
Disability and self-employment: evidence for the UK

Melanie K. Jones and Paul L. Latreille*

*WELMERC, School of Business and Economics, Swansea University,
Richard Price Building, Singleton Park, Swansea SA2 8PP, UK*

This article examines the self-employment decision for disabled and nondisabled workers in the UK. Using Labour Force Survey (LFS) data, it is found that self-employment may provide an important means by which those with work-limiting disabilities can accommodate their impairment.

I. Introduction

In what is now an extensive empirical literature, at least for the US, disability is consistently found to have negative effects on labour market outcomes as measured by both employment rates and earnings (see Jones, 2008 for a review). The emphasis of much of this work, and of the small number of UK studies to date, has been the influence of employer discrimination on outcomes (Kidd *et al.*, 2000; Jones, 2006; Jones *et al.*, 2006).¹ In the US, studies have recently also considered how disability affects the type of employment undertaken, and find that the disabled as a group are concentrated in nonstandard forms of employment, including independent contracting, and part-time and temporary employment, with lower pay and fewer benefits on average (Schur, 2002, 2003; Hotchkiss, 2004). An important question is whether this form of ‘crowding’ is the result of employer discrimination, or instead represents a ‘voluntary’ choice for the disabled, in that such forms of employment are better suited to the particular needs of disabled persons. The current evidence suggests

that part-time employment in particular, is a voluntary choice for this group (Schur, 2003; Hotchkiss, 2004; and in the UK context, Jones, 2007).

Self-employment has also been recognized as an important source of employment for disabled workers (see Blanck *et al.*, 2000 for the US and Boylan and Burchardt, 2002 for the UK). In the UK, the employment rate for those with a work-limiting disability is 43% for men and 38% for women; in each case, about half the rate of their nondisabled counterparts. However, 21% of work-limited disabled men who are employed are self-employed, compared to 17% of the nondisabled and those with a nonwork-limiting health problem, while the corresponding figures for women are 9% and 6–7%, respectively (Table 1). In a manner similar to that for ethnic minorities (see, for example, Clark and Drinkwater, 1998), overrepresentation of the disabled in self-employment may be a rational response to the presence of employer discrimination in the salaried sector. However, in the absence of enclave effects, it is possible that consumer discrimination will adversely affect the returns to self-employment for the disabled.² Whilst the

*Corresponding author. E-mail: p.l.latreille@swansea.ac.uk

¹ Relatedly McVicar and Anyadike-Danes (2008) examine the determinants of disability benefit claimant numbers; see also Bowitz (1997) for Norway; Koning and van Vuuren (2010) for the Netherlands; and a related piece by Riphahn (1997) for Germany.

² Using a variation of the model of Coate and Tennyson (1992) and Clark and Drinkwater (1998), discrimination in the salaried sector will induce a higher proportion (of ethnic minority individuals) into self-employment. However, the model assumes there is no direct consumer discrimination, which would act on the returns to self-employment in the opposite direction (Borjas and Bronars, 1989). There may also be greater barriers to entry into self-employment if, for example, discrimination affects access to finance, etc.

Table 1. The anatomy of self-employment: summary statistics

	Male			Female		
	Work-limited disabled	Nonwork-limited disabled	Nondisabled	Work-limited disabled	Nonwork-limited disabled	Nondisabled
Employment rate (%)	43.16***	89.08***	90.41	38.29***	78.42	78.51
Self-employment rate (as percentage of all employed)	21.28***	16.56	17.41	9.29***	6.28***	7.33
Employed (%)						
Work from home	5.73	6.39*	5.80	4.47**	3.52	3.61
Work in same LAD as residence	57.41***	51.31	50.47	68.17***	66.04***	63.61
Self-employed (%)						
Work from home	65.24***	58.52	56.35	62.93	60.70	60.00
Work in same LAD as residence	88.18***	82.36	80.70	88.64**	85.16	84.23
Type of self-employment (%)						
Paid by agency	1.25**	1.78	2.44	1.57	2.26	2.97
Sole director of limited liability business	5.33*	5.63	6.82	2.52	1.94	3.72
Running professional practice	23.04	25.27	24.20	21.70	27.10	24.63
Partner in professional practice	8.97***	10.46**	12.96	16.04	18.71	16.23
Working for self	53.01***	48.08**	44.31	52.52**	43.87	45.93
Sub contractor	6.02	5.82	7.02	1.89	1.29	1.97
Freelance work	2.38	2.96	2.25	3.77	4.84	4.55
Without employees	79.14***	73.81	73.56	79.57	77.32	76.64

Notes: Sample excludes unpaid family workers and government trainees. LAD denotes local authority district.

***, ** and * denote differences from the relevant nondisabled comparator group at the 1, 5 and 10% significance level, respectively.

incentives to enter self-employment depend on the relative strengths of these two sources of discrimination, other features of self-employment may provide alternative benefits for the disabled group relative to the nondisabled group. In particular, the work-limited disabled may be better able to 'accommodate' their disability by being able to choose duties, hours and location.³ The latter influence can be expected to act as a pull factor that might encourage a disabled individual to be self-employed.⁴ This hypothesis receives *prima facie* support from Fig. 1, which reveals that those whose impairment is not work-limiting have self-employment rates among those in work which are very similar to the nondisabled, in contrast to the higher rates among the work-limited disabled. Figure 1 also shows that apart from 1997 to 1998, self-employment rates have been relatively stable; the differences that

are the subject of this article are not unique to the specific year examined.

