DISABILITY DISCRIMINATION IN A “NEW MONOPSONY” MODEL: LABOUR MARKET TRANSITIONS IN THE PRE- AND POST-DDA PERIOD*

Paper prepared for the WPEG conference July 2013

Preliminary draft. Please do not quote.

Eirini-Christina Saloniki†
University of Kent

Abstract

This paper examines how pre- and post-DDA wage differences between the disabled and non-disabled can be understood in the simple monopsonistic framework. In particular, in the pre-legislation period where there exist two separate markets, disabled and non-disabled, the Burdett-Mortensen general equilibrium search model is used to explain these pay discrepancies. In the post-legislation period, if the market is integrated, it is proposed an extension of the aforementioned model and possible reasons behind any persistent pay differences are also addressed. Based on these models, useful predictions in the pre- and post-period are made regarding the job offer arrival rates, job destruction rates and the respective wage and job offer distributions of the two types of people. These predictions are then tested using data from the British Household Panel Survey between 1991 and 2009. The results show that the DDA legislative reform (2004) in general, has worsened the position of both disabled and non-disabled in the labour market (higher unemployment rates and lower job offer arrival rates). However, the non-disabled are much more affected since even though more jobs were offered, they don’t seem to be acceptable from them.

Keywords: disability; legislation; Burdett-Mortensen; flows; distribution.

JEL classification: I10, I18, J42, J71.

* I am obliged to Amanda Gosling and Mathan Satchi for their undivided help and support towards the completion of the paper.
† School of Economics, University of Kent, Email: es343@kent.ac.uk.
I. INTRODUCTION

Over the last two decades, disabled are usually at a worse position - mostly found receiving lower wages or having higher unemployment rates - in both the UK and the US labour market compared to their non-disabled counterparts. It is worthy to note that in the UK, in 2012 almost 46 percent of the working-age disabled people were in employment compared to 76 percent of the non-disabled while the wages of the disabled where 8 percent lower than those of the non-disabled.¹ But truly, what are the reasons behind these low outcomes?

Focusing on the wage differences between the disabled and non-disabled, the wage gap can be decomposed into an explained and an unexplained part. The explained part refers to differences in observed characteristics between the two groups, such as age and qualifications while the unexplained part - often highly significant and constituting a big part of the gap - is mostly attributed to discrimination.

Wage discrimination can arise in three ways; firstly, the well-known Becker type discrimination (1971) according to which employers decide to hire and pay lower wages to the minority workers because that’s the only way of accommodating their prejudice against these type of workers. In other words, the “disutility premium” that the minority workers pay is the income equivalent of the employer’s discomfort from having to work with a minority person.

Alternatively, discrimination can arise due to the asymmetrical information in the labour market or otherwise known in the literature as statistical discrimination; specifically, employers do not have sufficient information to assess the productivity of the prospective minority workers accurately. Therefore, they take the membership in the minority group as a signal of lower productivity. In the end, the minority workers pay once again the “risk premium” (in the form of lower wages) to compensate for the information problems at the screening stage.

Finally, though it has received less attention in the literature than the other two, it is crucial to refer to discrimination arising due to the monopsonistic type of the market. It is supported that in a simple monopsony (not in the sense of a unique buyer of labour but in the sense of not having an infinitely elastic demand curve) the

¹ Both the employment and wage gap statistics are published by the Labour Force Survey (October, 2012).
employers or the co-workers have enough market power to set wages \textit{a priori} and exploit the minority workers by paying them less in order to increase their profits.

In order to improve the position of the disabled and avoid discrimination in employment and other related areas, anti-discrimination legislation has been imposed both in the US and the UK such as the Americans with Disabilities Act (ADA, 1990) and the Disability Discrimination Act (DDA, 1996), respectively. A number of studies have examined the effectiveness of the relevant legislation but their results are quite contradicting for both countries mainly due to the lack of data and relevant disability definitions in the pre- and post-period. It can be said that most of them show a decrease rather than an increase of the employment rates of the disabled after the legislation implementation. Simple explanations to this could be the high adjustment costs implied by the legislation or even its non-enforcement.

Considering all the above and the limited empirical UK studies, this paper aims to answer the following questions: i) How could the simple monopsonistic model (Burdett-Mortensen, 1998) be extended to explain persistent pre- and post-DDA pay discrepancies between the disabled and non-disabled?; ii) What inferences can be made, using recent UK data, for their wage and job offer distributions together with main labour market transitions such as job destruction rates and job offer arrival rates?; and iii) Using that evidence, what can be said about the effectiveness of the respective anti-discrimination legislative reform in the UK (DDA, 2004)?

Assuming that in the pre-legislation period there are two separate markets, disabled and non-disabled, then the simple Burdett-Mortensen model could be used to explain the pay differences between the two groups of people. For the post-legislation period, assuming the existence of an integrated market, it is proposed an extension of the aforementioned model allowing for a common wage offer distribution. Based on these two models important predictions pre- and post- are made for the job offer arrival rates and turnover rates between the two groups together with inferences for their respective wage and job offer distributions. These predictions are then tested using data from 18 waves (1991 to 2009) from the British Household Panel Survey, and important conclusions on the effectiveness of the relative anti-discrimination legislative reform are also made. The results imply that the legislative reform has worsened the position of both disabled and non-disabled in the labour market, leading to higher unemployment rates and lower job offer arrival rates for both types of people in the post-period. The scene does not change when looking at the wage and
job offer distributions with the non-disabled being much more disadvantaged than the disabled as they seem to be doing more job shopping (less likely to accept jobs offers in the post-period).

