Disability and the Labour Market: A Review of the Empirical Evidence

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ABSTRACT

This review of the existing evidence on the impact of disability on labour market outcomes draws together the key themes in the literature and by considering a range of evidence provides a comprehensive overview of the significant negative effects disability has on both employment and earnings. Importantly, this paper is able to identify specific features of the disabled group that complicate their labour market analysis and, as such, examines the impact of different techniques and assumptions on the empirical results. In addition, recent evidence relating to significant changes in legislation affecting the disabled, such as the introduction of the Americans with Disabilities Act in the US and the Disability Discrimination Act in the UK, is considered.

JEL Classification: I1, J7.

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1. Introduction

Dramatic differences in labour market outcomes are observed on the basis of disability (see Acemoglu and Angrist, 2001 and DeLeire, 2000 for US evidence and Jones et al. forthcoming for the UK). In the UK, for example, the current employment rate is just 32.8% for the disabled, compared to a rate of 80.3% for the non-disabled.¹

In addition, the size of the disabled group has grown and their labour market outcomes have deteriorated over the past twenty years (for the US see Bound and Burkhauser, 1999 and for the UK, Bell and Smith, 2004). Their low rates of participation raise concerns about the presence of employer discrimination and social exclusion of the disabled (Burchardt, 2003b) and the implications of high rates of social security benefit claimants on public spending (McVicar, 2004a). As a result the issue has received growing attention from policymakers and a range of legislative and other reforms aimed at securing an improvement in the labour market position of the disabled have been introduced. Significant legislative changes include the introduction of the Americans with Disabilities Act (ADA) in the US in 1990 and the Disability Discrimination Act (DDA) in the UK in 1995, which by imposing obligations on employers to make reasonable adjustments to their premises and employment arrangements is aimed to enhance the access of disabled people to employment.

This review of the existing evidence relating to the impact of disability on labour market outcomes identifies and examines the main themes in the literature. By considering a range of international evidence it provides a comprehensive overview of the significant effects disability has on labour market outcomes, particularly employment and earnings. However, importantly this review also enables the key
empirical issues in this area to be identified along with techniques that have been used to resolve them and their implications for the empirical results. Finally, the paper considers the evidence relating to recent policy changes aimed at improving the labour market position to assess the impact on the labour market outcomes of the disabled.

Disability is a restriction or inability rather than a demographic characteristic and, there is not a single, consistently used, definition or method for classifying the disabled (Wolfe, 1984). Since estimates of the impact disability has on labour market outcomes are conditional on the definition of disability it is important to acknowledge the possible influence of measurement error and justification bias (Bound, 1991), these issues are examined in section 2. Sections 3 and 4 consider the evidence relating to the impact of disability on earnings and employment respectively. In doing so, they highlight the issues of endogeneity and sample selection bias, and within group heterogeneity that complicate the analysis of the disabled. In addition, given the emphasis on identifying the effect of discrimination in the literature, the influence of productivity differences between the disability groups, which may be unobservable and heterogeneous (Johnson and Lambrinos, 1985) are discussed. An important difference between disability and other personal characteristics is in its dynamics effects, which are considered by examining longitudinal evidence in section 5. This analysis recognises that disability is not necessarily a permanent state; a person may not be disabled for his or her entire life. Consequently, disability onset is correlated with personal and lifestyle characteristics giving rise to a selection and timing effect. In addition, differences in the duration of disability add to the heterogeneity observed within the disabled group. Finally, section 6 reviews the recent evidence relating to
policy changes affecting the disabled and considers the labour market effects of these initiatives.

2. The Measurement of Disability

There are two main ways to determine the existence of a disability from survey data. Firstly disability can be self-assessed (in data sources such as Labour Force Survey (LFS), National Health Interview Survey (NHIS), Current Population Survey (CPS), Survey of Income and Program Participation (SIPP)), where an individual assesses their own condition, and often if it affects their capacity to undertake work, without any reference to outside standards. Survey questions typically take the form *Do you have a health condition that limits the kind or amount of work you can perform?*. The exact wording of the question does affect the number classified as disabled (see Banks et al. 2004) but the main advantage of such questions is that they give direct information on work ability and, as such, are extensively used in labour market analysis (Kidd et al., 2000, Acemoglu and Angrist, 2001 and DeLeire, 2000). However, determining whether an individual has a long-term health problem and, if it is work limiting, are both subjective and there may be social and economic incentives to misreport disability status. As a result an individual’s declaration may depend on their preference for work and the possibility of claiming disability benefits. If the propensity to classify a given disability as work limiting is affected by employment status, disability becomes endogenous in regression analysis. This ‘justification bias’ (disability as a justification for choosing non-employment) has been examined extensively in US literature (see Bound, 1991, Kerkhofs and Lindeboom, 1995, Kreider, 1999 and Currie and Madrian, 1999). Conversely, there may also be an incentive to underestimate disability status on the grounds of stigmatisation (Bound,
Moreover the effects of stigma are likely to change over time, leading to changes in the size of disabled group, particularly after changes in policy (Kruse and Schur, 2003).

Secondly, empirical studies use self reported information on specific health conditions or more objective measures of health. Although observations are less likely to suffer from justification bias, the information on disability tends not to be as closely related to limitations on work and thus suffers from measurement error (Bound, 1991). The exact measures vary between studies but include:

1) Impairment specific information (Burkhauser et al., 2002), for example deaf in both ears, which is also self reported.

2) Self reported activity limitations (Kruse and Schur, 2003), for example functional activity (seeing, hearing, speaking, walking) or daily activities (dressing, preparing meals).

3) Self reported or physician diagnosed medical conditions or symptoms (Stern, 1989).

4) Subsequent mortality rates (Parsons, 1982) and other objective measures for example, body mass index (BMI) (Campolieti, 2002) or sick days (Burkhauser, 1979).

5) Health indices based on a range of medical conditions and functional limitations (Au et al., 2004).

Several studies have compared the difference in outcomes that result from different definitions of disability, since the bias associated with self reported measures is likely to work in the opposite direction to that associated with more objective measures.
The endogeneity of self reported measures will enhance the effect of disability on labour market outcomes, whereas the measurement error associated with objective measures will underestimate the true effect. As a result studies are able to identify a range of estimates of the influence of disability on labour market activity dependent on the type of measure used (Loprest et al, 1995, Kruse and Schur, 2003).