However, while self-employment is an important aspect of the labour market experiences of disabled persons, it is one that has hitherto been almost completely ignored in the disability literature, where the vast majority of studies exclude the self-employed altogether. Similarly, much of the previous empirical literature on the determinants of self-employment fails to consider the role of health. This literature has also ignored the participation (employment) decision and hence, the possibility of selectivity effects that may render estimates inconsistent.⁵ This issue is likely to apply *a fortiori* in the context of disability, where impairment(s) may influence both participation (employment) and self-employment decisions. This article therefore uses data from the UK Labour Force

³ The flexibility of hours has previously been found to be of importance in the context of female self-employment, a feature that is argued to reflect family responsibilities (see, e.g. Carr, 1996; Boden, 1999; Hughes, 2006).

⁴ The ability to accommodate a disability could act to increase the relative return to self-employment in two ways: accommodation could increase an individual's productivity in self-employment relative to employment, or could reduce the costs associated with work differentially by sector.

⁵ An exception to this is Pagán's (2002) examination of gender differences in participation and self-employment in rural Guatemala, where selectivity effects were found to be of considerable significance for females.

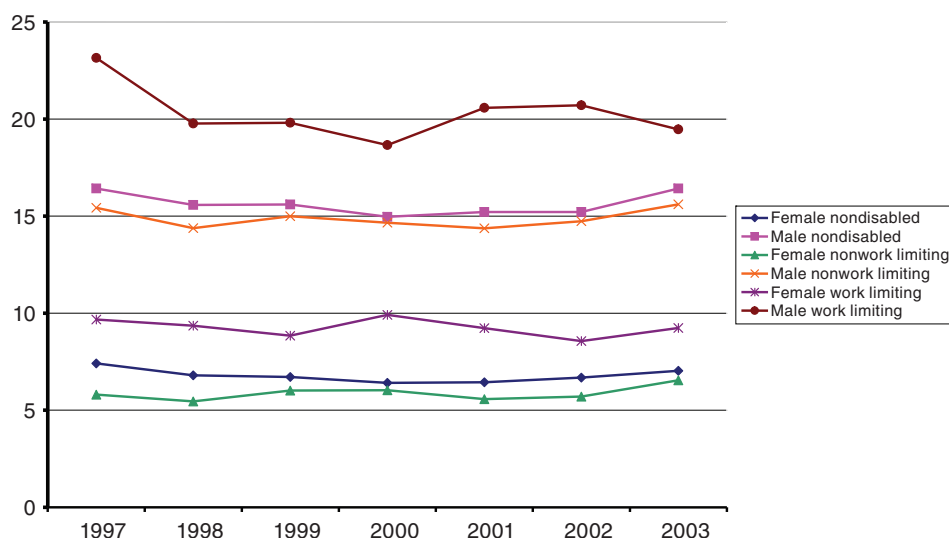


Fig. 1. Self-employment as a percentage of total employment by disability status 1997–2003

Source: QLFS, Summer quarters.

Survey (LFS) in 2003 to investigate the higher incidence of self-employment among the disabled, and to disentangle the relative influence of discrimination and accommodation factors. Using both probit and bivariate probit models, the latter of which controls for the potential selection bias which arises from focussing only on the employed, the probability of self-employment is decomposed by disability status to identify the contribution of differences in coefficients – the ‘unexplained’ gap. While traditionally interpreted as a measure of discrimination, this gap also captures the differences in preferences for self-employment among disability groups and hence, potentially conflates these two effects. However, using the same principles as DeLeire (2001), the unexplained gap can then be apportioned between these two elements by separating the disabled into those who report their disability limits the amount and/or type of work they can perform, and those who state that their impairment/illness is not ‘work-limiting’. Specifically, if it is assumed that the latter have no need to enter self-employment in order to accommodate their disability, then the unexplained component (relative to the nondisabled) reflects only the relative influence of discrimination. However, for the work-limited disabled, both effects are present. Making further assumption, as in DeLeire (2001), that the degree of unequal treatment is the same for the work-limited and nonwork-limited disabled, it is then possible to isolate the role of self-employment in accommodating disability.

The remainder of this article is structured as follows. In Section II, we briefly review the

small number of existing studies of disability and self-employment, and also elucidate some theoretical issues surrounding the choice of self-employment. In Section III, we outline the data and estimating framework, whilst Section IV presents the main empirical findings. Section V concludes this article.

II. Background

In the US, disabled workers are twice as likely as nondisabled workers to be employed part-time, on a temporary contract or as an independent contractor (Schur, 2002). Schur (2003) highlights three possible reasons for this: employer discrimination, the structure of the benefit regime and differences in preferences between the disabled groups. She finds the earning limits imposed by disability benefits and employer discrimination play only a small role, and that nontraditional employment opportunities provide an important mechanism by which the disabled may accommodate their disability. Hotchkiss (2004) provides supporting evidence with reference to part-time employment only, which she similarly finds is largely a voluntary decision. The same is true in the UK, where Jones (2007, p. 713) concludes that ‘the effect of employer marginalization, albeit a lower bound estimate, is very small, accounting for only 7% and 3% of the unexplained disability gap in part-time employment for work-limited disabled males and females, respectively’.

