage. In monopsonies too, elasticities determine the extent of the increase/decrease in employment. What remains highly significant that in both models the imposition of the minimum wage has the potential to reduce employment, however in the monopsony model it is level set it is more dependent on the level set.

### **3.4 Efficiency Wages**

Recently published work by Card and Krueger (1995) and Dickens et al (1993) have revived the efficiency wage theory of the minimum wage invented by the social economics revisionists of the mid-twentieth century. According to the revisionist school, an increase in the minimum wage could cause some firms to increase employment and others to reduce it.<sup>9</sup> In the efficiency wage model, the wage is set above the market wage due to the added benefits associated of paying a higher wage. In the efficiency wage model, the wage is set above the market wage due to the added benefits of paying a higher wage. It is based on the assumption that the productivity of the workers hired in a firm is a function of their wage. Paying the efficiency wage means that the firm will attract more productive workers, have less job turnover and lower recruiting costs. The intuition behind the following analysis is as follows,

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<sup>9</sup> Card and Krueger (1995).

**Higher Wage ? Higher Cost of Losing Job ? Lower Monitoring Cost ?  
Increase Employment.**

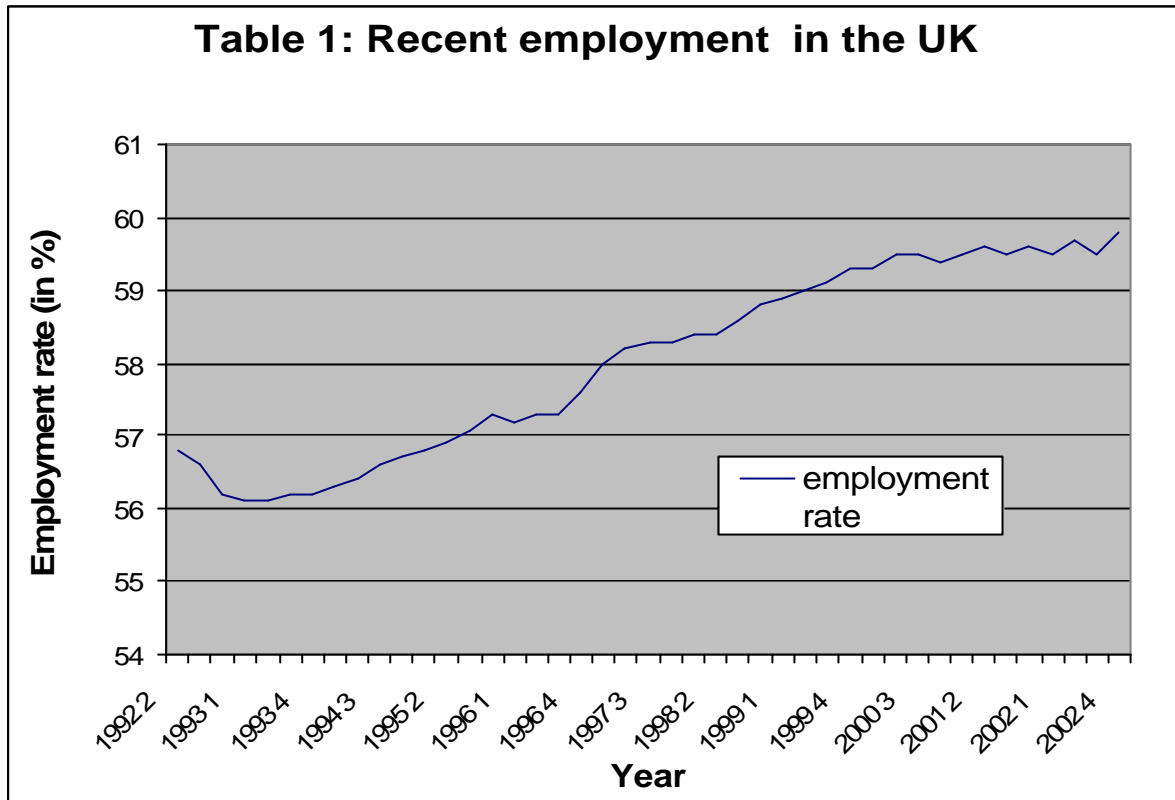
The efficiency wages model tells us that the minimum wage should also bring high productivity of the workforce through increased health and higher morale. A difficulty with this line of reasoning is that those most affected by the minimum wage tend to be relatively unskilled and inexperienced workers, who are often unsettled and lack motivation.<sup>10</sup> In addition, again it is extremely significant to realise that as in the monopsony model, beyond a certain level in this model the imposition of a minimum wage will still reduce employment.

**4. UK and the story so far**

Since the imposition of the National Minimum Wage Britain has seen employment soar to unprecedented levels. In December 2002, the Office for National Statistics (ONS) said almost 28 million people were now employed in Britain. The figures for November (2002) also suggested the number of jobseekers claiming benefits had dropped to the lowest level since 1975. However, the government's Labour Force Survey (LFS) showed an ongoing rise in the number of people out of work but not claiming benefits.

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<sup>10</sup> Sarlo (2000).

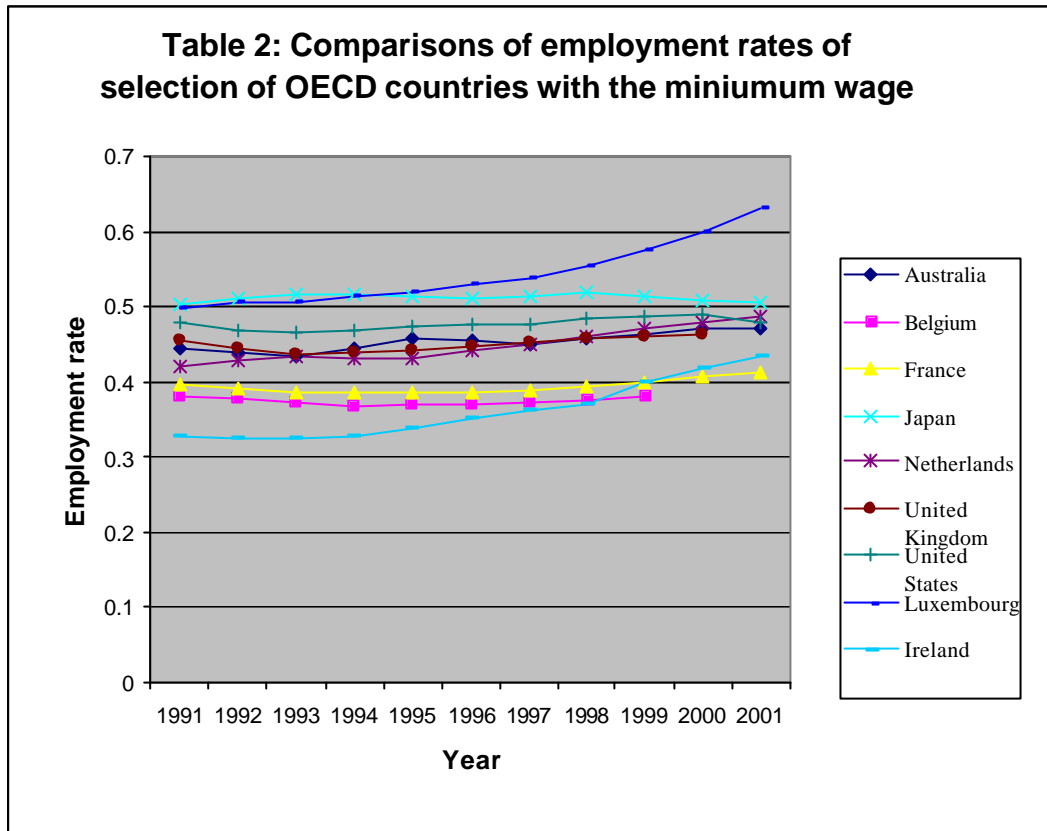


Source: Office of National Statistics (ILO employment).

*“The introduction of the minimum wage in April 1999 has had no discernible effect on the aggregate level of employment.”<sup>11</sup>*

The minimum wage was introduced at a time when the labour market was buoyant (see Table 1) fuelled by consumer spending. This has no doubt helped the minimum wage through its transition stage. This rise in employment represents a general trend in Europe (relative to the rest of the world) that has occurred during the late 1990s and the first few years of this century (see Table 2).

<sup>11</sup> Government evidence to the Low Pay Commission (November 2002).



Source: OECD figures on employment and population. Employment rate = numbers employed divided by the population for the particular country.

Advocates of the minimum wage claim that there have been no adverse employment effects from the imposition of the minimum wage in the UK. However, it could be argued that employment would have been even higher if a statutory minimum wage was not introduced. Supporters of the monopsony or efficiency wage models may claim that rising employment is evidence of their respective minimum wage theories.