The rest of the paper is organized as follows. In Section II the simple Burdett-Mortensen model is briefly presented together with an analytic representation of the proposed extension of it for the post-period (with some predictions for both models). In Section III it is given an overview of the relevant anti-discrimination legislation literature. In Section IV specific information about the dataset is provided together with the estimation results and insightful comments on the effectiveness of the respective anti-discrimination policy reform. The fifth and final section concludes.

II. MODEL

One of the reasons leading to discrimination of the disabled in the labour market is that employers exploit the “minority” workers to increase profits. To become clearer, the use of a monopsony model is important because of the limited job mobility of the workers with disabilities; not a monopsony in the sense of a single buyer but in the sense of a labour supply not being perfectly elastic (because in order to have a larger workforce, a firm must offer a higher wage).

A simple monopsonistic model is based on two main assumptions: firstly, there are frictions in the labour markets (referring to job rents) so a separation of a worker and an employer will make both parties worse off; the worker has to look for another job and the employer has to look for a new worker. These frictions can arise due to either the ignorance of workers about labour market opportunities, individual heterogeneity in preferences over jobs or even mobility costs. Allowing for frictions in the labour markets, employers get some market power which they then exercise by setting wages prior to their meeting with the workers and so there is no option for wage bargaining. That forms and the second assumption of the monopsonistic model.
a. Burdett-Mortensen model of labour market monopsony: an overview (discriminatory case)

In the Burdett-Mortensen (1998) model with zero interest rate \((r = 0)\) firms are assumed to have identical constant returns to scale production functions with average and marginal product of workers equal to \(p\). Workers are also identical meaning that each has the same value of leisure, \(b\). Some workers are employed and others are unemployed. The offer distribution of the workers and potential workers is \(F(w)\) and the job offer arrival rate is \(\lambda\).\(^2\) An employed worker accepts a wage offer if it is greater than his current wage while an unemployed worker accepts any offer greater than the reservation wage \(R\). It should be noted that in equilibrium, there is no point in any firm offering a wage less than \(b\), therefore an unemployed worker will accept any job offer. Finally, the job destruction rate is \(\delta\) (movement from employment to unemployment) and is exogenous.

In equilibrium, all firms earn the same profit,

\[
\pi(w) = \frac{\delta(p-w)}{[\delta + \lambda(1-F(w))]^2}. \tag{1}
\]

When \(w = R = b\), (1) becomes

\[
\pi(b) = \frac{\delta(p-b)}{[\delta + \lambda(1-F(b))]^2}, \text{ with } F(b) = 0, \tag{2}
\]

and after setting (1) = (2) and doing some further calculations the equilibrium job offer distribution is given by the following condition:

\[
F(w) = \frac{\delta + \lambda}{\lambda} \left[ 1 - \sqrt{\frac{p-w}{p-b}} \right]. \tag{3}
\]

Also, the fraction of employed workers receiving a wage \(w\) or less is \(G(w)\). It is crucial to note that \(G(w)\) differs from \(F(w)\) because workers are more likely to

\(^2\) For simplicity we assume that the lambdas are the same for the employed and unemployed (\(\lambda^1 = \lambda^0\), where \(\lambda^1\) is the job offer arrival rate of a person in employment [job-to-job moves] and \(\lambda^0\) is the job offer arrival rate of a person in unemployment).
work for high wage firms. The relationship between $F(w)$ and $G(w)$ is shown below:

$$G(w) = \frac{\delta F(w)}{\delta + \lambda [1 - F(w)]},$$

(4)

and it can be easily seen that $G(w) < F(w)$ for any $0 < F(w) < 1$.

After substituting (3) to (4) we get that the equilibrium wage distribution is

$$G(w) = \frac{\delta}{\lambda} \left[ \sqrt[3]{\frac{p - b}{p - w}} - 1 \right].$$

(5)

**Separate markets (pre-legislation period)**

In the pre-legislation period, we assume that we have two separate markets, the disabled and the non-disabled. If the job destruction rates are the same for both groups ($\delta$) while the job offer arrival rates differ ($\lambda_N$ if non-disabled and $\lambda_D$ if disabled, with $\lambda_N \neq \lambda_D$), then the firm’s profits will also be different for the different groups of people.