Objective health measures have also been used to instrument self reported disability in order to eliminate the endogeneity of disability (see Stern, 1989, Bound, 1991, O’Donnell, 1998, Dwyer and Mitchell, 1999, Campolieti, 2002 and Disney et al. 2003). This procedure enables aspects of ill health that have the most influence on self-reported health to be identified, and measures the extent to which self-reported disability represents true work limiting disability. Au et al. (2004) include a variable controlling for labour market participation alongside detailed health measures and individual characteristics to identify justification bias directly. More recent studies, such as Kreider and Pepper (2002) and Kreider and Pepper (2003), use self assessed work capacity to estimate bounds on the true disability rate under weaker assumptions (varying the percentage of misreports) than those required to obtain point identification. Under the assumption that disability is non-decreasing with age, models of participation which assume that self-reported measures correspond with true disability are mis-specified.

The empirical evidence on the bias associated with self reported disability is mixed. Several authors find that assuming self reported health state coincides with true health leads to biased inferences, with non workers, or workers with low expected wages,
over reporting disabilities (Bowe, 1993, Chirikos and Nestel, 1984, Kerkhofs and Lindeboom 1995, O’Donnell 1998, Kerkhofs et al. 1999, Kreider 1999, Lindeboom and Kerkhofs, 2002 and Kreider and Pepper, 2002, 2003). However, there are also studies that find that labor market status has no effect on misreporting health (Stern 1989, Dwyer and Mitchell 1999, and Benitez-Silva et al. 2003). Others suggest that the propensity to misreport depends on individual characteristics, with non-working women, high school dropouts, non-whites and former blue-collar workers all likely to overstate disability (Kreider, 1999) and if individuals receive disability insurance (Kerkhofs and Lindeboom, 1995). The type of disability reported has also been found to be significant. For example, Baker et al. (2001) match self-reported health measures with individuals’ health records and find that reporting error vary between types of disability. The ratio of the error variance ranges from thirty percent for diabetes to over eighty percent for arthritis.

In addition to the potential justification bias, self-reported health measures are also subject to measurement error. A certain medical condition may be interpreted as work limiting by one individual, but not by another, making self-reported disability non-comparable across individuals (Campolieti, 2002). In addition to the severity of the impairment whether a health problem is work limiting will depend on a range of factors, including an individual’s own employment opportunities (Kruse and Hale, 2003), the accessibility of the workplace, technological advances, changes in the nature of employment and labor market conditions (Baldwin and Johnson, 2001). Policy changes that increase access to workplaces will, therefore, affect the number of people reporting a work limiting disability (Kruse and Schur, 2003). This measurement error is compounded across countries where institutions, policy regimes
and cultures differ. Banks et al. (2004) examine differences in the rate of self-reported
disability across countries and across labour market status. The results suggest that
over 50% of the difference in rates of self-reported disability between US and the
Netherlands is due to differences in disability thresholds. If American thresholds were
imposed on the Dutch population, the self-reported work disability rate in the
Netherlands would fall by 7.6 percentage points to 27.3%, which would narrow the
gap between self-reported disability rates in the US and the Netherlands from 14.1
percentage points to 6.6 percentage points.

Conversely, individuals may have an impairment which they do not perceive to be
work limiting and, as such, a work limiting disability measure may underestimate the
number of people with a disability, and may underestimate the employment rate for
the disabled population as a whole (Burkhauser et al., 2002). However, the same
study finds no difference in the trends over time identified from self-reported and
more objective measures. As a result they conclude that, although work-limiting
definitions are not ideal, nationally representative data sets (e.g. CPS) are still able to
monitor trends in labour market outcomes. It should be noted, however, that work-
limiting disability questions tend to be included in surveys which focus on labour
market issues (CPS, LFS), while more detailed and objective health measures
traditionally come from surveys focusing on health (e.g. National Health Interview
Survey (NHIS), Welsh Health Survey (WHS)) and Hardy and Pavalko (1986) argue
the difference in the purpose of the questionnaires are likely to impact on
respondents’ answers.
Kreider (1999) argues the existence of over reporting health problems results in an upward bias of estimates of the effect of disability on employment. This has been supported in a range of empirical studies (Parsons, 1982, Chirikos and Nestel 1984, Anderson and Burkhauser, 1985). However, other studies find that the effect of disability on both employment and wages is consistent across different disability measures (Lambrinos 1981, Stern, 1989). This may even be the case when the evidence supports justification bias (Au et al., 2004). In contrast to theory, Campolieti (2002) finds evidence that self-reported disability underestimates the effect of disability on labour force participation.

In addition to criticisms regarding measurement error of more objective health measures (Lindeboom and Kerkhofs, 2002, Campolieti, 2002), the issue of endogeneity may still remain. In line with the arguments above, any self-reported information, no matter how specific, may be subject to some degree of justification bias. However, even if justification bias is not present, measures of disability are endogenous if work has a direct effect on health, and this can lead to biased estimates of the effect of disability on employment. Social interaction through work may have benefits on health, as may the additional income from employment, which may improve housing, diet and healthcare. Consistent with this, Baker et al. (2001) find that even objective health measures are more likely to be reported by the non-employed. However, there are also potential negative effects of employment, including stress and risk from workplace hazards. Haveman et al. (1994) find that estimates that do not account for the interdependence of health, work-time and wages are biased, though when controlling for this they find a negative relationship between health limitations and work time and wages. Since disability is affected by an
individual’s lifestyle, there is also a non-random assignment into disability status e.g. sectors with greater occupational hazards and, as such, estimates may suffer from sample selection bias.

The appropriate definition of disability will depend on the issue under examination. Measures of health from survey data have been criticized since they may differ from those used to assess the validity of disability benefit claims and disability as defined by legislation (Kirchner, 1996, Schwochau and Blanck, 2000 and Kruse and Schur, 2003). A measure that is appropriate to analyse labour market outcomes may, therefore, not be as appropriate for specific evaluation of policy.