## 5. FACTORS Impacting cross-country EMPLOYMENT.

### 5.1 Labour Market Imperfections

There are two significant labour market imperfections that are important to consider in the context of this study: -

#### a) *Minimum Wages*

When making cross-country comparisons, it is vital to understand how minimum wages are different by definition (see Appendix 1). Minimum wage arrangements, like those in France and the Netherlands, are based around a formula while others, like Ireland, seek a recommendation from the social partners.<sup>12</sup> Different countries have alternative methods and institutions established to oversee the implementation of minimum wages. In any model examining the cross-country impact of minimum wages would have to account for these differences.

Most countries similarly to the UK do have “development rates” in place. The later analysis will only account for the main minimum wage rate. Minimum wage can be set on hourly, weekly or even a monthly basis. This must be accounted in any measurement of the minimum wage’s impact on employment. Table 3 below shows an estimate of the hourly rate of the minimum wage at exchange rate and purchasing power parity levels.

**Table 3: Comparison of Level of Minimum Wages<sup>a</sup> per hour Across Countries, 2000**

<b>Country</b>	<b>In UK £s, using Exchange rates<sup>b</sup></b>	<b>PPPs<sup>c</sup></b>
Australia <sup>d</sup>	3.67	5.06
Luxembourg	4.15	4.88
Netherlands	3.86	4.87
Belgium	3.89	4.79
France	3.86	4.57
Canada <sup>e</sup>	3.03	3.93
Ireland	3.23	3.75
United States <sup>d</sup>	3.62	3.71

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<sup>12</sup> LPC 3<sup>rd</sup> Report Appendix 6.

<b>United Kingdom</b>	<b>3.70</b>	<b>3.70</b>
New Zealand	2.14	3.45
Japan <sup>f</sup>	4.13	2.73
Greece	1.55	2.36
Spain	1.48	2.09
Korea	1.09	1.90
Portugal	1.11	1.81

Source: OECD Main Economic Indicators 2000.

a. In all cases, the minimum wage refers to the basic rate for adults.

b. As of 30 November 2000.

c. Purchasing Power Parities for private consumption as of November 2000.

d. Federal minimum wage.

e. Weighted average of provincial rates.

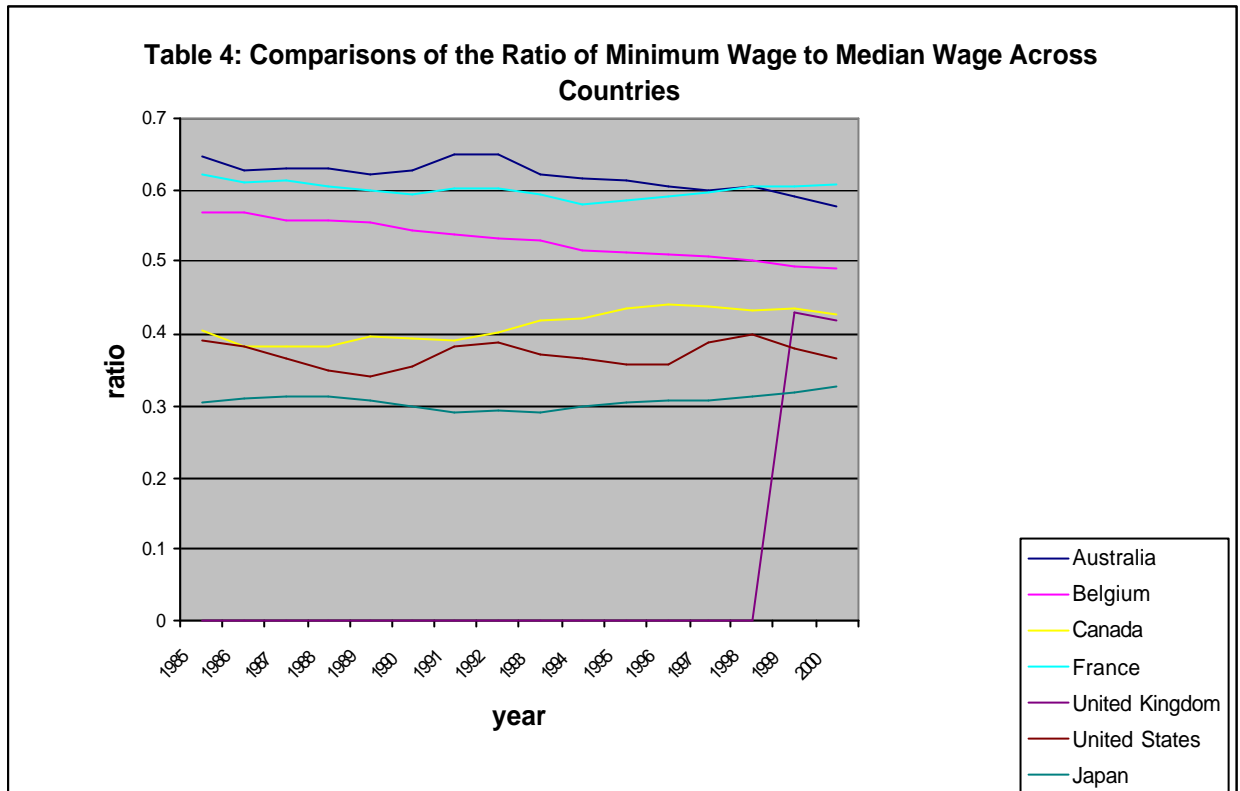
f. Weighted average of prefectural rates.

g. For countries where the minimum wage is not usually expressed as an hourly rate, the rate has been converted to an hourly basis assuming a working time of 8 hours per day, 40 hours per week and 173.3 hours per month.

Any comparisons of the minimum wage's impact on employment using the figures the minimum wage set out in Table 3 above would be subject to error because of the different income distributions across countries. The method of solving this problem that has become custom to most models is to use the Kaitz Index. This Kaitz Index measures the ratio of the minimum wage to the average wage.<sup>13</sup> Median wages are generally considered to be a better measure than the mean because they less affected the enormous differences in wage distributions across countries. In Table 4 below it is possible to compare the initial level in the UK with other OECD countries. If we expect the minimum wage to decrease employment, it should be expected that those countries where the minimum wage ratio is relatively high such as France and Belgium have a lower level of employment than a country like USA.

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<sup>13</sup> This is an unweighted version of the Kaitz Index. By definition, the Kaitz Index takes into account the proportion of those affected by the minimum wage and the fraction employment in industry I in year t. However, because this paper examines employment on the whole, the weights are not necessary.



Source: OECD Labour Market Statistics

It is immensely important to realise that the relationship between the minimum rate and median earnings will be influenced by what stage a country is at in their respective uprating cycle: the relative value will be higher at the time of uprating or just after. (See Appendix 2 for how individual countries uprate their minimum wage).

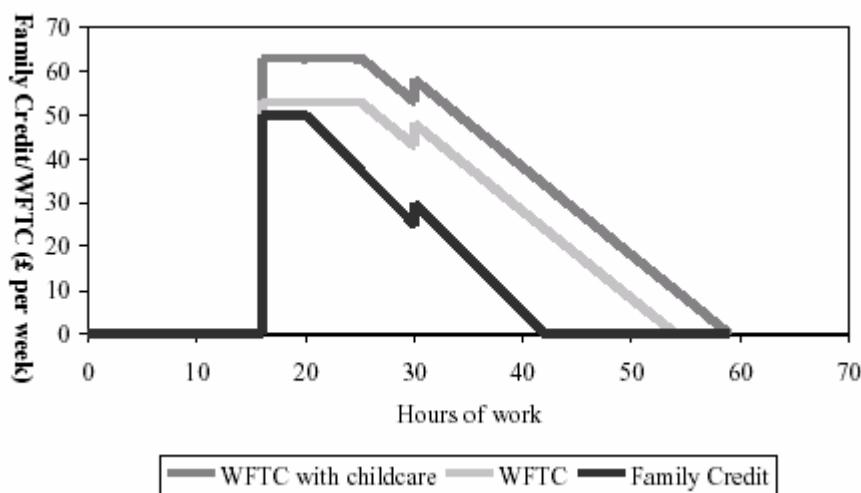
### ***b) Trade unions***

In macroeconomics trade unions have long been recognised by economists for having a negative impact on employment through the wage-setting relationship. According to neo-classical theory trade unions should have the same impact on employment as the minimum wage thus all the economic theory that applied to minimum wages and employment should also relate to trade unions. Measuring trade union influence, however, is extremely difficult to achieve because a higher proportion of the workforce within trade unions in one particular country does not necessarily they will have more influence.