Thus, equation (1) will be transformed as follows:

$$\pi_i(w) = \frac{p - w}{\{\delta + \lambda_i [1 - F_i(w)]\}^2}, \quad \text{with } i = N, D \ (N \text{ if non-disabled and } D \text{ if disabled}).$$

(6)

In a similar way, conditions (3) and (5) now become

$$F_i(w) = \frac{\delta + \lambda_i}{\lambda_i} \left[ 1 - \sqrt[3]{\frac{p - w}{p - b}} \right], \quad \text{and}$$

$$G_i(w) = \frac{\delta}{\lambda_i} \left[ \sqrt[3]{\frac{p - b}{p - w}} - 1 \right]^3.$$  

(7)  

(8)

---

3 Comparative statics of the model can be found in the Appendix, Annex B.

It should be noted that even if we had different lambdas for the unemployed and employed the equilibrium job offer and wage distributions would have still been the same.
b. Burdett-Mortensen model of labour market monopsony: an extension (non-discriminatory case)

**Integrated market (post-legislation period)**

In this section it is presented an extension of the simple Burdett-Mortensen model, describing the non-discriminatory case of having an integrated market and is suitable for the period after the legislation implementation. All the assumptions made in the simple version of the model above regarding the firm’s and the worker’s strategies as well as the identical workers still hold apart from the different wage offer distributions for the two types of people. In the post-period, there should be a common wage offer distribution for both types of people, denoted by $F_{post}(w)$. However, the distribution of wages across the employed workers who accept wages less or equal to $w$ will be different for the disabled and non-disabled since they will still look for better-paying jobs and so concentrated in the higher wage firms. $G_{D_{post}}(w)$ is the wage distribution of the disabled workers in the post-period whereas the respective distribution for the non-disabled is $G_{N_{post}}(w)$.\(^4\)

It should not be disregarded that the job destruction rates are still the same for both groups ($\delta$) while the job offer arrival rates differ ($\lambda_N$ if non-disabled and $\lambda_D$ if disabled, with $\lambda_N \neq \lambda_D$). The respective lambdas of the employed and unemployed, in order to make the calculations simpler, are assumed to be the same.\(^5\) Furthermore, in comparison with the pre-period, the relationship between the $F_{post}(w)$ and $G_{i_{post}}(w)$ with $i = N, D$ ($N$ if non-disabled and $D$ if disabled) will now be

$$G_{i_{post}}(w) = \frac{\delta F_{post}(w)}{\delta + \lambda_i [1 - F_{post}(w)]}. \quad (9)$$

If in the post-period the proportion of the disabled is $\gamma$ and the proportion of the non-disabled is $(1-\gamma)$ then the proportion of the disabled that the firm offering a wage $w$ would like to recruit at a given time will be

\(^4\) It should be noted that $G_{D}(w) \neq G_{D_{post}}(w)$ and $G_{N}(w) \neq G_{N_{post}}(w)$.

\(^5\) A representation of the model in the case of having different lambdas for the employed and unemployed can be found in the Appendix, Annex B.
\[ A_1 = \frac{\gamma \lambda_d}{\gamma \lambda_d + (1 - \gamma) \lambda_n}, \]  
while the proportion of the non-disabled will be
\[ A_2 = \frac{(1 - \gamma) \lambda_n}{\gamma \lambda_d + (1 - \gamma) \lambda_n}. \]

The profits that the firms earn will be the sum of the matching probabilities of the two types of workers - disabled and non-disabled, thus,
\[ \pi_{post}(w) = \frac{(1 - \gamma) \lambda_n (p - w)}{[\delta + \lambda_n (1 - F_{post}(w))]^2 [\gamma \lambda_d + (1 - \gamma) \lambda_n]} + \frac{\gamma \lambda_d (p - w)}{[\delta + \lambda_d (1 - F_{post}(w))]^2 [\gamma \lambda_d + (1 - \gamma) \lambda_n]}, \]  
and when \( w = R = b \) and knowing that \( F_{post}(b) = 0 \), (12) becomes
\[ \pi_{post}(b) = \frac{(1 - \gamma) \lambda_n (p - b)}{\delta + \lambda_n} \left[ \frac{\gamma \lambda_d + (1 - \gamma) \lambda_n}{(\delta + \lambda_d)^2} \right] + \frac{\gamma \lambda_d (p - b)}{\delta + \lambda_d} \left[ \frac{\gamma \lambda_d + (1 - \gamma) \lambda_n}{(\delta + \lambda_d)^2} \right]. \]

Therefore, in order to obtain the non-discriminatory equilibrium offer distribution we need to solve the equation below:
\[ \frac{(1 - \gamma) \lambda_n (p - w)}{[\delta + \lambda_n (1 - F_{post}(w))]^2} + \frac{\gamma \lambda_d (p - w)}{[\delta + \lambda_d (1 - F_{post}(w))]^2} = \frac{(1 - \gamma) \lambda_n (p - b)}{\delta + \lambda_n} \left[ \frac{1}{(\delta + \lambda_d)^2} \right] + \frac{\gamma \lambda_d (p - b)}{\delta + \lambda_d} \left[ \frac{1}{(\delta + \lambda_d)^2} \right]. \]

It is important to note that even though there is no analytical explicit solution to the above equation [for the \( F_{post}(w) \) distribution] however it has a form that should be easily solved numerically.

c. Predictions for both models

There are two ways of testing for the existence and extent of a monopsony: directly by estimating the elasticity of labour supply curve that face the individual employers and indirectly by looking at the predictions of the monopsony through a range of labour market phenomena such as differences in the job offer arrival rates.