3. The Impact of Disability on Earnings

Ill health or disability may be expected to reduce an individual’s productivity in work and thus earnings, though this will vary depending on the requirements of an occupation and the severity of the disability. This reduced capacity for work may also change an individual’s preferences away from consumption towards leisure. Additional difficulties in getting to and undertaking work may raise the disutility from work and thus increase the reservation wage. In addition, non-work income a person can obtain may increase with the onset of disability, which will similarly increase the reservation wage and reduce the probability of employment. However, it is possible that the observed inferior labour market outcome of the disabled are due, in part, to employers discriminating on the basis of disability. This may be the result of prejudice (Becker, 1971) or due to imperfect information, where an employer uses the presence of a disability as an indicator of the productivity level of the group (Phelps, 1972). This issue, separating the influence of observable characteristics from
discrimination, has received considerable empirical examination. However, the existence and expectation of discrimination may also affect the decisions of the disabled with regard to participation and investment in education resulting in the disabled having inferior characteristics in the labour market. Pre-labour market discrimination could also influence the characteristics of the disabled.

Independent of the definition of disability or the data set used evidence consistently finds disabled workers earn significantly less than nondisabled workers, even after controlling for differences in human capital and job related characteristics (for the US see Baldwin and Johnson, 1994, 1995, 2000, Haveman and Wolfe, 1990, Hale et al., 1998, Acemoglu and Angrist, 2001 and Kruse and Schur, 2003 and for the UK see Blackaby et al., 1999 and Kidd et al., 2000).\(^4\) However, there may be large unmeasured productivity differences between disabled and non-disabled workers in a human capital wage equation, which, without sufficient controls, is likely to contribute to the unexplained proportion of the wage differential. Several studies address this issue directly by attempting to control for the effect of health on productivity using measures of health and functional limitations (e.g. cognitive, mobility, sensory) as additional explanatory variables in the earnings equation, but an unexplained wage gap is still observed (Hendricks et al., 1996 and Baldwin and Johnson, 2000).

An alternative method to separate the effect of health from the effect of discrimination has been to distinguish between groups of the disabled who are likely to face different degrees of prejudice. Johnson and Lambrinos (1985) identify the disabled population as those that are handicapped (defined as visible impairment subject to prejudice
rather than by the severity of the disability) and find, whilst including an index of health problems and controlling for selectivity bias, that wage discrimination accounts for between thirty and forty percent of the offer wage differential. Baldwin and Johnson (1994), using data from the SIPP, also identify disabled individuals who are likely to face little discrimination, but who have health problems that affect productivity and compare the outcomes with those disabled likely to face discrimination. They find that those with impairments that are subject to prejudice suffer lower average wages and employment probabilities than those with impairments that are less subject to prejudice. Approximately forty percent of the wage gap between those disabled subject to prejudice and the non-disabled is due to discrimination. However, even though the offer wages for the disabled who are less likely to suffer prejudice are nearly the same as the non-disabled, a discriminatory component exists reflecting something other than prejudice (approximately 10%). The most obvious explanation appears to be the influence of disability on productivity that is not controlled for in the regression.

DeLeire (2001) criticises these techniques, suggesting that the prejudice associated with a disability may be related to the severity of the disability itself and is therefore correlated with work productivity, making it impossible to separate discrimination from the effect of health problems on productivity. Instead, he splits the population into three groups: the self-reported work limited disabled, the disabled who class their disability as non-work limiting and the non-disabled. The disabled who have a non-work limiting disability are assumed to have equal productivity to the non-disabled and, therefore, any unexplained gap in wages between these two groups of workers is solely due to discrimination. The unexplained gap between the work limited disabled
and the non-disabled is a combination of discrimination and productivity differences. Using data from the SIPP (1984, 1992, 1993), he finds that only a small percentage of the earnings gap (5-8%) is due to discrimination. Jones et al. (forthcoming) apply the method of Deleire (2001) to UK data in the period following the DDA and find little evidence of discrimination against the disabled if the unobserved productivity effect is taken into account. However, large raw earnings differences exist between the disabled groups indicating the importance of the unobserved productivity effect. Using a similar method Madden (2004) also examines the effect of productivity using UK data from the 1995 Family Resources Survey (FRS) and again finds that controlling for the effect of disability on productivity reduces the discriminatory wage gap.

Further complicating the analysis of the disabled group, there are differences between disabled individuals on the basis of the type and severity of the disability. Bartel and Taubman (1979), for example, examine four groups of diseases in the US and find that the labour supply effects of ill health are negative in all cases, with larger effects caused by bronchitis and asthma and psychoses and neuroses than heart disease and arthritis. Zwerling et al. (2002) use US data from The National Health Interview Survey Disability Supplement and find those with cardiovascular, musculoskeletal and respiratory diseases are less likely to work than other disabled individuals. They also find that within psychiatric diseases, there is a large variation in the propensity to work, with the lowest employment rates associated with schizophrenia and paranoid delusional disorder. In the UK, mental health problems seem to have the most negative impact on earnings and employment (Blackaby et al., 1999, Kidd et al., 2000 and Jones et al., forthcoming). The severity of a disability is more difficult to measure
but using self-reported classifications from the SIPP Hale et al. (1998) split the disabled group into severely, moderately and non disabled. Consistently they find the disabled have lower participation rates, lower rates of full time work and have a greater prevalence to occupy lower paying employment. Moreover, these effects are more pronounced as the severity of the disability increases and, although some of these outcomes are explained by the disabled possessing fewer qualifications, allowing for education does not eliminate them. Walker and Thompson (1996) use UK data and find that controlling for the endogeneity of education reduces the negative impact of disability on earnings.

Hum and Simpson (1996) use Canadian data and confirm that the disabled have lower participation rates, average hours of work and average earnings. They also examine the influence of both severity and type (mobility, sensory, mental or multiple impairment) of disability. They find that the severity of the disability has an important influence on all labour market outcomes and that only sensory disabilities are not associated with any labour market disadvantage. In an Australian study Wilkins (2003) finds that disability is associated with a twenty five percent decrease in employment probability but this employment disadvantage is greater for the more severely disabled, those with multiple impairments and those with mental health problems confirming that the type, severity and number of health problems are important. Using information on the age of disability onset Wilkins (2003) finds that mature disability onset has a worse impact on labour market outcomes (controlling for severity, type of impairment and other characteristics) relative to any other age group, suggesting that young people are more able to adapt to disability than the old.
The extent to which an impairment will affect an individual’s productivity will not only depend on the type and severity of the disability, but also on the specific requirements of a particular job and the interaction between the disability and the requirement (Wolfe, 1984). Schumacher and Baldwin (2000) attempt to control for this by including measures of job demands (verbal, spatial, numerical aptitudes, strength and physical demands of the job) by occupation and by functional limitations in the wage equation. A significant unexplained wage differential remains for workers with disabilities which is consistent with the previous literature.