## 5.2 Tax and Benefits

The levels of tax and benefits will undoubtedly have an effect on employment. The Low Pay Commission recognises that the employment “impact of the minimum wage” is “influenced by the tax and benefit system”.<sup>14</sup> When the national minimum wage was introduced in the UK in April 1999, the same year in October, the Working Families’ Tax Credit (WFTC) replaced the Family Credit doubling the recipients to 1,500,000 in the process.<sup>15</sup> This offered financial assistance for working families on low and middle incomes. Among a range of stated aims, the WFTC is intended to “improve work incentives, encouraging people without work to move into employment”.<sup>16</sup> The effect of tax on employment is thus of massive importance. Blundel et al (2000) found that the impact of the WFTC to increase overall employment of around 30,000 individuals. Figure 4 shows how in-work benefits increased as a result of WFTC. Introduced alongside WFTC was the Disability Person’s Tax Credit, which mirrored the structure of WFTC.

**Figure 3: Increase in the amount of in-work benefits from the introduction of WFTC**



Source: IFS

The influence of tax on employment is rather ambiguous. Tax does have an impact on employment but this is dependent on the size of the substitution and income effects of the individual as they decide on work and leisure. It would be expected that married females would be particularly sensitive to a change in the rate of taxation (i.e.

<sup>14</sup> LPC 3<sup>rd</sup> Report, Appendix 3.

<sup>15</sup> Duncan and Reed (2000).

<sup>16</sup> IFS March (2000).



substitution effect dominates the income effect) because the elasticity of hours worked with respect to wage is particularly high relative to others.<sup>17</sup> This, hopefully, will take into account WTFC and DPTC's influence on employment. It must be noted that the UK is not an exception. Several OECD countries accompany their minimum wages with in-work benefits (USA and Canada) or tax credits (Belgium and France) for the low paid.

On considering a benefit variable, unemployment benefits were an obvious choice due to the inevitable impact they will have on employment. Every developed country in the world has some kind of public unemployment insurance, which provides benefits to those who lose their jobs. Economic theory tells us that increases in unemployment benefit will decrease employment by reducing the incentives to work, making unemployment more attractive.

### 5.3 Public Expenditure on Labour Market Programmes

Since 1998, the Labour government have offered every long term unemployed person under 25 the New Deal options of work or training. The government have constantly proclaimed the New Deal as being successful, moving the unemployed into work. Table 5 shows the how many people have been employed through the New Deal.

It is not clear what proportion of these would become employed otherwise but even if the costs were greater than the gains, the New Deal appears to have increased the employment young people in the UK.

**Table 5: People Entering Employment through the New Deal: By Age and Type of Employment, January 1998 to September 2002.**

	18-24	25 and over	All aged 18 and over
<b>Sustained employment</b>			
Unsubsidised	73	64	71
Subsidised	6	16	8
All sustained employment	79	80	79

<sup>17</sup> Katz and Rosen claim between 0.2 and 1.0.

<b>Other employment</b>			
Unsubsidised	20	18	20
Subsidised	1	2	2
All other employment	21	20	21
<b>All entering employment</b>			
(=100%) (thousands)	398	126	525
<b>Those entering sustained employment</b>			
<b>as a percentage of all leavers</b>	40	21	33

Source: Office of National Statistics.

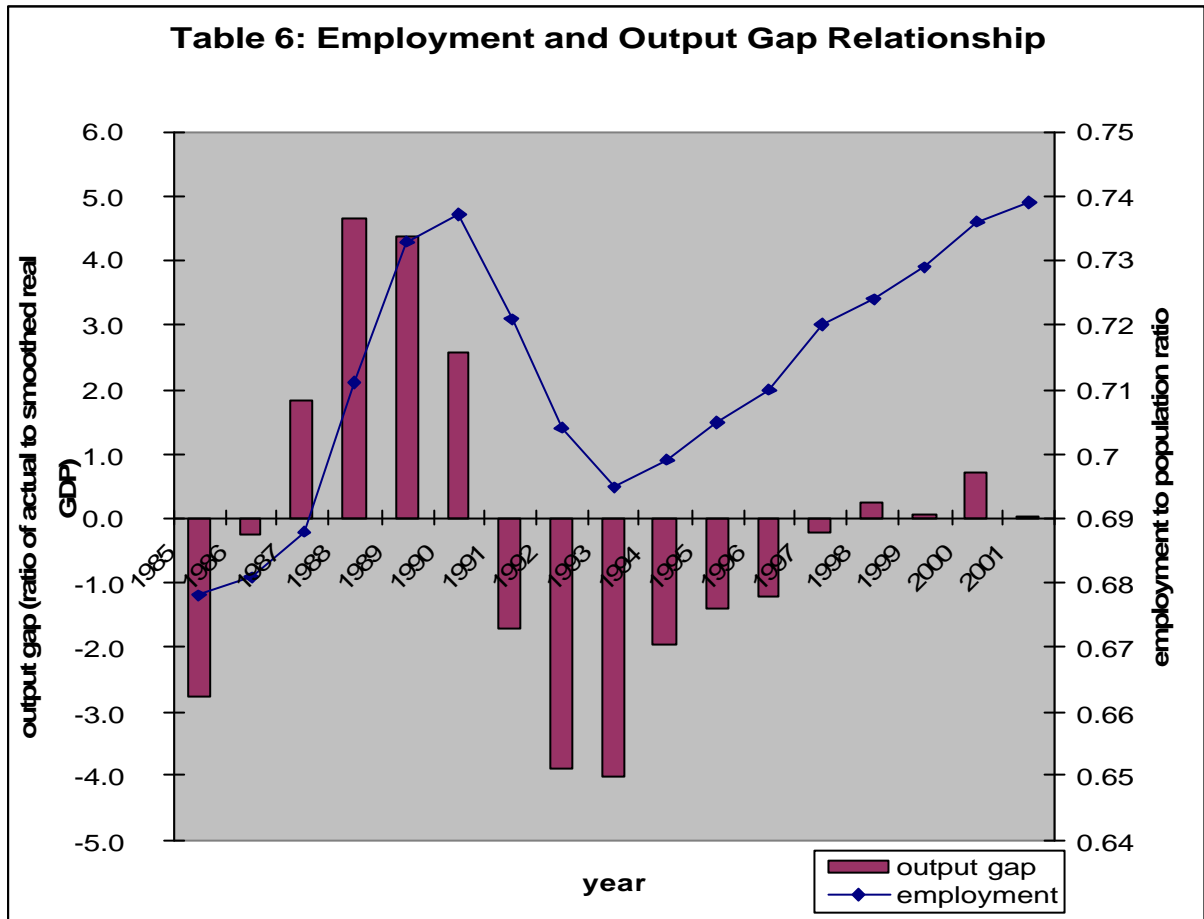
In general, an increased level of public spending on labour market programmes should increase employment.

“...countries that operated active labour market policies to help disadvantaged groups back into the labour market tended to show smaller disemployment effects from the minimum wage” (LPC 1<sup>st</sup> Report).

There was also a New Deal for lone parents introduced concurrently to the programme for young people. It is vital that any modelling of the impact of the minimum wage on employment contains a variable measuring the change in employment due to expenditure on labour market programmes. Difficulties may arise in measuring this affect across countries.

#### 5.4 The Business Cycle

Employment will be highly determined by what stage a country is at in their respective business cycle. When the actual GDP of an economy is in excess of potential GDP it is expected that employment will rise and vice versa. Table 6 below displays the positive correlation between the business cycle and employment.



### 5.5 Institutional Factors

There are some factors that affect employment across countries that cannot be explained by the points above. These are often unobservable factors can affect employment greatly between countries.

### 6. Explaining the Variables

As mentioned before, most of the analysis undertaken before on the minimum wage has used time series data. This paper intends to perform a pooled cross-section study, using the variation in the minimum wage across countries over time to identify the effect of the minimum wage on employment. Cross-section studies are generally considered by economists to provide less-definitive evidence on the impact of the minimum wage as Brown, Gilroy and Kohen (1982) observed;

*“On the basis of the cross-section studies alone, one is able to say little with confidence”*

However, as time-series regressions fail to produce statistically significant disemployment effects, it is expected that cross-section methods on this topic will increase further. National studies based of time-series data can be criticised as it is often difficult to distinguish variation in minimum wages relative to other factors affecting employment outcomes.<sup>18</sup> Therefore, it can be deduced that the impact of the minimum wage on employment, is difficult to identify. Across countries, greater variation in the minimum is enabled through different institutional frameworks.