As for the direct way, it is empirically difficult to estimate the elasticity of labour supply due to the need for good instruments in the form of firm-level demand shocks. For that reason, the paper focuses on the indirect way of testing for the monopsony; starting from the proportion of recruits from non-employment, a measure
of monopsony power, the higher the fraction of recruits from non-employment the higher the monopsony power in labour markets. Therefore, in order to explain part of the disability pay gap we should observe a high fraction of disabled recruits from non-employment. However, when thinking of whether disability acts as a constraint on job search and mobility, the predictions should be against the disabled, in the sense that they should be facing more constraints than the non-disabled probably caused by their disability. In addition, the overall level of job turnover might be similar between the two groups because the disabled will mainly leave their jobs for non-market reasons (for example, they are more likely to leave a full-time job because they cannot accommodate their disability).

Following these intuitions and based on the different models proposed above for the pre- and post-period, important predictions can be made for the differences in wage and job offer distributions between the two types of people. Knowing that in the pre- and post-period the disabled have lower job offer arrival rates than the non-disabled so that

\[ \lambda_D < \lambda_N, \]  

(15)

and with the common \( \delta \), it can be easily shown from (3) that

\[ F_N(w) < F_D(w). \]  

(16)

Likewise, since \( G(w) \) is a monotonic transformation of \( F(w) \) [see equation (4)] it should be that \( G_N(w) < G_D(w) \).  

(17)

As \( G(w) < F(w) \) for any \( 0 < F(w) < 1 \), it should be that

\[ G_N(w) < F_N(w). \]  

(18)

and \( G_D(w) < F_D(w). \)  

(19)

In the post-period, given conditions (9) and (15) and the common \( \delta \), the higher the job offer arrival rate the higher is the denominator of condition (9) and the lower is the ratio, so

\[ G_N^{\text{post}}(w) < G_D^{\text{post}}(w). \]  

(20)

\(^6\) From (16) and (17) it can be easily shown that \( G_N(w) - G_D(w) < F_D(w) - F_N(w). \)
Following (18) and (19) it should hold as well that
\[
G_{N}^{\text{post}}(w) < F_{N}^{\text{post}}(w),
\]
and \( G_{D}^{\text{post}}(w) < F_{D}^{\text{post}}(w). \)

Finally, it could also be shown that discrimination improves the job offer distribution for the non-disabled workers but it worsens it for the disabled, in other words \( F_{N}(w) < F_{D}^{\text{post}}(w) < F_{D}(w). \) For any comparisons of the wage distributions of the disabled and non-disabled between the pre- and the post-period, it can be said that non-discrimination improves the wage distribution of the disabled workers but it worsens it for the non-disabled \([ G_{N}(w) < G_{N}^{\text{post}}(w) \text{ and } G_{D}(w) > G_{D}^{\text{post}}(w) ]\).

III. ANTI-DISCRIMINATION LEGISLATION AND ITS EFFECTIVENESS

Description of the Acts and brief literature review

Many studies in the US have tried to examine the impact of the respective anti-discrimination legislation and in particular, the impact of the Americans with Disabilities Act (ADA) in 1990. The ADA was introduced to improve the labour market outcomes of the disabled by “making discrimination unlawful”. Therefore, it was passed with the belief that the disadvantages disabled people face in the labour market was primarily due to discrimination rather than disability itself.

DeLeire (2000), using data from the SIPP for the years pre- and post- the implementation of the ADA, found that on average employment of men with disabilities was 7.2% lower in the post-ADA period than before the introduction of the Act. Also, there were no subsequent changes to the wages of the disabled men which remained at 82% of the non-disabled male wage. These results implied that legislation had some unanticipated negative effects; most probably the demand for disabled workers was reduced due to the increasing costs of employing such workers. Furthermore, even though disability discrimination decreased and so led to an increase in supply, the latter was outweighed by the fall in demand. Thus, in the end

---

\(^7\) The proofs of both predictions can be found in *Appendix, Annex B*. 
the time and the magnitude of the changes were not consistent with ADA’s provisions.

In a different study (2001) but using the same data, DeLeire’s findings are quite contradicting; on the one hand, he found that the “unexplained” part of the wage gap attributed to discrimination did not fall after the introduction of the ADA but it increased by more than 3%. On the other hand, during this period, the negative effects of health on earnings were surprisingly lower suggesting either changes in technology or accommodation improvements of the legislation.

Similar legislation was introduced in the UK, namely the Disability Discrimination Act (DDA) in 1995. The DDA aimed to protect disabled people from direct discrimination in employment and related areas and it was implemented in three phases: in the first (1996), it is illegal to treat disabled people less favourably because of their disability; in the second in 1999, employers should make “reasonable adjustments” for their disabled employees and customers such as additional support or equipment (perhaps providing bank statements in large prints for those with sight problems); and in the third and final phase (2004) employees may have to make additional “reasonable adjustments” related to physical alterations to their premises so that they remove any access barriers. The latter might include putting bigger signs for customers with sight problems, installing an induction loop for deaf people or ramps for those with wheelchairs. Even companies who employ fewer than 15 people are not exempted from the rule.

The Act states that a person is thought of as disabled if he or she has “a physical or mental impairment which has a substantial and long-term adverse effect on his or her ability to carry out normal day-to-day activities”. Some of the main critics of the Act pointed out that additional costs imposed by the legislation such as hiring and firing, possible litigation and adjustment costs, and higher discount rates through more uncertainty might lower employment instead of raising it.

---

8 The law specifically states that they can make alterations in four ways: i) “remove the barrier or obstacle; ii) altering such as adding a ramp; iii) find means of avoiding the problem - for instance, reconfiguring the internal layout of a building; and iv) providing a service by reasonable alternative means (for example a GP with an inaccessible surgery might see patients in their homes)”.