It may also be the case that an employer can make necessary accommodations to equalize the productivity between the disabled and non-disabled worker. At the most extreme, this may enable the disabled person to continue working. In a dynamic study, Burkhauser et al. (1995) examine the influence of workplace accommodations on labour market exit in the US. They estimate a time hazard model, using Social Security data, and find employer accommodation has a positive effect on job tenure; indeed, they suggest workplace accommodation is as important as the benefit replacement ratio in the participation decision. Since accommodations are costly to firms it is likely that they will be passed on to disabled workers in the form of a reduced wage (Baldwin and Johnson, 2001). This issue has received limited attention, mainly due to data restrictions, however, Gunderson and Hyatt (1996) use a unique data source, the Ontario Workers Compensation Board Survey of Workers with Permanent Impairments, which provides information on workplace accommodation (both adjustments in terms of physical task and hours and material modifications of the workplace). In their study of injured workers in Ontario 1979-88, they find that the proportion of the cost of the accommodation passed on to workers through lower
pay depends on whether the worker was employed with the same firm prior to injury. In this case, the employer was found to pay for workplace modifications (but not for changing physical demands), whereas, a substantial part of the cost is borne by the employee if injured at another firm. Zwerling et al. (2003), using a nationally representative dataset, examine the relationship between personal characteristics and accommodations in the US. They find that although 12% of disabled people have workplace accommodations, female, more educated, older, full-time workers and the self-employed are more likely to receive accommodations. Provision is also greater for more severe limitations, but is less likely for those with mental health impairments.

Although the literature has considered the influence of unobserved productivity differences in some detail, less attention has been paid to the problem of selection bias that can arise as a result of the non-random assignment of individuals into disability status. Using UK data Madden (2004) controls for both selection into health and employment status. However, controlling for the endogeneity of health status does not significantly change the estimated impact of disability on employment or earnings in his study. Lechner and Vazquez-Alvares (2004) use matching techniques and data from the German Socio-Economic Panel (1984-2001) to overcome this problem. The disabled (treatment group) are individuals who become disabled and remain disabled at the third year. The control group are those who remain non-disabled for the same period. Despite the difference in methodology they identify a significant negative impact of disability, including an employment differential of nearly 10% and an earnings differential of 16%. Previous studies have failed to control for selection on the grounds of disability but have controlled for the bias in earnings equations that
results from a non-random sample choosing employment using the Heckman (1976) two-step procedure (Johnson and Lambrinos, 1985, Baldwin and Johnson, 1994, 1995, Kidd et al. 2000 and Jones et al., forthcoming). An important issue was raised in the UK by O’Donnell (1998) who argues that modelling should take into account that some disabled people are unable to work. Using data from 1985 British Office of Population Censuses and Surveys (OPCS), he models employment as an outcome of two decisions: capacity for work and desire for work, which is found to be an appropriate specification. Failure to model this inability to work overestimates the impact of disability on wages.

The effect of disability on labour market outcomes may differ between groups, such as by gender and race, and studies have recognised this heterogeneity by estimating equations separately by disability and other observable characteristics (Baldwin and Johnson, 1995 and Bound et al., 1995). Johnson and Lambrinos (1985) find that the proportion of the wage gap attributed to discrimination is greater for disabled women (nearly fifty percent) than disabled men (thirty percent). Similarly, Madden (2004), using UK data, finds that discrimination is greater for disabled women than disabled men in terms of both participation and wages. However, Loprest et al. (1995) examine gender differences in participation among older workers and find the effect of disability on participation is larger for men and single women than married women. There are also gender differences in the impact of particular limitations; for example, labour market outcomes are more adversely affected for men with mobility and strength limitations whilst women are more severely affected by ill health affecting sensory incapacity and appearance (Baldwin et al., 1994). Several of these studies go on to examine the impact of disability on discrimination on the grounds of gender.
Whilst disabled workers also suffer from sex discrimination (Johnson and Lambrinos, 1985) the magnitude is not found to be larger than for the non-disabled (Baldwin and Johnson, 1995).

4. The Impact of Disability on Employment

Whilst the focus of the literature has been on wage discrimination, the difference in employment probabilities between the two groups is even more dramatic. Several studies model the probability of employment using a probit model as part of a Heckman (1976) correction for sample selection on wages (for the US see Baldwin and Johnson, 1994, 1995 and for the UK see Kidd et al., 2000) or in an analysis of the effects of health conditions on the labour supply of older workers (Loprest et al., 1995 and Disney et al., 2003). Studies consistently identify a negative employment effect of disability and frequently find the influence of disability is greater on employment than wages (for the US see Baldwin and Johnson 1994, 1995 and for the UK see Walker and Thompson, 1996 and Kidd et al., 2000). Studies have also sought to decompose the gap in employment probabilities, particularly in the UK. Blackaby et al. (1999) and Kidd et al. (2000) both find that about half of the difference in employment probability is explained by differences in characteristics. Similar to the analysis of earnings, Madden (2004) finds this increases to over 70% when productivity and selection issues are controlled for.

Baldwin and Johnson (1992) note that the presence of wage discrimination will force some individuals to exit the labour market, and may, therefore, explain some of the observed difference in employment rates. However, Baldwin and Johnson (1994) find the disincentive effects of wage discrimination account for only two of the twenty
nine percentage point difference in employment rates between disabled men subject to prejudice and non-disabled men. Similarly, in a related study for females, Baldwin and Johnson (1995) find that wage discrimination accounts for less than one percentage point of the twenty six percentage point gap in employment. Using the same methodology UK studies such as Kidd et al. (2000) also find this effect to be small in magnitude.