The thirteen OECD countries with statutory minimum wages were used primarily because the data that is available on other countries necessary to fully assess the impact of the minimum wage on employment is substantially lacking. Some of the data required to complete this study to full competence is not available even for the OECD countries in the sample. The second reason why OECD countries were an obvious choice is because to examine the impact of the minimum wage on employment in the UK, countries which encounter similar economic cycles are more likely to produce accurate results.

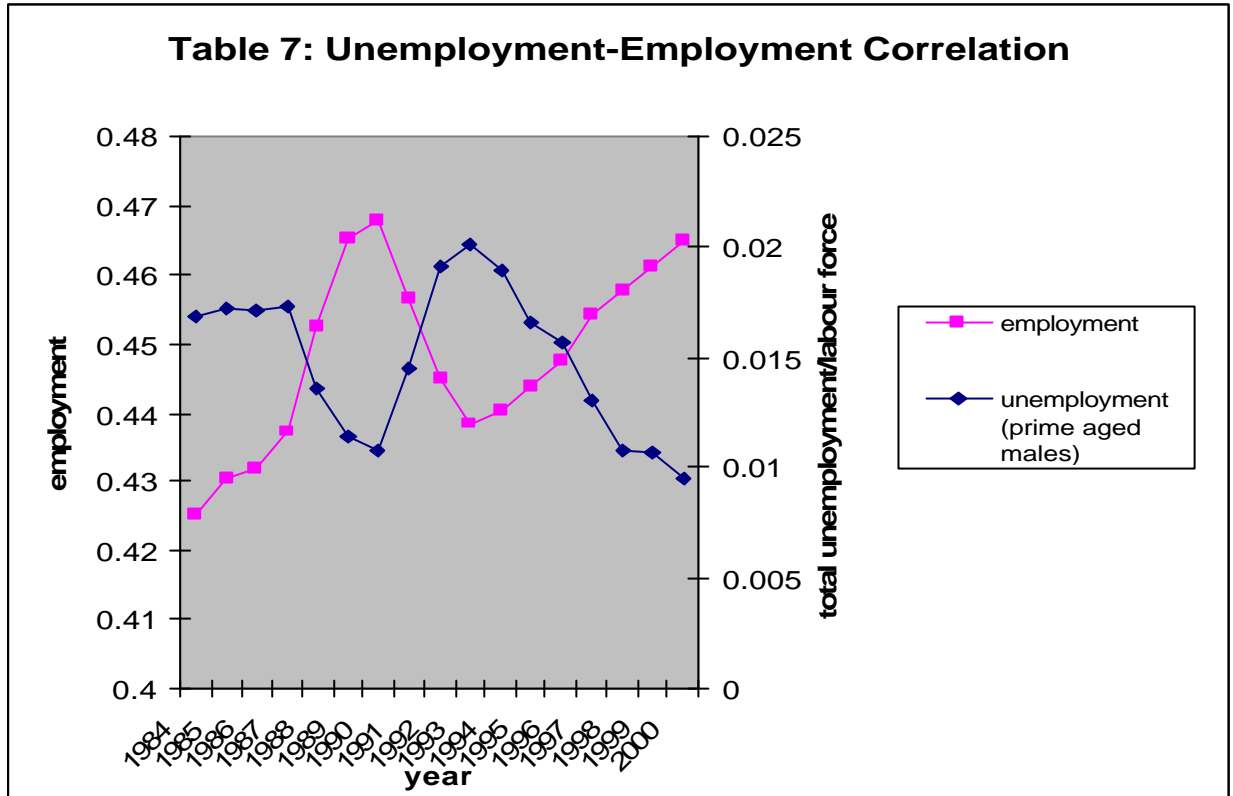
Few analyses of the minimum wage have been carried out on an international basis. The OECD (1998) also regressed the minimum wage against employment in a longitudinal study. The model produced in the OECD paper is open to criticism.

By including trade union density (% of workforce with trade union membership) in their model, they create a problem. They assume that numbers of member of a trade union automatically suggest influence. As mentioned before, this is not always the case. The OECD study also includes a peculiar definition of the business cycle in one of their models by using the unemployment rate for prime aged males. Modelling the affect of unemployment on employment is highly suspicious and implies simultaneity (see Table 7 to see how unemployment is correlated to employment in the UK). The mystifying inclusion of this variable as a measure of the business cycle is even more

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<sup>18</sup> OECD (1996) Employment Outlook.

apparent when the paper actually admits that unemployment of prime age male had increased over time (although Table 7 tells us otherwise).



Other criticisms levied at the OECD study are: -

- Why use non-wage labour cost as a proportion of total labour costs for each country as a tax variable when average income tax rate data is available?
- Why only use nine countries, when data was available for more?<sup>19</sup>
- If the results show “possible fragility”, does this not suggest that there is a relevant variable that has been left out of the model or the model misspecified some other way?

The model below will estimate (by OLS) the impact of the minimum wage on employment for thirteen OECD countries between (1985-1999): - Australia, Belgium, Canada, the Netherlands, the United States, France, Greece, Mexico, Portugal, Spain,

<sup>19</sup> I can use fifteen countries because now UK and Ireland have minimum wages.

Ireland<sup>20</sup>, Japan, New Zealand and of course the United Kingdom. This model will be substantially different from the OECD by: -

1. Including the UK (using the UK as the relative country) and 1999 as the comparison year
2. Creating a much larger database (using more countries and a set of different years)
3. Examining the expenditure on the labour market
4. Measuring how the minimum wage will interact with the tax and benefit system with particular relevance to the UK

Due to the missing data, rather than attempt a panel data model, a regular cross-section has been used. In order to account for time a dummy has been placed on each year to capture changes unexplained by the model that occur over time. Country dummies have also been added to the regression to take account of changes that materialise across countries. By the inclusions of these two variables, the model should estimate the impact of the minimum wage on employment across countries over time.

Equation 1 shows the general specification underlying the cross-country regressions results.

$$Ep_{it} = \mathbf{a} + \mathbf{b}_1 MIN_{it} + \mathbf{b}_2 OUT_{it} + \mathbf{b}_3 BEN_{it} + \mathbf{b}_4 EXP_{it} + \mathbf{b}_5 TAXSING_{it} + \mathbf{w}DUM_i + \mathbf{h}TIME_t + \mathbf{e}_{it} \quad (1)$$

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<sup>20</sup> Although 13 countries are used not enough data is available for Ireland thus there might as well be 12 countries as they have no input in the model.

**Table 7: Variable Description<sup>21</sup>**

<b>Ep<sub>it</sub></b>	The employment-population ratio for country i at time t. Used in most studies that attempt the measure of impact of the minimum wage on employment (see Appendix 7 for employment to population statistics of the UK and the OECD).
<b>MIN<sub>it</sub></b>	The minimum wage to median wage ratio (unweighted Kaitz index) for country i at time t (see Appendix 8 for a comparison of the unweighted Kaitz Index across the sample countries in 1999).
<b>OUT<sub>it</sub></b>	The Output Gap. Measuring at what stage country i is at in their business cycle at time t.
<b>BEN<sub>it</sub></b>	The % of GDP that is paid out in unemployment benefits for country i at time t (see Appendix 6b for negative correlation between unemployment benefit and employment).
<b>EXP<sub>it</sub></b>	The % of GDP spent on labour market programmes (such as the New Deal) in country i at time t (see Appendix 6a for correlation with employment)
<b>TAXSING<sub>it</sub><sup>22</sup></b>	The average amount of income tax for single person in country i at time t.
<b>DUM<sub>i</sub></b>	Dummy for country (not for the UK, which is used as the reference) country) to take into account institutional differences across countries that are unexplained by the model. The dummy variable will hopefully control for issues such as trade union density, which the OECD included in their model.
<b>TIME</b>	A time trend to take into account changes over time.
<b>e<sub>it</sub></b>	Error term

## 7. Analysis of Results

The minimum wage ratio is significant statistically when modelled against employment with a t-value of -2.81 (see Appendix 3a). The economic affect of the minimum wage is also reasonably significant. However, these the coefficient on the minimum wage refers to unit changes. All the variables effect on employment seem fairly consistent with economic theory. To find the responsiveness of employment to the minimum wage thus make economic sense of the results, elasticities of employment to the minimum wage are required. See Table 8 below for a detailed analysis of each of the variables impact on the dependent variable.

<sup>21</sup> See Appendix 5 for information of where the data was collected from.

<sup>22</sup> Note that average tax paid by a married person was not significant in the model but taking natural logarithms of the dependent variable and TAXMARR (not included in this paper) produced a larger elasticity than TAXSING thus is consistent with economic theory.