9 A more recent legislation, Equality Act (2010) protects disabled people against direct discrimination in areas beyond the employment field (such as the supply of goods, facilities and services).

10 More information about the DDA definition can be found in the Appendix, Annex A.

11 The DDA critics are consistent with the results of similar studies on the effect of the ADA.
It is a matter of fact that DDA has received less attention than the ADA, mainly due to the lack of data and suitable definitions for disability pre- and post-Act. Only a few studies have been focused directly on the employment impact of the introduction of the DDA; Bell and Heitmueller (2009) in order to account for different disability definitions made use of the BHPS and the FRS data. The main advantage of both data sources was that they had a DDA and a work-limiting disability question which allowed for comparisons in the pre- and post-legislation period. By applying the difference-in-differences approach, they showed that post-DDA employment rates moved into different directions depending on the data source: a 3.5%-4.5% decrease using the BHPS data and an up to 1% increase using the FRS data. However, the positive effect of the DDA on employment rates using the FRS was not indicative of the impact of the legislation since the unobserved individual heterogeneity across disabled was not taken into account in that case. For that reason, they concluded that DDA resulted mainly in a decline of employment rates of the disabled in the immediate post-DDA period. In parallel, they suggested that possible reasons for the absence of a significant impact of the legislation might have been either its non-enforcement or the absence of considerable changes in the perceived costs of physical adjustments or in the expected costs of non-compliance.

Adding to the UK evidence, Jones (2005) using data from the LFS aimed at testing whether there was employment discrimination against the disabled after the implementation of the DDA (1995). She found that the employment gap between the disabled, especially the work-limited and the non-disabled has narrowed for both genders since the DDA and so indicating a positive effect of the legislation. However, in a later study, (Jones, 2009) making use of a previously unexploited data source, the HSE came into results similar to the US studies. Specifically, by innovatively converting the cross-sectional data to a pseudo panel and so avoiding biased estimates of the effect of the legislation on employment, she found a reduction in employment of the disabled by about 3% in the post-DDA period.

Overall, it can be concluded that the results of the relevant studies on the effectiveness of the anti-discrimination legislation have been quite contradicting for both the US and the UK.
IV. DATA AND RESULTS

The data used in this study are from the British Household Panel Survey (BHPS) covering 18 waves from 1991-2009.  

For the purpose of our study the sample is restricted to employed and unemployed men and women aged 21 to 60 years old. Every year each individual in the household is asked almost the same questionnaire. In some cases, a member of a household may be absent or too old to complete the interview themselves. As a result, a proxy respondent is administered to answer the questionnaire which is usually another member of the household (the spouse or an adult child). Since the proxy questionnaire is a much shortened version of the individual questionnaire proxy respondents are excluded from our sample.

The lack of a DDA question in the post-period made it impossible to define differently the disabled and non-disabled in the two periods. Hence, in our sample a person is thought of as disabled in the pre- and post-period if he/she has responded “Yes” to the questions “Do you have any of the health problems or disabilities listed on this card?”, and “Does your health in any way limit your daily activities compared to most people of your age?”. \(^\text{13}\) We define the pre-legislation period as the period between 1991 and 2003 while the post-legislation period covers the years between 2005 and 2009.

Having made the appropriate changes we ended up with a total sample of 58,228 individuals in the pre- and 13,326 individuals in the post-period. Regarding how many of them are thought of disabled, 5,913 individuals, covering 10.2 percent of the total sample in the pre-period whereas in the post- the disabled account for a greater percentage, 13.4 percent of the total sample (1,784 individuals).

In Table 1 are presented some useful descriptive statistics of the unemployment rates and the flows into and out of employment (all of them are expressed in percentages). Interestingly, the unemployment rates are much higher for the disabled than the non-disabled before and after the implementation of the Act (but the relative prices are almost the same). However, when comparing the pre- with the immediate post-DDA period, the increase in the unemployment rates of the non-disabled is greater than that for the disabled creating concerns about the effectiveness

---

\(^{12}\) Each wave starts in September and ends in April or May of the following year.

\(^{13}\) Unfortunately, in the BHPS data there is no available question on whether the health problem is long-term or not (lasted more than 12 months).
of the legislative reform. The turnover rates in the last two columns of the table for
the two groups of people, in both periods are roughly the same which is in accordance
with the assumption of the common destruction rates that was previously made when
presenting the model.\textsuperscript{14}

Looking at the transitions from unemployment to employment, when
comparing the two types of people, the non-disabled seem to move more often to
employment than those with a disability before and after the legislation reform which
is again consistent with the model predictions. Overall, in the post-period the
respective percentages for the two groups are much lower compared to the pre-period,
though the decrease in these percentages is much greater for the non-disabled. It
should be noted that a movement from unemployment to employment in year $t$ has
occurred if someone was not employed at the end of year $t-1$, but was employed at
the end of year $t$.\textsuperscript{15}

Table 1: Labour market transitions in the United Kingdom in the pre- and immediate
post-DDA period