More recently, studies have begun to examine whether disability affects the type of employment undertaken. US evidence suggests that the disabled are concentrated in non-standard forms of employment, including independent contracting, part-time and temporary employment (Schur, 2002, Schur, 2003 and Hotchkiss, 2004b) that have lower wages and fewer benefits on average. The important question is whether this is the result of discrimination or a voluntary choice made by the disabled. Schur (2003) finds that, even when personal characteristics are controlled for, the disabled are significantly more likely to be in temporary and part-time employment. She argues that there are three possible reasons for this: the disability benefit regime; employer discrimination and the flexibility required by the disabled. The evidence suggests that flexibility is the dominant reason and that these forms of employment enable individuals who are unable to undertake standard types of employment to work. Consistent with this, Hotchkiss (2004b) finds the disabled have a higher propensity to be employed part-time relative to the non-disabled, which is predominately due to differences in voluntary part-time employment.

In similar research, Presser and Altman (2002) use data from the Medical Expenditure Panel Survey (MEPS) and do not find a significant relationship between working non-
day shifts and disability in the US: about one fifth of each group work late or rotating
 shifts. However, the disabled face lower wage discrimination when working
undesirable hours relative to the standard day, which is consistent with employers
being less able to discriminate owing to staff shortages for undesirable hours. Blanck
et al. (2000) find that workers with disabilities are nearly twice as likely to be self-
employed as the non-disabled. In the UK, the rate of self-employment is also higher
for the disabled (Boylan and Burchardt, 2002). Again, there appear to be two central
explanations. Firstly, employer discrimination reduces the relative wages of disabled
employees, making self-employment more attractive and hence pushing disabled
workers into self-employment. Secondly, the disabled may gain greater freedom and
flexibility to accommodate their disability through self-employment. The high rates of
self-employment are consistent with the higher rates of home working among the
disabled (Schur and Kruse, 2002).

Less attention has been attributed to the occupational choice of disabled workers,
although initial evidence for the US (Hale et al., 1998) and the UK (Meager et al.,
1998, Blackaby et al., 1999 and Smith and Twomey, 2002) find disabled workers are
concentrated in low skilled jobs such as administrative, secretarial, administrative
skilled trades and personal services. Schumacher and Baldwin (2000) find evidence
for a quality-sorting hypothesis, where, because disabled workers have a lower
amount of unmeasured skill both disabled and non-disabled workers receive lower
wages in occupations with a higher proportion of disabled workers.

Amongst the employed, the impact of disability on job mobility has been examined.
Baldwin and Schumacher (2002) use data from the SIPP and find few differences in
job mobility between disabled and non-disabled workers. One exception is that workers with disabilities have higher rates of involuntary job change, indicating that there may be discrimination in firing or that job mismatch is greater among workers with disabilities. There is limited evidence to suggest differences in the wage effect of job changes, confirming that employment effects are more serious than wage effects for the disabled.

5. Dynamic Effects

As Baldwin and Johnson (2001) highlight, disability, unlike gender or race, can be a non-permanent state, with the most common forms of disability often developed during middle age. UK evidence confirms this, only 11% of the disabled adult population are born with their disability, 12% acquire it in childhood, and the remaining 75% become disabled during their working life (Burchardt, 2003b). Baldwin and Johnson (2001) suggest that the disabled population should, therefore, be split into two main groups: those who are disabled during childhood and those who are disabled later in life (after entering work), a distinction which is important since they face very different labour market issues. The first group may face discrimination in education and upon entry to work, whereas the second group are affected by discrimination when returning to work after illness. However, it is very rare for cross section studies to have information on the date of disability onset to enable analysis of the timing of onset and, furthermore, disability may not be sudden, but a gradual deterioration in health (Burchardt, 2003b). Emphasising the importance of this issue, Pelkowski and Berger (2004) find the adverse effects of disability depend on the age of disability onset, with more pronounced effects for males in their 40s and females in their 30s.
Previous analysis of longitudinal data in the US focused on the relationship between disability, employment and benefit income (Burkhauser and Daly 1996, 1998). Similar UK studies have investigated transitions in relation to incapacity benefits rather than disability and employment directly. They find that economic incentives (benefit levels, pay, pension rights, local labour market conditions), in addition to personal characteristics, are important determinants of inflows, outflows and the duration of sickness claimants (Fenn, 1981, Holmes and Lynch, 1990 and Disney and Webb, 1991). However, more recently, longitudinal data has begun to examine the dynamic impact of disability and the associated labour market transitions, particularly in the UK.

The effect of disability onset on labour market exits can be related to the more extensive literature on the impact of health on the retirement decision (Disney et al., 2003 for example). In an international study, Bardasi et al. (2000) compares the impact of disability on labour market transitions in Britain, the US and Germany. The onset of disability is associated with a larger outflow from employment in Britain, with 81% employed two years prior to onset of disability and only 36% two years after the onset compared to 96% and 83% in Germany. Moving into non-employment, however, is not associated with major reductions in income. The employment rate of the disabled men is about 50% of the non-disabled group, but disabled men earn 70% of their non-disabled counterparts in Britain. Burchardt (2003a) uses the longitudinal element of the LFS and finds that 2.6% of people become disabled (as defined by the DDA) quarter on quarter. As a result of the onset of disability, 5% leave employment immediately whereas after 9-12 months 13% have left employment. The probability
of exiting employment is increased by low human capital and poor employment protection.

Jenkins and Rigg (2003) use UK data from the British Household Panel Survey (BHPS) to split the effect of disability into three stages i) a selection effect ii) the effect of disability onset and iii) the effect of disability post onset. Consistent with self-reporting bias, individuals who experienced disability onset were typically more disadvantaged prior to becoming disabled, having fewer qualifications, lower incomes and lower employment rates. Indeed, having no qualifications increased the probability of disability (by over 50%), although this is consistent with justification bias it may also in part reflect higher rates of disability among low income groups. However, the effect of onset was still negative, with the proportion of persons in paid work falling by 26% and their median income falling by 10%. After the initial onset effect, average work income increases but the probability of being in employment falls with the duration of disability. Burchardt (2000) also uses the BHPS and focuses on the duration of disability. She finds that, although at any one time the long-term disabled account for a large proportion of all disabled people, only a small proportion who experience disability are long-term disabled. Indeed, over half of those who become disabled as adults have a duration of 2 years or less, emphasizing that it is not a permanent state for many individuals, although after four years, the exit rate from disability is severely reduced. The study highlights the heterogeneity of disability in a cross sectional study, which, depending on the definition used, could treat an individual with long term sickness in the same way as an individual with a temporary spell of incapacity. Confirming this heterogeneity, Pelkowski and Berger (2004) find that temporary health problems have only a limited effect on both hours and earnings.
Buddelmeyer (2001) examines re-employment of the disabled in the Netherlands using receipt of disability benefits to define the population. There is a high return to work, with one third of people who enter the scheme returning to work in a four-year period, particularly among those with more work experience and better educational qualifications.