To date, however, relatively few studies have considered the effect of disability on self-employment

(and none attempts a control along the lines proposed by DeLeire). One of the exceptions is Blanck *et al.* (2000), who investigate Iowa's Entrepreneurs With Disabilities (EWD) programme designed to enhance the access to self-employment for the disabled. These authors highlight the role of discrimination (either perceived or actual), particularly in relation to hiring and firing, as a major motivation for disabled persons starting their own business. Discrimination is also found by Schur (2003) to be more important as an explanation of higher self-employment rates among the disabled than for the other nonstandard forms of employment that this group may enter. In contrast, a Rural Training Centre (RTC) Rural Research Report (2001), summarising the findings of a national survey of disabled entrepreneurs and/or disabled persons seeking help from state Vocational Rehabilitation (VR) agencies, notes that the need to create one's own job and to accommodate a disability were cited by respondents almost as frequently as wanting to work for oneself, owning one's own business, making more money and identification of a market opportunity. Only in a much smaller proportion of cases did respondents state that other jobs were unavailable. The absence of job opportunities is identified as a key factor underpinning the greater use of self-employment as a potential VR tool by state VR counsellors in Arnold *et al.* (1995).

In the UK, an early study by Prescott-Clarke (1990) using primary data from her own survey on economically active persons with health problems examines the differences between disabled employees and self-employed workers. Several of Prescott-Clarke's findings point to the role of disability/health as a contributory factor in the self-employment decision, many of them consistent with the accommodation hypothesis. Thus, 19% of the self-employed reported that they had to work at home due to their condition compared with just 1% of employees. In many instances, the accommodation of the disability related to a greater flexibility of work patterns/schedules. For example, around twice as many of the self-employed (40%) say they are unable to work a standard week compared with those in waged employment (19%), whilst the corresponding percentages for those reporting having to take breaks regularly due to health are 48% and 23%, respectively. Accordingly, a higher average work handicap

score was reported for the self-employed (cf. employees). Among those who were currently disabled and self-employed, half suggested that their decision to become self-employed was affected by their health problem, leading Prescott-Clarke (1990, p. 69) to conclude that 'There is a clear implication in the data that their self-employment status is at least in part a result of their health problem'.

More recently, in commissioned research undertaken for the Small Business Service, Boylan and Burchardt (2002) identify a number of empirical regularities using nationally representative data from the LFS and the Family Expenditure Survey (FES). Foremost among these is that the disabled⁶ are more likely to be self-employed than their nondisabled counterparts. However, further investigation reveals that for men at least, this is explicable in terms of the different age profiles. Among the self-employed, disabled persons were less likely than the nondisabled to cite positive reasons such as the desire for independence or exploiting a market opportunity as reasons for becoming self-employed. Instead, for some disabled persons (and most notably those with low levels of educational attainment), the decision to enter self-employment appeared to be a consequence of push factors, and in particular the lack of alternative opportunities.

Of course, this raises the issue of employment protection for the disabled. The primary piece of legislation in the UK is the 1995 Disability Discrimination Act (DDA), subsequently modified by the EU Framework Employment Directive⁷ and extended by the 2005 DDA. For those in waged employment, the DDA provides protection against discrimination on the basis of disability including in relation to recruitment and dismissal,⁸ and places an obligation on employers to provide reasonable adaptations such as modifications to workplaces and/or work arrangements. As noted by Boylan and Burchardt (2002, p. 15), the DDA's employment provisions do not impact directly on the self-employment of disabled persons excepting insofar as the reduction in discrimination against disabled persons by employers may reduce the impact of the 'push' into self-employment occasioned by such discrimination. There are, however, other sections of the DDA covering and impacting the discrimination in self-employment. First, it is unlawful for service

⁶ As defined by the DDA (see below), i.e. a physical or mental impairment having a substantial and long-term adverse effect on an individual's ability to carry out normal day-to-day activities, where long-term essentially means 12 months or longer. Note that this differs from the definition used in this article, which relates to work capacity.

⁷ Council Directive 2000/78/EC, implemented in the DDA 1995 (Amendment) Regulations 2003. See Wells (2003) for a discussion of the impact of this directive on UK disability discrimination law.

⁸ Initially, covering workplaces of 20 (and from 1998, 15) or more employees, all workers are now covered in response to the 1997 Treaty of Amsterdam.

providers to discriminate against buyers of a good or service on the basis of disability, including in the provision of services to those seeking to become self-employed, and second, self-employed persons who work under contract are covered by the DDA, potentially including the requirement for ‘reasonable adjustments’. However, they do not ‘prohibit discrimination by clients selecting independent (self-employed) suppliers of goods or services’ (www.disability.gov.uk).

In addition, it seems unlikely that the benefit regime would encourage the disabled into self-employment or reduce the probability of labour market exit among the self-employed, since the main disability benefit in the UK at the time to which our data relate, Incapacity Benefit, was available for the self-employed in a similar manner to employees⁹ (replaced for new claimants by Employment and Support Allowance from October 2008). Policy initiatives aimed at increasing the employment of the disabled such as Disabled Persons Tax Credit (DPTC) (replaced by Working Tax Credit (WTC)) and the Access to Work scheme also apply to self-employment. More generally, because many of the enterprise schemes cover both the disabled and the nondisabled, there is little reason to suppose that these schemes are directly responsible for the higher self-employment incidence among the disabled population who work.¹⁰

III. Methodology

Data and econometric model

Four quarters from the 2003 UK LFS are used to construct an annual cross-sectional dataset for the analysis. Individuals are separated into three groups on the basis of their self-reported disability status, following DeLeire (2001).¹¹ First, the entire sample is asked:

- (a) *Do you have any health problems or disabilities that you expect will last for more than a year?*

Those who answer *no* form the nondisabled group (N). Those who answer *yes* to question (a) are asked

two additional questions:

- (a) *Does this health problem affect the KIND of paid work that you might do?*
 (b) *Does this health problem affect the AMOUNT of paid work that you might do?*

An individual who has a long-term health problem (*yes* to (a)) that does not affect the amount or type of work (*no* to (b) and (c)) is classed as nonwork-limited disabled (D_2). An individual who has a long-term health problem (*yes* to (a)) that affects either the amount or type of work they can do (*yes* to either (b) or (c)) is work-limited disabled (D_1). Of course, the nature of disability may differ considerably between (and within) the disabled groups, for example, on the basis of the type and severity of disability. The number of health problems is often used as a proxy for severity and, unsurprisingly, the work-limited disabled have on average just over one more health problem than the nonwork-limited. In terms of the type of their main health problem, the work-limited disabled are more likely to report a problem with limbs (back, arms and legs) or with mental health (depression, learning difficulties, phobias, etc.) than the nonwork-limited. Instead, the nonwork-limited have a higher incidence of health problems related to breathing difficulties, circulation problems and problems with stomach, liver or kidneys. This heterogeneity may be expected to affect their incentive to become self-employed. In fact, controlling for the heterogeneity within the two disabled groups reveals a role for the disability type (the five groups are: health problem affects limbs; sight and hearing; skin, breathing and organs; mental health; and other) and number of health problems in determining employment (as in Jones *et al.*, 2006), but not as a determinant of self-employment.¹²

The sample is restricted to those of working age excluding government trainees, unpaid family workers and full-time students. Estimation is undertaken separately for each of the j disability groups and by gender. The self-employment equation is given by

$$S_{ij}^* = X_{ij}\beta_j + \varepsilon_{ij} \quad (1)$$

⁹ Entitlement is based on having paid sufficient National Insurance contributions.

¹⁰ The main exception to this was the New Deal for Disabled People (NDPP) pilot schemes – see Boylan and Burchardt (2002) for an account – although as they note, the focus of the national roll-out has been on waged rather than self-employment.

¹¹ As such, the information shares the criticisms of all self-reported measures (Bound, 1991).

¹² Estimates from a bivariate probit which include the type and number of health problems are not presented here since the specification of the model is constrained to be the same for the j disability groups in order to decompose the outcomes. The absence of evidence to suggest self-employment is concentrated among a particular subset of the disabled is, however, consistent with self-employment itself being heterogeneous and, hence, disabled individuals choosing types of self-employment which best accommodate their impairment.

where S_{ij} , which has $S_{ij} = 1$ for the self-employed and $S_{ij} = 0$ for employees is related to S_{ij}^* as follows:

$$S_{ij} = \begin{cases} 1 & \text{if } S_{ij}^* > 0 \\ 0 & \text{if } S_{ij}^* \leq 0 \end{cases}$$

While Equation 1 can be estimated using a simple probit model, this ignores the potential sample selection bias that may arise because S_{ij} is only observed for those in employment. Sample selection bias can arise if the disturbances from the selection and outcome equation are correlated through, for example, common unobservables affecting the employment and self-employment decisions. This may result in incorrect inferences regarding the impact of the observables on self-employment. A bivariate probit model with selection is estimated to account for the potential selection issue.¹³

The first stage of the bivariate probit with selection is an employment equation given by

$$E_{ij}^* = Y_{ij}\gamma_j + \mu_{ij} \quad (2)$$

where i indexes individuals and the observed binary variable E_{ij} is related to E_{ij}^* as follows:

$$E_{ij} = \begin{cases} 1 & \text{if } E_{ij}^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

with $E_{ij} = 1$ for the employed and $E_{ij} = 0$ for the unemployed and the inactive. The self-employment Equation 1, which is only observed if $E_{ij} = 1$, forms the second equation in the bivariate probit. This model assumes that μ_{ij} and ε_{ij} are distributed bivariate normal with means equal to zero, unit variances and the correlation between the two errors within each disabled group (and gender) is denoted as ρ_j . This allows the estimation of the following log likelihood function by maximum likelihood for each

of the j disability groups:¹⁴

$$L_j = \sum_{\substack{i \in K \\ S_i=1}} \ln[\Phi_2(X_{ij}\beta_j, Y_{ij}\gamma_j, \rho_j)] \\ + \sum_{\substack{i \in K \\ S_i=0}} \ln[\Phi_2(-X_{ij}\beta_j, Y_{ij}\gamma_j, -\rho_j)] \\ + \sum_{i \notin K} \ln[1 - \Phi(Y_{ij}\gamma_j)] \quad (3)$$

where K is the set of observations for which S_i is observed, $\Phi(\cdot)$ is the standard normal distribution and $\Phi_2(\cdot)$ represents the cumulative bivariate normal distribution.