<table>
<thead>
<tr>
<th>Unemployment rates</th>
<th>Flows into employment $(U \rightarrow E)$</th>
<th>Flows out of employment $(E \rightarrow U)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-disabled</td>
<td>Disabled</td>
<td>Non-disabled</td>
</tr>
<tr>
<td>Pre-period</td>
<td>23.29%</td>
<td>64.06%</td>
</tr>
<tr>
<td>Post-period</td>
<td>27.82%</td>
<td>67.60%</td>
</tr>
</tbody>
</table>

It would be useful to see how the wage and job offer distributions of both
types of people in the pre- and post-period differ in order to check the rest of the
model’s predictions and make clearer inferences to whether non-disabled and/or
disabled have been at a worse position in the post-DDA period. These distributions
are non-parametrically estimated using the kernel density estimation and the

\textsuperscript{14} A movement from employment to unemployment has occurred in year $t$ if someone was employed
at the end of year $t-1$ and was no longer employed at the end of year $t$.

\textsuperscript{15} It was not possible to check for the job-to-job moves and hence, whether our assumption for the
same lambdas between the employed and unemployed is valid due to the high non-response rates of the
relevant variable.
respective graphs are shown in the figure below. Focusing on the right part of Figure 1, it can be seen that for the non-disabled, the wage distribution, as shown by the solid line, in both periods lies above and to the right of the job offer distribution which is consistent with what was previously predicted \[ F(w) > G(w) \]. In addition, in the post-DDA period both distributions are more leptokurtic (there is not enough variation within the observations) suggesting that the legislative reform has worsened the position of the non-disabled.

Figure 1: Wage and job offer probability densities in the pre- and post-DDA period

It is important to note that the graphs do not change much for the disabled (see Appendix, Annex C) showing that the legislative reform has not improved the position of the disabled either. However, even though both groups have been worse-off after the policy implementation, the non-disabled are much more affected; this is because despite the higher job offers that were made in the post-legislation period, they are not acceptable from the non-disabled who seem to be doing more job shopping. The latter, is also confirmed when looking at the cumulative density graphs in Figure 2; in
the post-period both cumulative densities have shifted to the right and the distance between the two has considerably increased.

Figure 2: Cumulative densities in the pre- and post-DDA period for the non-disabled

To sum up, in the immediate post-DDA period both disabled and non-disabled are at a worse position but the non-disabled seem to be even more. Possible reasons for these negative effects of the legislative reform could be perhaps either the fact that more time is required to see some substantial positive effects of it, or that the adjustment costs are so high that the firms do not proceed with the implied physical alterations (non-enforcement of the legislation), or that the firms do not mind losing custom by ignoring the DDA even if competitors have already made improvements.

V. CONCLUSION

This paper looks at how wage discrepancies between the disabled and non-disabled in the pre- and post-DDA period (2004) can be understood in the simple monopsonistic framework. The general equilibrium search model (Burdett-Mortensen, 1998) with two separate markets (disabled and non-disabled) is used for the pre-period while in the post-period if there is an integrated market, an extension of
the aforementioned model is proposed. From these two models, important predictions are made for the labour market transitions of the disabled and non-disabled, such as job offer arrival rates and job destruction rates as well as for their respective job offer and wage distributions. Then, it is examined whether these predictions are brought by recent UK data from the British Household Panel Survey and conclusions on the effectiveness of the respective anti-discrimination legislative reform are also made (DDA, 2004).

The results suggest that the policy reform has worsened the position of both disabled and non-disabled in the labour market; the unemployment rates have increased for both types of people in the post-period on average by 4% whereas their job offer arrival rates are (in relative terms) slightly lower by almost 0.5%. The “negative” picture does not change when looking at the wage and job offer distributions, but the non-disabled seem to be at a much worse position than their disabled counterparts. The latter is confirmed by the fact that although more jobs have been posted in the post-period, they are not acceptable from the non-disabled (they do more job shopping).

To conclude, the findings of this paper are in accordance with most of the available UK studies, showing a negative effect of the legislative reform on the improvement of the position of the disabled in the labour market. It seems that either the specific legislative reform requires more time to be fully enforced or that the additional adjustment costs imposed by the reform are high enough to worsen rather than improve the position of the disabled.
REFERENCES


APPENDIX

Annex A

Further comments on the DDA definition of a disabled person

“A physical or mental impairment that has a substantial and long-term adverse effect on his/her ability to carry out normal day-to-day activities” (DDA, 1996)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical impairment</td>
<td>A “weakening” of any part of the body caused through illness, by accident or congenitally, e.g. blindness, paralysis or heart disease;</td>
</tr>
<tr>
<td>Mental impairment</td>
<td>A “clinically well-recognised” mental illness e.g. schizophrenia, anxiety or depression, or a learning disability;</td>
</tr>
<tr>
<td>Substantial</td>
<td>The impact on normal day-to-day activities must be “more than minor or trivial” but not necessarily severe;</td>
</tr>
<tr>
<td>Long-term</td>
<td>“The effect must have lasted, or is expected to last, for at least 12 months”;</td>
</tr>
<tr>
<td>Adverse effect</td>
<td>Manual dexterity, physical coordination, ability to lift or carry everyday objects, continence, speech, hearing or eyesight, memory or ability to concentrate, learn or understand, or perception of risk of physical danger;</td>
</tr>
<tr>
<td>Normal day-to-day activities</td>
<td>Activities that are carried out on a regular basis such as doing the housework, climbing stairs or walking for at least 10 minutes.</td>
</tr>
</tbody>
</table>