The elasticity of employment ratio to the minimum wage ratio is (-0.209), meaning that an increase in the minimum wage ratio by 1% will decrease the employment-population ratio by 0.209% (see Appendix 3b). The coefficients on the other variables measure the proportionate change on the employment-population ratio from 1% increase in the respective variable. The lack of statistical significance of expenditure on labour market programmes tells us that the government expenditure have limited but positive affect on employment. Appendix 6a shows that in recent years expenditure on the labour market has tailed off while employment has kept on rising. This implies a bleak future for the New Deal. It is important to understand the importance of the country dummies as these tell us about employment of other countries relative to the UK (see the full affect of these in Appendix 3b).

$R^2$ , the coefficient determination is relatively high, however, in longitudinal models this is often ignored, along with the other tests used for a regular cross-section. The joint significance of the variables in the model, represented by the F-test is rejected reinforcing suggestions that the model is well specified.

**Table 8: Estimated employment elasticities with respect to the minimum wage based on the cross-country regressions (1985-1999)**

Variable	Coefficient	Standard Error	t-value
<b>LMIN<sub>it</sub></b>	-0.209	0.0674	-3.10
<b>OUT<sub>it</sub></b>	0.00391	0.00150	2.62
<b>BEN<sub>it</sub></b>	-0.0444	0.0113	-3.93
<b>EXP<sub>it</sub></b>	0.0113	0.0207	0.545
<b>TAXSING<sub>it</sub></b>	-0.0444	0.0113	-3.92

```

sigma          0.0283281  RSS          0.0979028428
R^2            0.961579  F(31,122) =  98.49 [0.000]**
log-likelihood 348.26    DW          0.71
no. of observations 154  no. of parameters 32
mean(LEp)     -0.452678  var(LEp)    0.0165463

```

Tests

Normality test: Chi<sup>2</sup>(2) = 58.111 [0.0000]\*\*



hetero test:  $F(35,86) = 2.0894 [0.0031]**$   
 RESET test:  $F(1,121) = 0.091210 [0.7632]$

The model passes the RESET test implying that there are no omitted variables and the model is in the correct functional form. However, the model just fails the heteroscedasticity test, which tells us that the residuals of the model have a non-constant variance (see Appendix 9) and the t-ratios are incorrect.

Card and Kreuger (1995) adhere to using separate variables for the minimum and median wage instead of the Kaitz Index. The Kaitz Index is correlated to economic activity as its denominator is average wages. As economic activity rises employment will increase, however the Kaitz Index will fall. The minimum wage index is thus negatively correlated to average wages. The minimum wage, however, is not correlated negatively to median wages (see Appendix 4 for their correlation of their natural logarithms). The Kaitz Index will downward bias the affect of the minimum wage on employment. Replacing the Kaitz Index (MIN) with separate median and minimum wage variables did lessened the impact of the minimum wage by huge proportions. A one unit increase in the relative currency only decreased employment-population ratio by 0.00000316 (see Appendix 3c). The fact that the coefficient on the minimum wage ratio has a larger impact than modelling the two separate wage variable suggests there is some validity of the Kaitz Index biasing downwards the impact of the minimum wage on employment. This could well be the cause of the heteroscedasticity in Table 8 because the model in Appendix 3c passes all the tests except normality, which we can ignore due to the large size of the sample. In addition, the expenditure on the labour market became statistically significant at the 10% level. The new model is therefore: -

$$Ep_{it} = a + b_1 MW_{it} + b_2 MED_{it} + b_3 OUT_{it} + b_4 BEN_{it} + b_5 EXP_{it} + b_6 TAXSING_{it} + wDUM_i + hTIME_i + e_{it} \quad (2)$$

The results of this model can be seen in Appendix 3c.

## **8. Limitations of Results**

### **8.1 Data Limitations**

There are many limitations to the results that were achieved in Section 7. Firstly data is not available for all countries. Initially, it had been planned to look across fifteen OECD countries but due to a lack of data Korea and Luxembourg had to be omitted from the results.<sup>23</sup> In addition the period intended to be looked at also had to decrease due to missing values. It was originally intended to look at the dataset from 1981-2001 rather than 1985-1999. Comparing across countries making the UK my reference country with only one year of minimum wage data for the UK means there is a chance that model (2) estimated in Section 7 is still biased. This type of analysis would definitely have benefited from a greater number of observations.

### **8.2 Age Specifications**

This paper has looked at general employment rather than different age groups and sectors. Numerous past papers tend to focus primarily on teenage employment but governments tend to focus on aggregate employment more than teenage employment in policy making. However, assessing the minimum affect on prime age male employment would have been beneficial to this study.

This study would undoubtedly have been aided if it was possible to calculate the effects of the development rate of the minimum wage across countries. Table 8 below shows the changes in the employment rate of the 18-21 year old age group in the UK (1997-2002). The overall trend in youth employment has been upwards the minimum wage's introduction in 1999 appeared to have no detrimental on this group. However, data for summer 2002 indicates there was a fall of this group by two percentage points from 2001. The problem with calculating a cross-country analysis on the development rate is that countries they apply to different age bands/sectors, which would be difficult to account for.

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<sup>23</sup> Ireland also in theory should be omitted.

**Table 8: Employment rate of 18-21 year olds (Summer 1997 to Summer 2002)**

Source: The Department of Trade and Industry

### 8.3 Nominal not Real

The minimum wage and median wage values used to establish the minimum wage ratio are recorded in nominal terms in the particular country's currency units. Preferably, the real value of minimum wages across countries standardised into one currency at PPP levels would have been used but this data is simply not available, for earlier years in the sample.

### 8.4 Endogeneity in the Model?

By including tax and benefits in the model, an endogeneity problem is possibly created. One should not hold constant the effects of supply-side variables, such as taxation and benefits when there is a possibility that they could be influenced by the minimum wage. By raising income, the minimum wage should increase the amount of tax paid by the employee by reducing the amount of tax credits that it is necessary for the government to pay to low paid workers and via shifting employees into higher tax bands. According to the Department of Trade and Industry a 10p increase in the minimum wage is estimated to reduce expenditure on means-tested benefits and tax credits by £23 million. The increase in taxation receipts is of similar proportions; with

the estimated increase in income tax and National Insurance contributions estimated £35 million each.<sup>24</sup> There is thus a possibility of bias in the model estimated.

## **9. Future study**

Further study in this area is necessary before any concrete conclusions can be made in this area on the UK. As the minimum wage is still in the early stages in the UK, it is likely that studies will involve cross-section as oppose to time-series studies. Studies using cross-section analysis would be benefited by comparing the impact of the minimum wage across regions of the UK, to discover whether regions where the pay is lower suffered greater disemployment affects. In addition, it would be interesting to compare elasticities of employment with the respect to the minimum wage of countries where the minimum wage is earnings or price indexed compared to where it is not.

## **10. Conclusion**

Performing a longitudinal study to assess the impact of the minimum wage on employment across OECD countries, this paper has added to the ever increasing empirical material of one of the most fiercely contested policy questions in economics.<sup>25</sup> The first model produced was misspecified, highlighting the weakness of the Kaitz Index used to represent the minimum wage in a number of past literature. The results that I have achieved from model (2) that are shown in appendix 3c are roughly in accordance with many recent studies in this area, that the increases in the minimum wage will decrease employment, but only slightly.<sup>26</sup> However, this relies on all things remaining equal. Invariably, all things are not equal and policies such as the WFTC, the New Deal, the business cycle and median income will constantly change over time and appear to have a much greater effect on employment than the minimum wage. Strong negative correlation between the average rate of taxation for a single person and employment tells us that tax credits introduced by the Labour government

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<sup>24</sup> Department of Trade and Industry (2002)

<sup>25</sup> Stewart (2002).

<sup>26</sup> For studies that are consistent with findings of this paper i.e. negative effects yet relatively economically insignificant of the minimum wage on employment see Burkhauser et al (1997) and Dickens et al (1994).

should have positive affects on employment. The New Deal, however, maybe is a policy that we should remain sceptical about. It is the National Minimum Wage's interaction with the tax and benefit system, employment programmes such as the New Deal and the business cycle that will help decide employment in the short run, not the National Minimum Wage alone.