Employment status is classified using the definitions of International Labour Organization (ILO) which relate to activity in the reference week (7 days ending last Sunday). Individuals are then asked to self-report their self-employment or employee status in their main job.¹⁵ The variables that determine employment Y_{ij} are well-understood and will largely be the same as those that determine self-employment X_{ij} . Thus, both the vectors include fairly standard controls for age, education, ethnicity, marital status, housing tenure, the presence of another income earner in the household and region.¹⁶ In the self-employment equation, the presence of another income earner in the household and housing tenure are essentially proxies for access to financial capital and hence for capital constraints in this decision, factors for which we have no direct measures.¹⁷

However, one issue that does arise in the bivariate probit with selection concerns the identification. Identification can be achieved by relying on functional form and distributional assumptions alone when the variables that determine self-employment are the same as those which determine employment. However, it is preferable to include at least one variable in the selection (employment) equation (i.e. in Y_{ij}) that does not appear in the final outcome (self-employment)

¹³ An alternative would be to examine labour market status for all individuals (including the nonemployed) and include self-employment as a response category in a multinomial logit. This is not considered here since the focus of this article is on the determinants of self-employment conditional on employment. Predictions from the multinomial logit model would relate to the unconditional probability of self-employment and, thus, it would not be possible to separate influences on the employment decision from the self-employment decision.

¹⁴ Estimates are computed using Stata's 'heckprob' command.

¹⁵ Employment status in a second job (which only applies to 4% of our sample) is not considered here and thus individuals cannot be classed as in paid employment and self-employment simultaneously. We acknowledge that in some cases (such as sub-contracting), the boundary between paid and self-employment is not straightforward, but individuals are classed into one group on the basis of their own evaluation of the nature of their main employment.

¹⁶ The decomposition results are not sensitive to replacing the regional dummy variables with controls for regional economic conditions such as employment and unemployment rates.

¹⁷ While our set of controls is relatively comprehensive, there are a couple of more obvious omissions such as psychological factors and family background which are unavailable in our data. See Le (1999) for a review of the empirical work in this area. Moreover, the absence of longitudinal data means we are unable to control for unobservable factors that determine employment choice (e.g. preferences for risk). However, the sample sizes in longitudinal surveys would be insufficient to examine the self-employment decision amongst the disabled.

equation (i.e. in X_{ij}). However, as is true in many contexts, finding suitable identifying restrictions is far from straightforward, since almost any regressor that determines whether an individual works could conceivably also impact on the decision to be self-employed. The identifying restriction adopted here is the presence of dependent children of pre-school age – with the exception of nonwork-limited disabled males, this variable is a significant factor in determining whether an individual works, but in no case does it impact on the decision to be self-employed, and as such appears a reasonable choice.¹⁸ In addition, since X_{ij} is observed for the employed, it also contains a set of industry dummies.¹⁹

Decomposition analysis

The primary objective of this article is to consider the extent to which differences in predicted self-employment probabilities for the (work-limited) disabled relative to the other disability groups reflect differences in characteristics (such as age), or differences in the response to those characteristics. We, therefore, perform a modified Oaxaca (1973) decomposition analysis for each of the above-mentioned models in order to disentangle these two influences. For the self-employment probit model, the decomposition follows

the widely applied methodology of Gomulka and Stern (1990). The explained gap between the nondisabled and the work-limited disabled group is given by

$$(\hat{S}_{D_1} - \hat{S}_N)_{\text{explained}} = \left[(1/n_{D_1}) \sum_{i=1}^{n_{D_1}} \Phi(X_{iD_1} \hat{\beta}_N) \right] - \left[(1/n_N) \sum_{i=1}^{n_N} \Phi(X_{iN} \hat{\beta}_N) \right] \quad (4)$$

where η_j denotes the sample size for the j th group. The unexplained gap is

$$(\hat{S}_{D_1} - \hat{S}_N)_{\text{unexplained}} = \left[(1/n_{D_1}) \sum_{i=1}^{n_{D_1}} \Phi(X_{iD_1} \hat{\beta}_{D_1}) - (1/n_{D_1}) \sum_{i=1}^{n_{D_1}} \Phi(X_{iD_1} \hat{\beta}_N) \right] \quad (5)$$

Corresponding decompositions are performed for the nonwork-limited disabled where D_2 replaces D_1 in both equations. All the decompositions are performed assuming (given their predominance in the population) the nondisabled coefficients represent the nondiscriminatory case, this also aids interpretation.^{20,21}

For the bivariate probit model with selection, the decomposition follows Mohanty (2002). The average

¹⁸ It is possible that self-employment could be used to accommodate the presence of young children (particularly for females) which would invalidate this exclusion restriction. However, since this is not evident in the data and in the absence of a more plausible exclusion restriction, we continue to use the presence of young children here. The main results are not sensitive to using a control for the number rather than the presence of young children or using the alternative probit model specification.

¹⁹ Note that we do not include occupational dummies at the second stage due to the danger that these may conflate occupation and self-employment status (e.g. being a manager). However, the inclusion of occupational controls has little impact on the relative accommodation and discrimination components of the decompositions reported.

²⁰ The results are not sensitive, if instead, the pooled model is used to form the nondiscriminatory group.