(Pope and Bambra, 2005)
Annex B

Burdett-Mortensen model (discriminatory case)

Comparative statics

\[
\frac{\partial F_i(w)}{\partial \lambda_i} < 0; \quad \frac{\partial F_i(w)}{\partial \delta} > 0.
\]

If \( \delta/\lambda_i \) is the friction parameter then, \( \frac{\partial F_i(w)}{\partial (\delta/\lambda_i)} > 0 \).

\[
\frac{\partial G_i(w)}{\partial \lambda_i} < 0; \quad \frac{\partial G_i(w)}{\partial \delta} > 0; \quad \text{and} \quad \frac{\partial G_i(w)}{\partial (\delta/\lambda_i)} > 0.
\]

If unemployment is given by the equation

\[
u_i = \frac{\delta}{\delta + \lambda_i},
\]

then, \( \frac{\partial \nu_i}{\partial \lambda_i} < 0; \quad \frac{\partial \nu_i}{\partial \delta} > 0; \quad \text{and} \quad \frac{\partial \nu_i}{\partial (\delta/\lambda_i)} > 0.\]
Proofs of the predictions of the models

**Statement 1**

"Discrimination improves the wage offer distribution for the non-disabled but it worsens it for the disabled".

**Proof**

If 

\[ \gamma_i \hat{\lambda}_i \]

\( i \) is the proportion of the workers the firm will recruit at a given wage \( w \) in the post-period (\( i = 1,2 \) for the non-disabled and disabled respectively).

\( F_i(w) \) is the discriminatory offer distribution for each type \( i \);

\( F_{\text{post}}(w) \) is the non-discriminatory offer distribution (which is common for both disabled and non-disabled by assumption).

In the discriminatory case we know that

\[ F_N(w) < F_D(w) \]  \hspace{1cm} (I)

and in equilibrium it should hold that (profit maximization condition)

\[ \frac{(p-w)}{[\delta + \hat{\lambda}_i (1-F_i(w))]^2} = \frac{(p-b)}{(\delta + \hat{\lambda}_i)^2} \].  \hspace{1cm} (II)

Also, \( p-w \sum_{i=1}^{2} \frac{\gamma_i \hat{\lambda}_i}{[\delta + \hat{\lambda}_i (1-F_i(w))]^2} = (p-b) \sum_{i=1}^{2} \frac{\gamma_i \hat{\lambda}_i}{(\delta + \hat{\lambda}_i)^2} \).  \hspace{1cm} (III)

If \( F_{\text{post}}(w) \leq F_N(w) \) then it should be that \( F_{\text{post}}(w) < F_D(w) \).

Hence,

\[ (p-w) \sum_{i=1}^{2} \frac{\gamma_i \hat{\lambda}_i}{[\delta + \hat{\lambda}_i (1-F_{\text{post}}(w))]^2} < (p-w) \sum_{i=1}^{2} \frac{\gamma_i \hat{\lambda}_i}{[\delta + \hat{\lambda}_i (1-F_i(w))]^2} \]  \Rightarrow
\[
\sum_{i=1}^{2} \frac{\hat{y}_i}{\delta + \lambda_i (1 - F_{\text{post}}(w))} < (p - b) \sum_{i=1}^{2} \frac{\hat{y}_i}{\delta + \lambda_i} , \text{ which contradicts (III).}
\]

Therefore, it must be that \( F_{\text{post}}(w) > F_N(w) \).  

(IV)

Similarly, suppose that \( F_{\text{post}}(w) \geq F_D(w) \). Then, it should be that \( F_{\text{post}}(w) > F_N(w) \).

Hence,

\[
(p - w) \sum_{i=1}^{2} \frac{\hat{y}_i}{\delta + \lambda_i (1 - F_{\text{post}}(w))} > (p - b) \sum_{i=1}^{2} \frac{\hat{y}_i}{\delta + \lambda_i (1 - F_i(w))} \Rightarrow
\]

\[
(p-w) \sum_{i=1}^{2} \frac{\hat{y}_i}{\delta + \lambda_i (1 - F_{\text{post}}(w))} > (p - b) \sum_{i=1}^{2} \frac{\hat{y}_i}{\delta + \lambda_i} , \text{ which contradicts (III).}
\]

Thus, it must be that \( F_{\text{post}}(w) < F_D(w) \).  

(V)

From (I), (IV) and (V) we can conclude that \( F_N(w) < F_{\text{post}}(w) < F_D(w) \).

Statement 2

“Non-discrimination improves the wage distribution for the disabled workers but it worsens it for the non-disabled”.

Proof

We know that in the discriminatory and non-discriminatory case, it is \( G_N(w) < G_D(w) \) and \( G_{N_{\text{post}}}(w) < G_{D_{\text{post}}}(w) \), respectively.