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## 12. Appendix

### **Appendix 1: Different Minimum Wage Definitions**

Country	Definition of the minimum wage
Belgium	Basic 'core minimum salary', normally excludes premia, bonuses and allowances unless they can be defined as remuneration for the normal performance of work. Different arrangements can be negotiated at either sectoral or company level.
Canada	Canada Basic wage. Varies according to Province; legislation usually covers gratuities, call-in pay and deductions.
France	Earnings, including bonuses, tips and commission, and accommodation and meals; but excluding profit sharing bonuses, overtime, weekend working and night working premia and other compensatory payments.
Greece	Minimum wage excludes overtime hours and commission.
Japan	Minimum wage excludes bonuses, overtime, holiday pay and night working premia.
Netherlands	Earnings, including holiday, meals and housing allowances; but excluding all additional overtime and shift premia, bonuses and other compensatory payments.
New Zealand	Minimum wage can include piecework; but not merit bonuses, tips or other gratuities. The inclusion or exclusion of all other additional payments (such as premia, allowances and supplements) within the minimum wage is decided by the parties to the employment contract. Deductions can be made for board or lodging up to a maximum figure.
Portugal	Minimum wage does not include premia, bonuses, or other allowances, except sales commission and production bonuses. It can include the value of any food and lodging provided.
Spain	Basic wage, including piecework earnings, excluding all other payments. Overtime, shift and unsociable hours premia, profit shares, and all allowances (except sick pay, holiday pay and maternity pay) are excluded.
USA	A specific hourly amount, including incentive pay, tips and accommodation and meals; but excluding overtime, shift or unsociable hours premia, and all other allowances.
<b>UK</b>	<b>Minimum wage excludes overtime hours and commission. Includes tips, gratuities and service charges through the payroll. In addition includes sales commission and other payments related to output. Excludes loans, expenses/allowances, overtime and shift premia.<sup>27</sup></b>

Source: LPC 1<sup>st</sup> Report. For UK information see footnotes.

## Appendix 2: How Different Countries Uprate their Minimum Wage

### Uprating of Minimum Wages

Country	Method of Uprating
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<sup>27</sup> Department of Trade and Industry.



Australia	Independent body (Australian Industrial Relations Commission) is responsible for setting minimum 'safety net' rates for awards and the Federal Minimum Wage. Reviews are triggered by the Australian Council of Trade Unions and usually, but not necessarily, take place each year. Reviews consider economic factors and the needs of the low paid.
Belgium	Uprating is by indexation, triggered by the social security system. Indexation is supplemented by collective bargaining every two years.
Canada	Uprating is based on recommendations from provincial Labour Ministries from time to time, taking into account cost of living and views of employers and employees. The recommendations are reviewed and voted on by the provincial Parliament.
France	Uprating takes place annually, at least in line with a statutory minimum indicated by a formula. Uprating is calculated on the basis of the annual rate of price increases (excluding tobacco) in the year to May, added to half the value of the averaged increase in hourly purchasing power of manual workers in the first quarter. In the past the Government often increased the level above this statutory minimum increase.
Greece	Minimum wages are set under National General Collective Labour Agreements, which are valid for two years. Negotiations take place in January—March and the Agreement comes into force retrospectively from 1 January.
Ireland	The rate is set by the Government, following a recommendation from the social partners. If there is no agreed recommendation the Labour Court can be asked to make a recommendation to the Government. There is no set timetable for upratings.
Japan	The system operates regionally. The minimum wage is reviewed and amended each Autumn. Regional Minimum Wage Councils, comprising representatives of labour unions, employees and public agencies, make a proposal based on their consideration of cost of living, salary of workers in similar industries, and the financial capability of employers. The final decision is made by the Director of the Regional Labour Standard Agency.
Netherlands	The Ministry of Social Affairs uprates twice yearly (1 January and 1 July) taking account of the increase in average wages, unless wages and/or the social security bill have risen too fast. If the ratio between the number of people claiming social benefits (including pensions) and the number of people working exceeds the level of 82.6%, the Government may decide not to link the wage to average contractual wage increase (as it did between 1993 and 1996). If the ratio is lower than 82.6% (as has happened since 1996), the minimum wage must be linked to wage growth. Every four years the Government is obliged to review whether the minimum wage is too high or too low.
New Zealand	The Minister of Labour conducts annual reviews in accordance with the Minimum Wage Act. The review considers the effectiveness of the minimum wage in meeting its objectives, and the impact on employment and unemployment. The Minister invites submissions from the New Zealand Council of Trade Unions and the New Zealand Employers' Federation, as well as other organisations, as part of the review.
Portugal	An Inter-Ministerial annual review considers the social and economic effects of the minimum wage. This includes the expected inflation rate and productivity levels. Following consultation with the social partners, the wage is usually uprated annually and implemented from January of each year.
Spain	The Government uprates annually in December following consultation with the social partners. The Government is obliged to take account of inflation, average national productivity, participation levels and general economic conditions.
UK	Uprating takes place periodically. The Government considers recommendations from an independent Commission, which reports following wide-ranging consultation and consideration of the effects on the economy, sectors and groups of workers.
US	Changes are voted on by Congress intermittently.

Source: LPC 3<sup>rd</sup> Report (Volume 2).

**APPENDIX 3a): Using an unweighted Kaitz Index**  
**(minimum wage as a ratio of the median wage)**

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	0.912743	0.04421	20.6	0.000	0.7775
MIN	-0.259404	0.09240	-2.81	0.006	0.0607
OUT	0.00293258	0.0009002	3.26	0.001	0.0800

EXP	0.00321242	0.01248	0.257	0.797	0.0005
BEN	-0.0238038	0.006757	-3.52	0.001	0.0923
TAXSING	-0.00400638	0.001185	-3.38	0.001	0.0856
dum1985	-0.0201384	0.01261	-1.60	0.113	0.0205
dum1986	-0.0133667	0.01197	-1.12	0.266	0.0101
dum1987	-0.00657680	0.01179	-0.558	0.578	0.0025
dum1988	-0.0102501	0.01167	-0.879	0.381	0.0063
dum1989	-0.0135603	0.01157	-1.17	0.244	0.0111
dum1990	-0.00833431	0.01165	-0.716	0.476	0.0042
dum1991	-0.00435767	0.01174	-0.371	0.711	0.0011
dum1992	-0.00316694	0.01194	-0.265	0.791	0.0006
dum1993	-0.00274287	0.01220	-0.225	0.823	0.0004
dum1994	-0.00670128	0.01199	-0.559	0.577	0.0026
dum1995	-0.00510287	0.01200	-0.425	0.671	0.0015
dum1996	-0.00167752	0.01201	-0.140	0.889	0.0002
dum1997	0.00237666	0.01183	0.201	0.841	0.0003
dum1998	0.00688752	0.01186	0.581	0.563	0.0028
dumaus	0.0457420	0.02867	1.60	0.113	0.0204
dumbel	-0.0436706	0.03083	-1.42	0.159	0.0162
dumcan	0.0132031	0.02193	0.602	0.548	0.0030
dumfra	-0.0696082	0.03193	-2.18	0.031	0.0375
dumgre	-0.171141	0.03089	-5.54	0.000	0.2010
	dumire	0.000000	---		
dumjpn	-0.0575177	0.02499	-2.30	0.023	0.0416
dumneth	-0.0445787	0.02948	-1.51	0.133	0.0184
dumnzl	0.0387241	0.02272	1.70	0.091	0.0233
dumpor	-0.0748834	0.02478	-3.02	0.003	0.0696
dumspa	-0.210804	0.02339	-9.01	0.000	0.3997
dumusa	0.0137139	0.02096	0.654	0.514	0.0035
sigma	0.0170891	RSS		0.0356287525	
R <sup>2</sup>	0.963203	F(31,122) =	103	[0.000]**	
log-likelihood	426.093	DW		0.678	
no. of observations	154	no. of parameters		32	
mean(Ep)	0.641065	var(Ep)		0.00628741	

#### Tests

Normality test:	Chi <sup>2</sup> (2) =	58.605	[0.0000]**
hetero test:	F(35,86) =	2.1014	[0.0029]**
RESET test:	F(1,121) =	0.74444	[0.3899]

### **APPENDIX 3b): Using natural logarithms to define elasticity of employment with respect to the minimum wage**

	Coefficient	Std.Error	t-value	t-prob	Part.R <sup>2</sup>
Constant	-0.372277	0.07453	-4.99	0.000	0.1698
LMIN	-0.209039	0.06737	-3.10	0.002	0.0731