²¹ It is, of course, often of interest to determine the contributions of particular variables or groups of variables to the observed differential. A detailed decomposition (i.e. for individual variables) of the characteristic and coefficient effect has been proposed by Yun (2004) in which the contribution of variable k to the explained and unexplained gaps, respectively is

$$E_k = W_k^{\Delta X} \left[(1/n_{D_1}) \sum_{i=1}^{n_{D_1}} \Phi(X_{iD_1} \hat{\beta}_N) - (1/n_N) \sum_{i=1}^{n_N} \Phi(X_{iN} \hat{\beta}_N) \right]$$

$$U_k = W_k^{\Delta \beta} \left[(1/n_{D_1}) \sum_{i=1}^{n_{D_1}} \Phi(X_{iD_1} \hat{\beta}_{D_1}) - (1/n_{D_1}) \sum_{i=1}^{n_{D_1}} \Phi(X_{iD_1} \hat{\beta}_N) \right]$$

where the k th weight on each characteristic and coefficient is given by

$$W_k^{\Delta X} = \frac{(\bar{X}_{D_1}^k - \bar{X}_N^k) \hat{\beta}_N^k}{(\bar{X}_{D_1} - \bar{X}_N) \hat{\beta}_N}$$

$$W_k^{\Delta \beta} = \frac{X_{D_1}^k (\hat{\beta}_{D_1}^k - \hat{\beta}_N^k)}{X_{D_1} (\hat{\beta}_{D_1} - \hat{\beta}_N)}$$

with

$$\sum_{k=1}^K W_k^{\Delta X} = \sum_{k=1}^K W_k^{\Delta \beta} = 1$$

predicted conditional probability of self-employment for the j th group is

$$\hat{S}_j^C = \frac{1}{\eta_j} \sum_{i=1}^{\eta_j} \frac{\Phi_2(X_{ij}\hat{\beta}_j, Y_{ij}\hat{\gamma}_j, \hat{\rho}_j)}{\Phi(Y_{ij}\hat{\gamma}_j)} \quad (6)$$

Given that the second stage constitutes the primary focus of this article, we follow Mohanty in assuming that the same employment equation applies as for the comparator (nondisabled) group,²² thereby isolating the unexplained difference in predicted *conditional* probabilities only, rather than the total difference.

For the work-limited disabled (males or females), the unexplained gap is the difference between the predicted conditional probability of self-employment for the nondisabled evaluated at the work-limited disabled self-employment coefficient vector and their predicted own conditional probability, i.e.

$$\begin{aligned} (\hat{S}_{D_1}^C - \hat{S}_N^C)_{\text{unexplained}} &= \frac{1}{\eta_N} \sum_{i=1}^{\eta_N} \frac{\Phi_2(X_{iN}\hat{\beta}_{D_1}, Y_{iN}\hat{\gamma}_N, \hat{\rho}_N)}{\Phi(Y_{iN}\hat{\gamma}_N)} \\ &\quad - \frac{1}{\eta_N} \sum_{i=1}^{\eta_N} \frac{\Phi_2(X_{iN}\hat{\beta}_N, Y_{iN}\hat{\gamma}_N, \hat{\rho}_N)}{\Phi(Y_{iN}\hat{\gamma}_N)} \end{aligned} \quad (7)$$

while for the nonwork-limited disabled, the corresponding gap is

$$\begin{aligned} (\hat{S}_{D_2}^C - \hat{S}_N^C)_{\text{unexplained}} &= \frac{1}{\eta_N} \sum_{i=1}^{\eta_N} \frac{\Phi_2(X_{iN}\hat{\beta}_{D_2}, Y_{iN}\hat{\gamma}_N, \hat{\rho}_N)}{\Phi(Y_{iN}\hat{\gamma}_N)} \\ &\quad - \frac{1}{\eta_N} \sum_{i=1}^{\eta_N} \frac{\Phi_2(X_{iN}\hat{\beta}_N, Y_{iN}\hat{\gamma}_N, \hat{\rho}_N)}{\Phi(Y_{iN}\hat{\gamma}_N)} \end{aligned} \quad (8)$$

Thus, Equation 7 represents the change in the conditional self-employment probability of a nondisabled individual if they behave like a work-limited disabled worker in choosing between salaried and self-employment, while Equation 8 denotes the change if the nonwork-limited disabled coefficient vector is instead applied at the second stage. Thus, the approach applies different coefficient vectors to the same (nondisabled) characteristics throughout.

In general, decompositions of this type do not permit the researcher to separate the contributions of

differences in preferences and unequal treatment to the unexplained component. However, the DeLeire approach permits such a separation, at least within limits, in this context. If the nonwork-limited disabled are assumed to have no reason to enter self-employment in order to accommodate their disability, the unexplained component (relative to the nondisabled) reflects only the relative influence of unequal treatment. Since their disability, by definition, does not affect the type or amount of work they can do, this seems to be a plausible assumption.

A further assumption is, however, required to identify the accommodation effect. That is, that the degree of unequal treatment is the same against the work-limited and nonwork-limited disabled. Under this assumption, the degree of unequal treatment can be estimated from the nonwork-limited disabled decomposition and imposed on the work-limited disabled. Thus, the role of self-employment in accommodating disability can be identified.

There may be reasons why we might expect this second assumption not to hold. For example, due to differences in the type and severity (and visibility) of disability, we may expect discrimination in the labour market to be positively related to the work-limiting nature of disability. In the context of earnings, as DeLeire notes, this means that the measure of discrimination identified from the nonwork-limited group can then be interpreted as a lower bound. In the context of self-employment, it is important to note that the measure of unequal treatment identified is actually a balance of two sources of discrimination. That is, discrimination in the salaried sector and consumer discrimination.²³ Therefore, $(\hat{S}_{D_2}^C - \hat{S}_N^C)_{\text{unexplained}}$ will only be positive if the influence of discrimination in the salaried sector outweighs the effect of consumer discrimination and, conditional on characteristics, the nonwork-limited disabled will be more likely to be self-employed. In this context, even if both types of discrimination are lower for the nonwork-limited disabled relative to the work-limited disabled, this does not necessarily imply the balance of discrimination is lower. That is because a high degree of discrimination in both sectors will not affect the *relative* reward to self-employment. The measure of unequal treatment (and therefore

²² Results are qualitatively invariant when pooling across the three disability categories as the basis for comparison.