Evidence relating to health and older workers suggests that poor health does encourage retirement (Loprest et al., 1995, Bound, 1991, Sickles and Taubman, 1986, Anderson and Burkhauser, 1985 and Campoleiti, 2002). Bound et al. (1999) use data from the Health and Retirement Survey (HRS) and emphasise that in the US it is not only poor health but also the deterioration in health that has an important influence on labour market exits. Moreover they suggest that the onset of poor health causes some people who remain employed to change jobs, consistent with workers adapting their type of employment so they can remain in the labour force. Recent evidence for the UK (Disney et al., 2003), using the BHPS and instrumenting self reported health, confirms that it is deterioration in health that is associated with the transition into non-employment. Kerkhofs et al. (1999) take into account the endogeneity of health when modelling the retirement decision and find that subjective measures overstate the effects of health on retirement, while endogeneity has the reverse effect. Similarly, Dwyer and Mitchell (1999) use self-rated and objective measures of health from the HRS and find that ill-health brings forward retirement by a couple of years, but that the effects differ with the type of health problem; the greatest acceleration in retirement being due to chronic conditions such as functional limitations and circulatory disorders. The effect of disability may also affect the retirement decision of other members in the household. Johnson and Favreault (2001), using data from
the HRS, find that, whilst both men and women are more likely to retire if their spouses have already retired, this does not hold for spouses whose partner has exited the labour force due to ill health, particularly when spouses are not yet eligible for retirement benefits. This may indicate that the incentive to care for a disabled partner is outweighed by the incentive to compensate for the loss in income.

6. Policy

6.1 Disability benefits

The effect of disability benefits on labour supply has been examined extensively and studies consistently find a significant negative relationship (Bound and Waidmann 1992, Harkness 1993, Gruber and Kubik 1997, Bound and Burkhauser 1999, Gruber 2000, Buddelmeyer 2001 and Autor and Duggan, 2001). The impact of benefit levels on participation has been quantified by examining how participation rates vary with the replacement ratio in a cross section (Parsons, 1980, Haveman and Wolfe, 1984, Haveman et al., 1991), and various studies confirm large disincentive effects from benefits. Parsons (1980) estimates that the elasticity of non-participation to changes in benefits is between 0.49 and 0.93; however, subsequent evidence suggests lower values between 0.1-0.2 (Leonard, 1986). A problem with this approach is that the replacement ratio tends to be a decreasing function of past earnings making it difficult to distinguish between low earnings or generous benefits as the reason for non-participation. More recently, studies have identified various ways of examining differences in the replacement ratio that are independent of earnings. Bell and Smith (2004), for example, use the reform of the 1995 reform of UK disability benefits, to test the effect of benefit generosity on the number of claimants and find an overall elasticity of 0.26 which increases to 0.63 for the least educated males. Gruber (2000)
performs a similar test in Canada, but focuses on differences between types of disability benefits and estimates the elasticity of non-participation to be in the range of 0.28 to 0.36.

Similar studies examine the impact of benefit rejection on participation. Bound (1989) uses those who fail a medical test for disability benefits as a control group. Only half of those who were refused benefits were employed, which suggests claimants have serious health reasons for not working. Gruber and Krubik (1997) examine US state variation in benefit rejection rates and find a ten percent increase in rejection leads to a reduction of non-participation of two point eight percent among older males. Differences in policy regimes across countries also provide information about the work incentive effect of alternative schemes. Burkhauser and Daly (1998), for example, compare the US and Germany, and although disability rates are similar between the two countries, differences in their welfare system create large differences in employment probabilities and the number of benefit claimants. In the US, where the policy emphasis has been on transfer payments, the onset of disability is found to be associated with a greater decline in work than in Germany.

The dramatic falls in participation of males in the UK since the 1980s has prompted an increased interest in the possible role of disability benefits (Gregg and Wadsworth, 1999, McVicar, 2004a, Bell and Smith, 2004). This phenomenon has not been confined to the UK, countries including the US (Bound and Burkhauser, 1999), the Netherlands and Scandinavian countries (Bowitz, 1997 and Jensen, 2003) and Australia (Wilkins, 2003) have all experienced increases in disability benefit claimants. Although these studies define the disabled population as those in receipt of
benefit income, the impact of changes to the benefit regime provides important information about the incentive structures created by such schemes.8

Evidence suggests that the rise in disability claimants has been the result of a combination of both an increase in the generosity of disability benefits and the deterioration in the labour market for low skilled workers (Bound and Burkhauser, 1999, Autor and Duggan, 2001 and Bell and Smith, 2004). McVicar (2004a) argues that the UK, unlike the US, has not experienced falling real earnings at the lower end of the wage distribution and so benefit replacement rates have not grown in the UK. Bell and Smith (2004), however, find evidence that the decline in participation has been concentrated on unskilled men who have reported long-term illness. Although this supports the disincentive effects of incapacity benefits, job destruction following a negative demand shock offers an alternative explanation for the decline in participation.

Beatty et al. (2000) model the effects of an adverse demand shock and argue that the sick are the first to lose their jobs and that they are the individuals that have most incentive to move on to disability benefits. Consistent with this, Rupp and Stapleton (1995, 1998) examine the determinants of benefit receipt, and suggest that economic contractions create an inflow of new benefit claimants, but that expansions do not create equal outflows leading to the rising pool of claimants. In the UK, not only have disability benefits increased in generosity, but it is argued there are also more incentives to claim disability benefits than unemployment benefits (Beatty et al. 2000). This is explained by differential benefit rates between schemes, the means testing (Fothergill, 2001) and conditions of receipt (e.g. meeting job advisors)
associated with job seekers allowance and the incentive for job centres to reduce unemployment figures (Nickell and Quintini, 2001).