OUT	0.00391866	0.001495	2.62	0.010	0.0533
EXP	0.0112590	0.02065	0.545	0.587	0.0024
BEN	-0.0443530	0.01127	-3.93	0.000	0.1126
TAXSING	-0.00669268	0.001943	-3.44	0.001	0.0886
dum1985	-0.0303168	0.02085	-1.45	0.149	0.0170
dum1986	-0.0209188	0.01984	-1.05	0.294	0.0090
dum1987	-0.00779217	0.01954	-0.399	0.691	0.0013
dum1988	-0.0129256	0.01934	-0.668	0.505	0.0036
dum1989	-0.0175264	0.01919	-0.913	0.363	0.0068
dum1990	-0.00847136	0.01931	-0.439	0.662	0.0016
dum1991	-0.00174598	0.01947	-0.0897	0.929	0.0001
dum1992	-2.39132e-005	0.01980	-0.00121	0.999	0.0000
dum1993	-0.000854764	0.02023	-0.0423	0.966	0.0000
dum1994	-0.00800695	0.01986	-0.403	0.688	0.0013
dum1995	-0.00677782	0.01988	-0.341	0.734	0.0010
dum1996	-0.00127427	0.01990	-0.0640	0.949	0.0000
dum1997	0.00615806	0.01958	0.315	0.754	0.0008
dum1998	0.0129827	0.01963	0.661	0.510	0.0036
dumaus	0.0832445	0.04525	1.84	0.068	0.0270
dumbel	-0.0540770	0.05110	-1.06	0.292	0.0091
dumcan	0.0307882	0.03634	0.847	0.398	0.0059
dumfra	-0.101310	0.05020	-2.02	0.046	0.0323
dumgre	-0.272813	0.04957	-5.50	0.000	0.1989
	dumire	0.000000	---		
dumjpn	-0.118826	0.04337	-2.74	0.007	0.0580
dumneth	-0.0537678	0.04825	-1.11	0.267	0.0101
dumnzl	0.0715102	0.03778	1.89	0.061	0.0285
dumpor	-0.118804	0.04092	-2.90	0.004	0.0646
dumspa	-0.356132	0.03911	-9.11	0.000	0.4046
dumusa	0.0119457	0.03487	0.343	0.732	0.0010
sigma	0.0283281	RSS		0.0979028428	
R^2	0.961579	F(31,122) =	98.49	[0.000]**	
log-likelihood	348.26	DW		0.71	
no. of observations	154	no. of parameters		32	
mean(LEp)	-0.452678	var(LEp)		0.0165463	

Tests

Normality test: Chi^2(2) = 58.111 [0.0000]\*\*  
hetero test: F(35,86) = 2.0894 [0.0031]\*\*  
RESET test: F(1,121) = 0.091210 [0.7632]

**APPENDIX 3c): Using the minimum wage and median wage  
as separate variables**

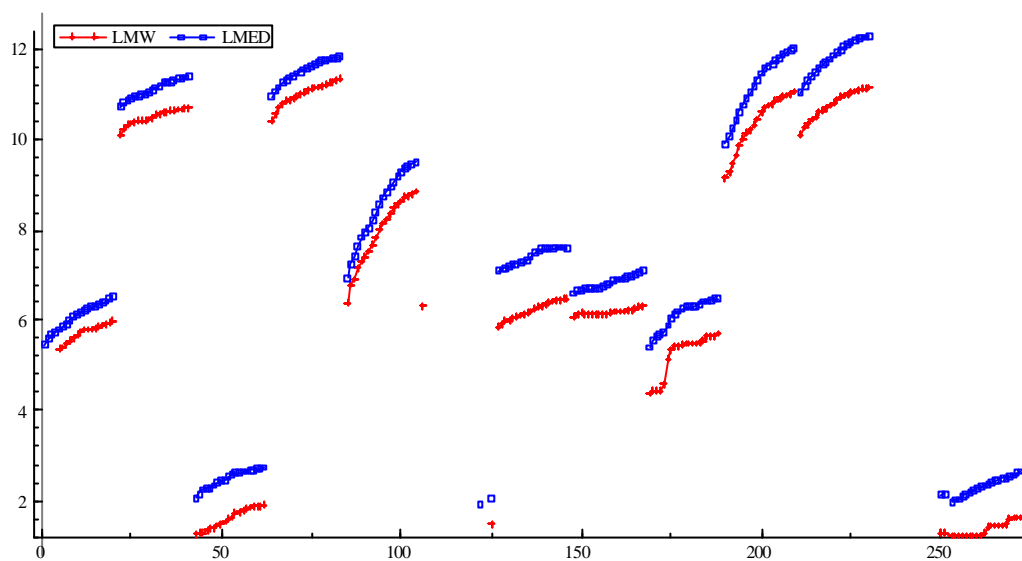
	Coefficient	Std. Error	t-value	t-prob	Part.R^2
Constant	0.789360	0.02821	28.0	0.000	0.8662
MW	-3.16402e-006	1.253e-006	-2.52	0.013	0.0500

MED	8.78703e-007	3.942e-007	2.23	0.028	0.0394
OUT	0.00406051	0.0008897	4.56	0.000	0.1469
EXP	0.0227331	0.01428	1.59	0.114	0.0205
BEN	-0.0180075	0.006952	-2.59	0.011	0.0525
TAXSING	-0.00374893	0.001298	-2.89	0.005	0.0645
dum1985	-0.0307648	0.01303	-2.36	0.020	0.0440
dum1986	-0.0218865	0.01258	-1.74	0.084	0.0244
dum1987	-0.0136680	0.01227	-1.11	0.268	0.0101
dum1988	-0.0174099	0.01221	-1.43	0.156	0.0165
dum1989	-0.0187198	0.01198	-1.56	0.121	0.0198
dum1990	-0.0122848	0.01198	-1.03	0.307	0.0086
dum1991	-0.00737302	0.01199	-0.615	0.540	0.0031
dum1992	-0.00553007	0.01217	-0.455	0.650	0.0017
dum1993	-0.00208376	0.01230	-0.169	0.866	0.0002
dum1994	-0.00474709	0.01201	-0.395	0.693	0.0013
dum1995	-0.00213661	0.01197	-0.178	0.859	0.0003
dum1996	0.00274716	0.01192	0.230	0.818	0.0004
dum1997	0.00711194	0.01176	0.605	0.546	0.0030
dum1998	0.0122910	0.01178	1.04	0.299	0.0089
dumaus	-0.0117270	0.02249	-0.522	0.603	0.0022
dumbel	-0.0477014	0.03096	-1.54	0.126	0.0192
dumcan	0.00683117	0.02249	0.304	0.762	0.0008
dumfra	-0.0193426	0.04880	-0.396	0.693	0.0013
dumgre	-0.190536	0.02937	-6.49	0.000	0.2581
dumire		0.000000		---	
dumjpn	-0.0192977	0.02478	-0.779	0.438	0.0050
dumneth	-0.0946783	0.02631	-3.60	0.000	0.0967
dumnzl	0.0160776	0.02367	0.679	0.498	0.0038
dumpor	-0.0336166	0.03410	-0.986	0.326	0.0080
dumspa	-0.171082	0.03073	-5.57	0.000	0.2039
dumusa	0.0314169	0.02056	1.53	0.129	0.0189

Tests

Normality test:  $\text{Chi}^2(2) = 57.817 [0.0000]**$   
hetero test:  $F(6,114) = 0.65907 [0.6828]$   
RESET test:  $F(1,120) = 0.062823 [0.8025]$