²³ In this context, employer discrimination refers to any action by the employer which disadvantages a disabled individual in paid employment, all else constant, such that the relative reward to self-employment rises and acts as a push into self-employment. Discrimination on hiring and in terms of earnings or promotion opportunities could all have this effect. Similarly, consumer discrimination would include any influence that reduces the reward to self-employment (all else constant), such as placing a lower value on the product or service because it is supplied by a disabled individual. These influences will not affect every disabled individual since some forms of disability are not visible and some forms of self-employment do not involve close contact with consumers, but, we assume they have an influence on aggregate self-employment probabilities of the disabled.

accommodation) will be biased if the balance of discrimination differs between the disability groups. *A priori* one would, however, expect the extent of employer and consumer discrimination to be strongly and positively correlated, such that any bias imparted is likely to be small.

IV. Results

Descriptive statistics

Table 1 provides some background statistical information on the current employment situation for each of the gender-disability groups, and also reports (two-tailed) *t*-tests of differences between each of the disabled groups and the relevant nondisabled comparator (male/female as appropriate).

A number of features of this table are evident. First, those with a work-limiting disability are substantially less likely to be in employment than both the nondisabled and those whose disability does not limit either the amount or type of work they are able to undertake. Among those who are in employment, it is also evident that men exhibit a higher incidence of self-employment compared with women, whilst for both genders, the work-limited disabled are more likely to be self-employed.

As might be anticipated, self-employed men and women are far more likely to work from home²⁴ than salaried employees for each of the three disability groups, and accordingly more likely to reside and work in the same Local Authority District (LAD). The difficulties that disabled individuals face in getting to work may be an incentive to undertake self-employment, and comparisons across disability groups lend limited support to this, at least for self-employed work-limited disabled men. Members of this group are significantly more likely to work from home than their self-employed nondisabled counterparts, whilst the proportion working in the same LAD as their residence is significantly higher for the disabled compared with the nondisabled for both men and women, regardless of whether they are self-employed or work for an employer.

When examining other features of self-employment, it emerges that the type of self-employment is fairly similar among the disability groups. However, one feature which stands out is that the work-limited disabled, in particular, are more likely than the other disability groups to class themselves as 'working for self' and, for men, less likely to be a partner in a professional practice or a sole director of a limited company. Consistent with this, the proportion of the work-limited disabled male self-employed employing others is significantly lower, with nearly 80% having no employees compared to 74% of nondisabled and nonwork-limited disabled men. For both men and women, individuals with a work-limiting disability are also more likely to report that they are working for themselves.

Taken as a whole, Table 1 provides an important clue to the relationship between disability status and self-employment status. In particular, those whose disability is not work-limiting appear more similar in almost all respects to those without any form of disability. This suggests that among the key factors that drives the decision to engage in self-employment (particularly men) is the potential need for those whose disability is work-limiting to have flexibility of work schedules etc., and hence, the ability to accommodate their impairment (Boylan and Burchardt, 2002).²⁵ The econometric evidence below seeks to determine this more formally.

Estimation results

Means of the variables for each of the six subgroups (three disability groups each for males and females) appear in Table 2. Table 3 presents the estimates from the self-employment probit model for each gender and disability group. The corresponding results from the bivariate probit models are presented in Tables 4 and 5 for males and females, respectively. The focus of the discussion here is on the self-employment decision because the parameters in the employment equation are relatively standard, and largely conform to results reported elsewhere (e.g. Kidd *et al.*, 2000; Jones *et al.*, 2006).

The first feature concerns the sign and significance of ρ in Tables 4 and 5. As is evident, this parameter is consistently negative for males and, as indicated by

²⁴ Working from home includes working in your own home itself, from grounds or out-buildings, and when using home as a base but possibly working in other locations.

²⁵ Somewhat more direct evidence on the factors promoting self-employment is considered in the 2001 LFS and reported by Boylan and Burchardt (2002). Among the more interesting results are that when considering the reported reasons for self-employment, only small differences are evident across disability groups *within* gender, with larger differences being evident *between* genders. In particular, men were substantially more likely than women to cite push factors such as the absence of jobs locally or being made redundant, while a significantly higher proportion of women stated that their reason for becoming self-employed was due to family commitments.