Assuming that \( G_{N_{\text{post}}}(w) > G_N(w) \), and since \( G(w) \) is a monotone transformation of \( F(w) \) [in the pre-period \( G_i(w) = \frac{\delta F_i(w)}{\delta + \lambda_i [1 - F_i(w)]} \) and in the post period \( G_{i_{\text{post}}}(w) = \frac{\delta F_{i_{\text{post}}}(w)}{\delta + \lambda_i [1 - F_{i_{\text{post}}}(w)]} \)], it should also hold that

\[
\frac{\delta F_{i_{\text{post}}}(w)}{\delta + \lambda_i [1 - F_{i_{\text{post}}}(w)]} > \frac{\delta F_N(w)}{\delta + \lambda_N [1 - F_N(w)]} \Rightarrow
\]
But, from Statement 1 we also know that \( F_N(w) < F^{\text{post}}(w) \).

So, it can be said that
\[
\frac{1}{\delta + \lambda_N[1-F^{\text{post}}(w)]} > \frac{1}{\delta + \lambda_N[1-F_N(w)]} \Rightarrow
\delta + \lambda_N[1-F_N(w)] > \delta + \lambda_N[1-F^{\text{post}}(w)] \Rightarrow 1-F_N(w) > 1-F^{\text{post}}(w) \Rightarrow F^{\text{post}}(w) > F_N(w)
\]

Similarly for the disabled, if we assume that \( G^{\text{post}}_D(w) < G_D(w) \), due to the fact that \( G(w) \) is a monotone transformation of \( F(w) \), it should also hold that
\[
\frac{\delta F^{\text{post}}(w)}{\delta + \lambda_D[1-F^{\text{post}}(w)]} < \frac{\delta F_D(w)}{\delta + \lambda_D[1-F_D(w)]} \Rightarrow
\frac{F^{\text{post}}(w)}{\delta + \lambda_D[1-F^{\text{post}}(w)]} < \frac{F_D(w)}{\delta + \lambda_D[1-F_D(w)]}
\]

But, from Statement 1 we know that \( F_D(w) > F^{\text{post}}(w) \).

Hence, it should be that
\[
\frac{1}{\delta + \lambda_D[1-F^{\text{post}}(w)]} < \frac{1}{\delta + \lambda_D[1-F_D(w)]} \Rightarrow
\delta + \lambda_D[1-F_D(w)] < \delta + \lambda_D[1-F^{\text{post}}(w)] \Rightarrow 1-F_D(w) < 1-F^{\text{post}}(w) \Rightarrow F^{\text{post}}(w) < F_D(w)
\]

Both (VII) and (IX) are true therefore it can be concluded that
\[
G^{\text{post}}_N(w) > G_N(w) \text{ and } G^{\text{post}}_D(w) < G_D(w)
\]
“New” monopsony model assuming different lambdas for the employed and unemployed (non-discriminatory case)

**Useful definitions**

\[ \lambda_N^0 : \text{job offer arrival rate of an unemployed non-disabled person;} \]
\[ \lambda_N^1 : \text{job offer arrival rate of an employed non-disabled person;} \]
\[ \lambda_D^0 : \text{job offer arrival rate of an unemployed disabled person;} \]
\[ \lambda_D^1 : \text{job offer arrival rate of an employed disabled person;} \]
\[ \gamma_1 : \text{fraction of employed disabled;} \]
\[ \gamma_2 : \text{fraction of unemployed disabled;} \]
\[ (1 - \gamma_1) : \text{fraction of employed non-disabled;} \]
\[ (1 - \gamma_2) : \text{fraction of unemployed non-disabled.} \]

The proportion of the non-disabled that the firm offering a wage \( w \) would like to recruit at a given time will be

\[ A_N = \frac{(1 - \gamma_1)\lambda_N^1}{\gamma_1\lambda_D^1 + (1 - \gamma_1)\lambda_N^1} + \frac{(1 - \gamma_2)\lambda_N^0}{\gamma_2\lambda_D^0 + (1 - \gamma_2)\lambda_N^0}, \]

while the proportion of the disabled will be

\[ A_D = \frac{\gamma_1\lambda_D^1}{\gamma_1\lambda_D^1 + (1 - \gamma_1)\lambda_N^1} + \frac{\gamma_2\lambda_D^0}{\gamma_2\lambda_D^0 + (1 - \gamma_2)\lambda_N^0}. \]

The profits that the firms earn will be the sum of the matching probabilities of the four types of workers - employed disabled, employed non-disabled, unemployed disabled and unemployed non-disabled, hence,

\[ \pi^\text{post}(w) = A_N \frac{(p - w)(\delta + \lambda_N^1)\lambda_N^0}{(\delta + \lambda_N^1)(\delta + \lambda_N^0)(1 - \bar{F}^\text{post}(w))^2} + A_D \frac{(p - w)(\delta + \lambda_D^1)\lambda_D^0}{(\delta + \lambda_D^1)(\delta + \lambda_D^0)(1 - \bar{F}^\text{post}(w))^2}. \]
Then, we need to find the respective reservation wage (it will not be just equal to the value of leisure) and the profits $\pi^{post}(R)$. To find the equilibrium offer distribution we need to set $\pi^{post}(w) = \pi^{post}(R)$ and do the relevant calculations.
Annex C

Extra graphs

Figure C1: Wage and job offer probability densities in the pre- and post-DDA period

![Graphs showing wage and job offer probability densities for the pre- and post-DDA period.](image)

Figure C2: Cumulative densities in the pre- and post-DDA period for the disabled

![Cumulative density graphs for the disabled during the pre- and post-DDA period.](image)