**APPENDIX 4): The Correlation Between Minimum and Median Wages**

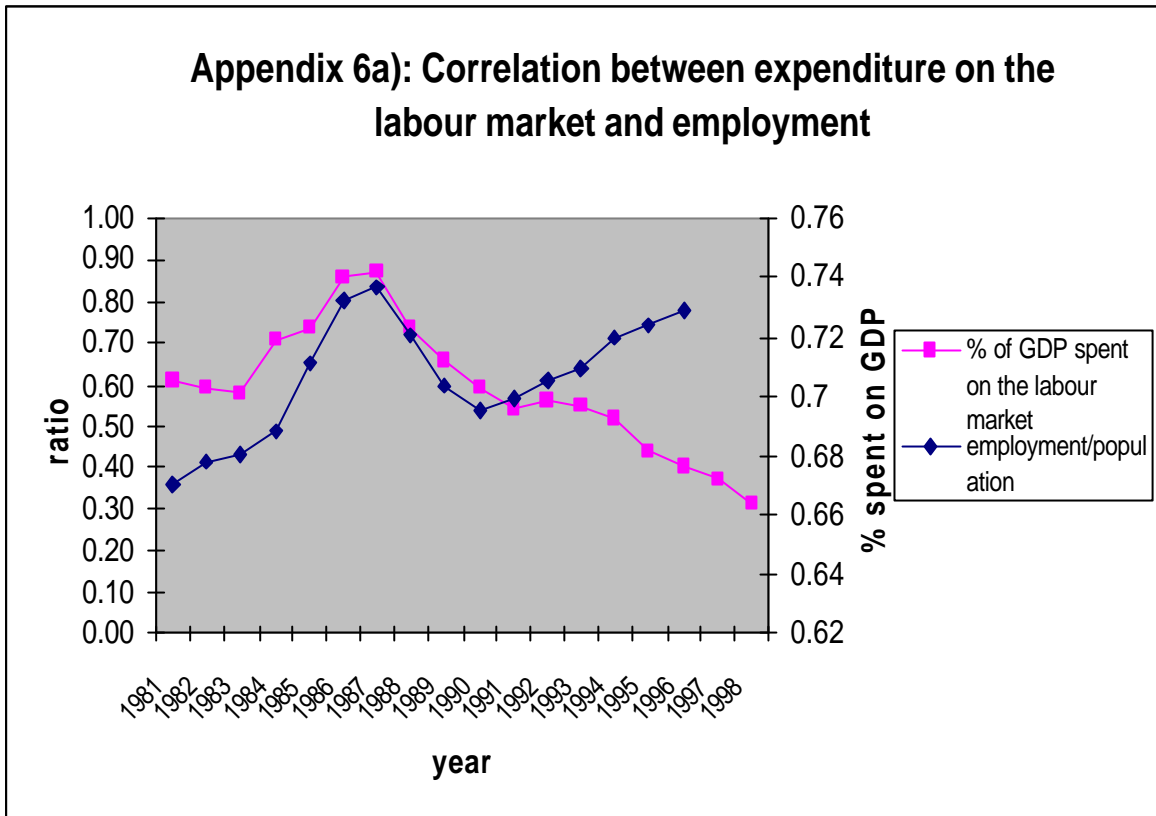


### Appendix 5: Data Collection

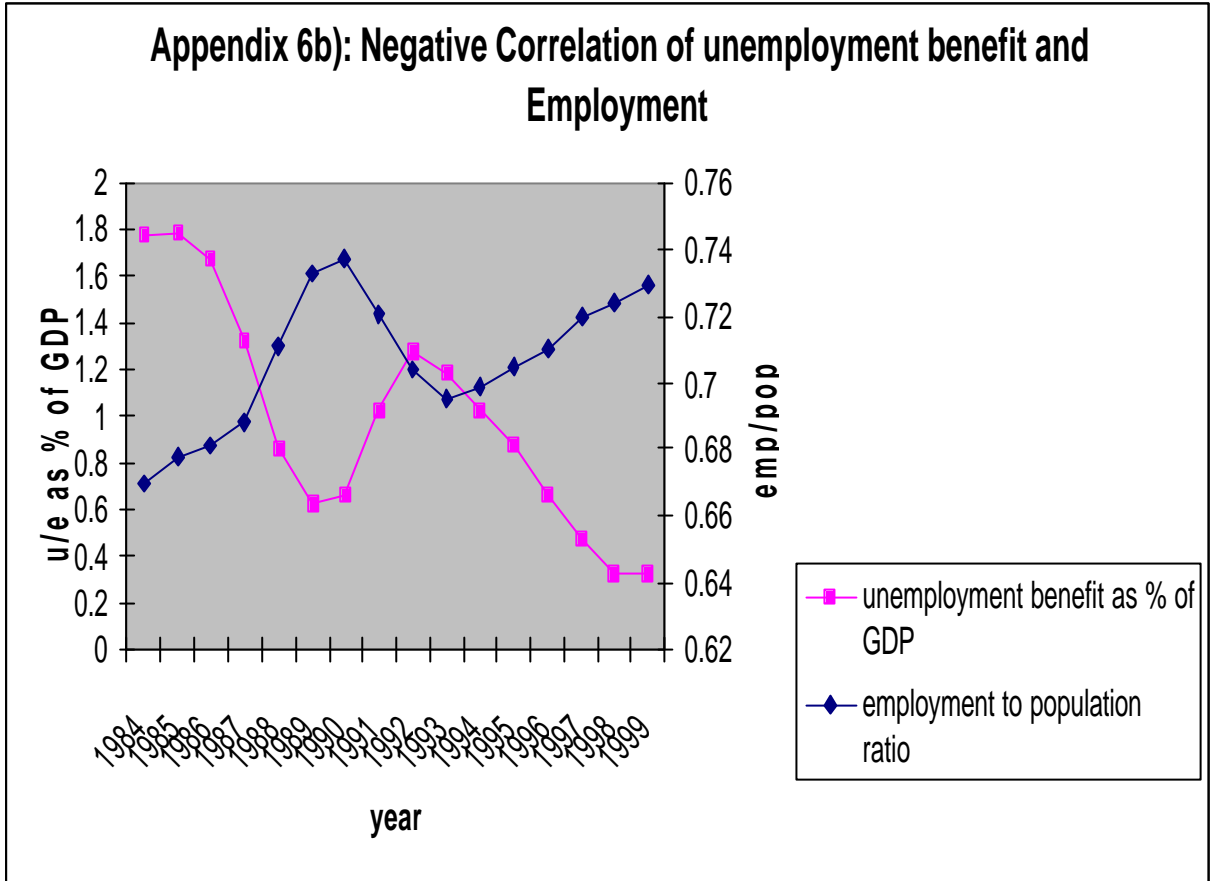
$Ep_{it}$	The OECD Labour Statistics Database (Labour Force by Sex)
$MW_{it}$	The OECD Labour Statistics Database (Minimum Wages)
$MED_{it}$	The OECD Labour Statistics Database (Minimum Wages)

<b>OUT<sub>it</sub></b>	The OECD Demand and Output Database: Output Gaps
<b>BEN<sub>it</sub></b>	The OECD Government Outlays Database
<b>EXP<sub>it</sub></b>	The OECD Labour Statistics Database (Government Expenditure on Labour Market Programmes).
<b>TAXSING<sub>it</sub></b>	The Source OECD Database (Taxing Wages)/ OECD Revenue Statistics.
<b>TAXMARR<sub>it</sub></b>	The Source OECD Database (Taxing Wages)
<b>MIN<sub>it</sub></b>	MW <sub>it</sub> /MED <sub>it</sub>
<b>e<sub>it</sub></b>	Error term

## Appendix 6







## **Appendix 7: Comparison of the UK and OECD Employment Statistics**

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*Statistics for UK  
employment*

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Mean	0.709
Standard Error	0.00477
Median	0.71
Mode	N/A
Standard Deviation	0.018474
Sample Variance	0.000341
Kurtosis	-0.963
Skewness	-0.19239
Range	0.059
Minimum	0.678
Maximum	0.737
Sum	10.635
Count	15

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*Statistics for OECD  
Employment*

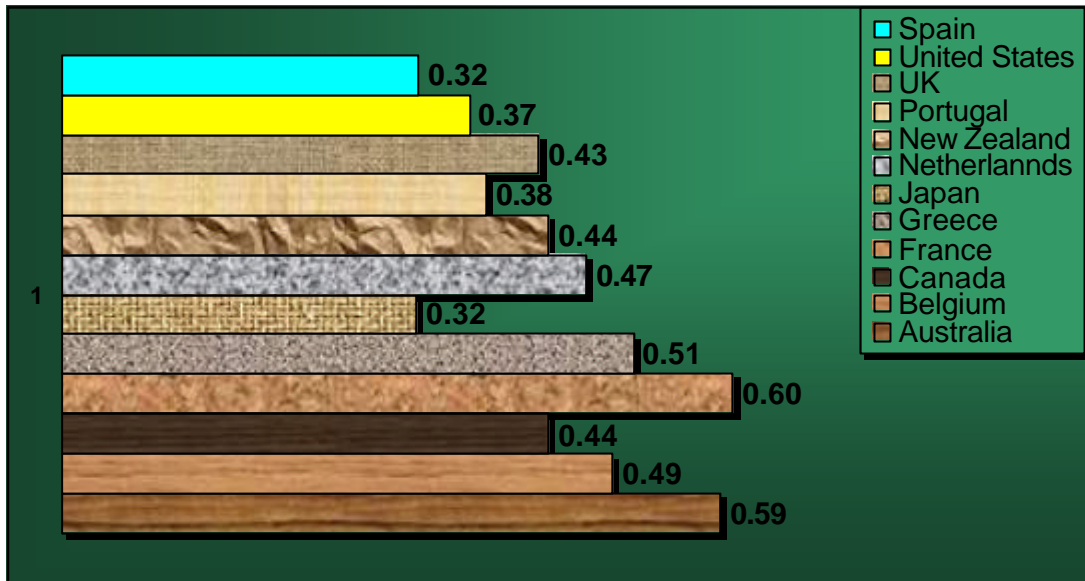
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Mean	0.644659
Standard Error	0.005377
Median	0.668
Mode	0.668
Standard Deviation	0.079759
Sample Variance	0.006362
Kurtosis	-1.06077
Skewness	-0.43899
Range	0.301
Minimum	0.463
Maximum	0.764
Sum	141.825
Count	220 <sup>28</sup>

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<sup>28</sup> Note the difference between this number and the number of observations in the models. This is because of missing data for certain countries for some of the variable in the retrospective year.

### Appendix 8: Comparisons of Minimum Wage Ratios



## Appendix 9: Non-Constant Variance of Residuals