In analyzing the increase in incapacity benefit in the UK, Moncrieff and Pomerleau (2000) find the largest increase in claimants suffer from musculoskeletal disorders and mental disorders, particularly milder depressive and neurotic disorder. Bell and Smith (2004) find an almost three-fold increase in the proportion of the disabled with mental health and behavioural disorders between 1979 and 2001. This increase in mental health problems may be the result of increasing recognition and diagnosis of these conditions rather than real increases. But since both recognition and diagnosis of mental health and musculoskeletal limitations are cited by GPs as subjective it is difficult to explain these increases and to identify true disability (Hiscock and Ritchie, 2001).

6.2 Discrimination Acts

Recent changes to legislation relating to the disabled have led to a growing literature evaluating the ADA, which was introduced to improve the labour market outcomes for the disabled by making discrimination unlawful in the US. DeLeire (2000), using data from SIPP, finds that, on average, employment of men with disabilities is 7.2% lower in the post ADA period than before the Act was passed. The largest employment declines were observed in manufacturing, managerial and blue collar occupations. There were no observable changes to the wages of disabled men, which remained at 82% of the male non-disabled wage. Although other policy changes could have contributed to the change in employment, DeLeire (2000) argues that the timing and magnitude of the changes were consistent with the ADA. In direct support of
these findings, Acemoglu and Angrist (2001) document similar results using an alternative dataset, the CPS, particularly for men and women aged between 21-39. There is no evidence that the ADA reduces job separations for the disabled, which suggests that the ADA has not acted as a form of employment protection. Furthermore, even though the number of disability transfer payments rose during the same period, this cannot, on its own explain, the decline in employment. Confirming the ADA as the reason for the decline in employment among the disabled, the impact was found to be greater in larger firms (smaller firms being exempt from legislation) and in states with more ADA-related discrimination charges. The important implication of these results is that the legislation reduced the demand for disabled workers by raising the costs of employing such workers, with this reduction in demand outweighing any increase in supply brought about by a reduction in discrimination.

These results, however, have been questioned on the grounds that the work disability measure used may not accurately reflect coverage under the ADA. Legislation, by removing the stigma of disability, may encourage more individuals to report a disability. In contrast, some, who reported a disability prior to the legislation, may not do so after its introduction if improvements to the workplace change the effect of the disability to non-work limiting. As Kruse and Schur (2003) conclude, the analysis of the employment effects of disability legislation is confounded by changes in the composition of those reporting disabilities, the role of disability income and the relative effects of business cycles on workers with and without disabilities (see also Kruse and Hale, 2003). Indeed, they find greater reporting of disability post ADA. They use data from the SIPP to examine fourteen alternative measures based on
differences in self-reported disability, the severity of limitations and receipt of disability benefits. Consistent with the previous studies, they find evidence of decreasing employment of the disabled several years after the ADA, but, when more specific disability measures are used relating to the ADA employment is found to increase.

Neutral evidence with respect to the ADA is presented by Schumacher and Baldwin (2000) who identify very few differences in the labour market outcomes of the disabled between 1990 and 1993. Although this suggests that the ADA has had little impact on the labour market the timing of this study may be important in that the effects of the legislation may not have been observable by 1993. Indeed, the wage differential between disabled and non-disabled men was found to increase between 1990 and 1993. Similarly, DeLeire (2001) finds the discriminatory component of the wage gap did not fall after the introduction of the ADA. However, during the period, the negative effect of health on earnings did decline (through the productivity effect), which may have been due to improvements in technology or accommodations made by employers for the disabled.

Beegle and Stock (2003) make use of the fact that disability discrimination laws vary widely across states to create an experimental framework that generates treatment and comparison groups. Compared with previous research, where evaluation of the ADA only captures the additional effect of the ADA over and above existing legislation, using state differences in the laws allows separation of those who were previously subject to legislation from those who were not in the same period (i.e. in different states), with the advantage of controlling for pre-existing trends in outcomes (that
were common across states). Using data from the Census of Population, they find negative effects of the laws on the relative earnings of the disabled. When pre-existing trends in employment are controlled for there is no such effect on relative employment rates of the disabled. Jolls and Prescott (2004), also use state level differences in the ADA, but examine the impact of the separate components of ADA. They report two main findings. Firstly, the negative employment effects were mainly the result of employers having to make reasonable accommodations for disabled employees rather than the effect of increased firing costs for this group. Secondly, and in contrast to previous evidence, state level data suggests that the fall in disabled employment post-ADA reflects other factors rather than the ADA itself. Hotchkiss (2004a) criticises other evaluation studies, suggesting they fail to control for selection into the labour market. When controlling for this selection effect the predicted unconditional employment probability for a disabled person increases post ADA. Further, there is evidence that non-participant welfare recipients have changed their identification in order to move off welfare payments and into disability programmes. Using state level data, the evidence suggests that the impact of the ADA has been limited, which Hotchkiss suggests may be due to prior state level legislation crowding out the impact of the ADA.

DeLeire (2000) and Acemoglu and Angrist (2001) suggest disability benefits were not an important influence on the fall in employment post ADA, since employment fell most for those groups least likely to receive disability benefits. However, Bound and Waidmann (2002) find the growth in the Social Security Disability Insurance program in the 1990s (which resulted from changes made in the 1980s) explains nearly all of the fall in employment during the 1990s. However, Kruse and Schur (2003) note that
the ADA may have contributed to this growth in benefits if, for example, fewer disabled people were hired. Business cycles also generate disproportionate effects on the disabled, given their secondary nature in the labour market. The recession of the early 1990s recession could therefore have contributed to the increase in non-employment among the disabled in the post ADA period. However, Kruse and Schur (2003) account for labour market tightness in their evaluation of ADA but this does not change the effect the ADA has on employment.

Analysis of legislation has also occurred in Germany and, most recently, in the UK. Verick (2004) uses the German Socio-Economic Panel to evaluate the impact of the People with Severe Disabilities Act (PSDA). Previously, a 5% quota system was in place to enforce the employment of the disabled, but, due to high unemployment amongst the disabled the PSDA was reformed in 2001 and an increased penalty introduced for not meeting targets. The Government claimed the reform reduced unemployment among the disabled by 24%, but Verick’s study suggests gains in unemployment were partly met by individuals exiting the labour force, rather than increasing demand for these workers. Bell and Heitmueller (2005) apply the methodology of Acemoglu and Angrist (2001) to evaluate the impact of the DDA in the UK. Using data from the BHPS and the FRS and applying a difference in difference approach, they find some evidence of a negative impact (or at least no positive effects) of the DDA. They suggest that the lack of awareness of the Act and low levels of take up of financial support by employers and individuals, are possible reasons for the absence of a significant impact. However, Jones (2005) using data from the LFS finds that the gap in employment between the disability groups has narrowed since the DDA, consistent with a positive effect of legislation. Jones et al.
(forthcoming) consider earnings in the period following the DDA using the LFS and find that the wage gap between the work limiting disabled and the non-disabled has fallen only for men. Also within the UK, the Department of Work and Pensions has undertaken evaluation studies into the New Deal for the disabled, which is a scheme offered to those who claim incapacity benefits to aid their move into employment through a series of job brokers. Adelman et al. (2004), outline the characteristics of participants, the service they received and the employment outcomes for those who registered between May and June 2002. One year after registration 46% had entered post-registered employment, of which 38% moved into employment within six weeks. Poor education and basic skills and those with a negative attitude to employment were found to be least likely to find work. An earlier report (Department of Work and Pensions, 2004) which synthesises the findings from the first 18 months (July 2001-Nov 2003) found that 32% had gained employment, but that only 39% of these had found sustained employment up to May 2003.

7. Conclusion
This review of the literature on the labour market impact of disability provides insights into both the important implications of disability on the labour market and the complexities associated with this type of empirical analysis. At the outset, empirical research on disability has to consider the problems of measurement error and justification bias when identifying the disabled. There is no consensus of which definition of disability is most appropriate, although self-reported measures have been applied more extensively in empirical work. An issue associated with identifying the disabled group is the sample selection bias that arises due to selection into disability status; this is in addition to the selection bias from the employment decision, which
may be particularly important given the low participation rates of the disabled group. However, despite studies introducing varying controls for selection issues and the endogeneity of health they consistently identify a significant negative effect of disability on both employment and earnings regardless of data source, country or time period.

The evidence that examines the reasons for the gap in earnings and employment by disability status is less conclusive. This is because disability will have an affect on productivity which is difficult to control for without extensive information on work capabilities, which themselves will vary by occupation. Inadequate controls will result in disability having an unobserved effect on productivity, which using the standard decomposition analysis will inflate the unexplained component. The result being that the effects of discrimination, unobserved productivity differences and differences in preferences cannot be separated. UK studies which assume there is no unobserved effect of productivity between the disabled and non-disabled groups tend to find about half of the wage or employment differential is explained by inferior labour market characteristics of the disabled leaving the remaining half as an upper bound on discrimination. In contrast, studies that use a Deleire (2001) type of methodology find a very small unexplained gap in earnings and employment indicating differences in productivity are far more important than discrimination. However, both of these methods rely on strong assumptions to generate their results. One possible solution is to use more detailed data sets on health status, which would control for the type of health problem, severity and work capacity, reducing the unobserved effect, however these data sources will have more limited labour market information.
This simple classification of the population into disability states ignores the numerous sources of heterogeneity that exist within this group. Studies consistently find the type and severity of the disability are important influences on labour market outcomes with more severe disability and mental health problems associated with greater labour market disadvantage. Although far less evidence relates to the dynamic effects of disability it is clear that its impact varies through the duration of the disability (which itself is heterogeneous) and depend on the characteristics of the individual, most importantly age, at onset. Given the extensive information that is required to control for labour market, health and longitudinal information it is not surprising that each study tends to focus on certain aspects of these issues.

The results from evaluation of the ADA in the US are very mixed, with earlier work suggesting the legislation had a negative effect on employment but which is not supported by more recent extensions to the original work, particularly using state level data. Again this evidence highlights issues in evaluation including defining the disabled population on the basis of policy, changes in the composition of the disabled as a result of the legislation and limitations in the coverage in the legislation, which will be important in evaluation of similar legislation in other countries. To separate the effects of legalisation from more general trends over time pre-existing trends and business cycle effects need to be controlled for, as do the effects of other policy changes during the same period.

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Notes

1 Data are from the Local Area Labour Force Survey 2003/4. The definition of disability requires an individual to be both DDA and work limited disabled.
2 The International Classification of Impairments, Disabilities and Handicaps provide definitions for each of these concepts. An Impairment is any temporary or permanent loss or abnormality of a body structure or function, whether physiological or psychological. An impairment is a disturbance affecting functions that are essentially mental (memory, consciousness) or sensory, internal organs (heart, kidney), the head, the trunk or the limbs. A Disability is a restriction or inability to perform an activity in the manner or within the range considered normal for a human being, mostly resulting from impairment. A Handicap is the result of an impairment or disability that limits or prevents the fulfilment of one or several roles regarded as normal, depending on age, sex and social and cultural factors.
3 A higher reservation wage amongst the disabled implies the expected wage for the disabled will be greater than the non-disabled, however the observed earnings difference will be affected in the opposite direction by differences in productivity and discrimination.
4 Studies also consider the impact of disability on poverty, for a UK study see Burchardt (2003b) and for a US study see Kruse (1998). The evidence suggests that disabled individuals are more likely to live in poverty, but this depends on their situation prior to disability. When the costs associated with being disabled are taken into account, the effect is enhanced (Burchardt, 2003b).
5 This may be due to two conflicting influences, employers may be more willing to hire the disabled in less desirable jobs where there are greater staff shortages, whilst, relative to the non-disabled, the disabled may suffer greater discomfort from working shifts.
6 A discussion of the impact of disability benefits on labour supply is included in the last section.
7 McVicar (2004a) provides an overview of the current disability benefits available in the UK.
8 Most authors agree that the increase in disability benefit claimants cannot be explained by changes in average health levels (Beatty et al., 2000 and Autor and Duggan, 2001). However, recent evidence does provide support for real increases in disability among younger individuals. Lakdawalla et al. (2001) find that disability in the US has increased by 40% among those aged in their 40’s and this has coincided with an increase in diabetes and asthma. Whilst Bell and Smith (2004) note that self reported disability has not increased overall in the UK, it has increased dramatically among the least qualified, who are also the group that have had a large rise in benefit uptake.
9 Over time the number work limited are affected by changes in technology and the changing nature of employment regardless of changes in legislation.
10 DeLeire (2000) also notes that the change in employment in the post ADA period was a break rather than a continuation of a trend and that disability benefits did not change significantly during the period.