Table 2. Means of explanatory variables

Variable	Males			Females		
	Work-limited disabled	Nonwork-limited disabled	Nondisabled	Work-limited disabled	Nonwork-limited disabled	Nondisabled
Aged 25–34	0.118	0.131	0.231	0.142	0.174	0.262
Aged 35–44	0.190	0.209	0.279	0.251	0.262	0.304
Aged 45–54	0.260	0.276	0.215	0.316	0.292	0.221
Aged 55+	0.375	0.322	0.145	0.229	0.188	0.091
Single	0.271	0.228	0.474	0.225	0.237	0.296
Married	0.597	0.687	0.592	0.582	0.635	0.604
North	0.070	0.054	0.050	0.067	0.054	0.052
Yorkshire and Humberside	0.096	0.099	0.091	0.092	0.101	0.090
East Midlands	0.071	0.075	0.071	0.070	0.071	0.069
East Anglia	0.035	0.037	0.037	0.032	0.032	0.038
South west	0.078	0.087	0.082	0.078	0.091	0.082
West Midlands	0.089	0.084	0.090	0.094	0.082	0.088
North west	0.114	0.102	0.096	0.106	0.100	0.098
Wales	0.066	0.046	0.046	0.064	0.046	0.047
Scotland	0.094	0.084	0.087	0.092	0.091	0.088
Northern Ireland	0.045	0.024	0.039	0.048	0.022	0.039
Degree or higher degree	0.083	0.175	0.208	0.074	0.137	0.178
Other degree	0.058	0.091	0.084	0.083	0.108	0.106
A levels	0.281	0.325	0.290	0.127	0.161	0.164
O levels	0.128	0.148	0.173	0.218	0.264	0.272
Other qualification	0.158	0.135	0.130	0.158	0.158	0.138
Home owned	0.256	0.251	0.186	0.207	0.203	0.162
Home mortgaged	0.363	0.581	0.620	0.389	0.555	0.606
Social housing	0.295	0.100	0.097	0.321	0.160	0.134
No. of children	0.477	0.542	0.714	0.660	0.707	0.915
Child <5	0.074	0.095	0.152	0.099	0.126	0.196
White	0.934	0.955	0.929	0.921	0.948	0.920
Immigrant	0.083	0.063	0.093	0.095	0.080	0.106
Other earner	0.439	0.634	0.668	0.519	0.685	0.723
Agriculture and fishing	0.026	0.018	0.020	0.007	0.005	0.005
Manufacturing	0.199	0.223	0.209	0.078	0.077	0.084
Construction	0.128	0.121	0.139	0.012	0.019	0.016
Distribution, hotels etc.	0.175	0.153	0.159	0.237	0.201	0.201
Transport and communication	0.110	0.102	0.098	0.031	0.036	0.038
Banking and finance	0.127	0.156	0.159	0.130	0.142	0.155
Public administration	0.158	0.158	0.155	0.429	0.456	0.429

Notes: Means relate to regression (bivariate probit) samples. Industry sector means relate to individuals in employment only.

a likelihood ratio test, significant at the 5% level for the nonwork-limited disabled and the 1% level for the nondisabled. In contrast, ρ is insignificant throughout for females (it is on the margin of significance at the 10% level for the nondisabled). Therefore, these findings suggest that for men, *unobservables* that exert a positive effect on employment impact negatively on self-employment, which might be interpreted as evidence that for males in the sample, the choice of self-employment is occasioned at least in part by a lack of other employment opportunities. In contrast, for women, selection effects appear less important, although the positive

sign on ρ for the nondisabled suggests that self-employment is a more positive choice, with the same unobservables impacting positively on both decisions.

The key determinants of self-employment, to which we now turn, are qualitatively similar between the probit and bivariate probit models. First, notwithstanding Boylan and Burchardt's use of earlier data, the alternative DDA definition of disability and a different specification, our results similarly support the prior of a monotonically positive relationship between age and self-employment for both sexes and each disability group. An interesting pattern emerges when considering the results for qualifications

Table 3. Probit estimates of the probability of self-employment

	Males			Females		
	Work-limited	Nonwork-limited	Nondisabled	Work-limited	Nonwork-limited	Nondisabled
Aged 25–34	0.332** (2.15)	0.414*** (2.88)	0.524*** (12.85)	1.065*** (4.19)	0.446** (2.07)	0.446*** (7.23)
Aged 35–44	0.513*** (3.33)	0.679*** (4.73)	0.757*** (17.75)	1.050*** (4.09)	0.824*** (3.79)	0.671*** (10.51)
Aged 45–54	0.737*** (4.78)	0.879*** (6.12)	0.904*** (20.46)	1.317*** (5.10)	0.877*** (3.99)	0.795*** (12.13)
Aged 55+	0.885*** (5.53)	1.018*** (6.91)	1.104*** (22.89)	1.499*** (5.57)	1.033*** (4.49)	0.894*** (12.09)
Single	-0.291*** (2.82)	-0.073 (0.80)	-0.006 (0.16)	0.106 (0.80)	0.133 (1.03)	0.037 (0.76)
Married	-0.152* (1.77)	-0.124* (1.65)	-0.010 (0.28)	0.120 (1.14)	0.194* (1.88)	0.144*** (3.51)
North	-0.177 (1.59)	-0.175* (1.71)	-0.151*** (3.45)	-0.023 (0.16)	-0.248 (1.48)	-0.381*** (5.87)
Yorkshire and Humberside	-0.044 (0.48)	-0.167** (2.14)	-0.175*** (5.22)	-0.231* (1.77)	-0.092 (0.82)	-0.212*** (4.60)
East Midlands	-0.139 (1.36)	-0.036 (0.44)	-0.141*** (3.88)	-0.158 (1.11)	-0.023 (0.19)	-0.089* (1.88)
East Anglia	-0.050 (0.38)	-0.346*** (2.74)	-0.073 (1.58)	-0.315 (1.50)	-0.283 (1.38)	-0.050 (0.84)
South west	-0.083 (0.91)	0.043 (0.56)	0.014 (0.42)	-0.170 (1.38)	0.130 (1.26)	0.068* (1.70)
West Midlands	-0.110 (1.19)	-0.119 (1.46)	-0.084** (2.55)	-0.054 (0.44)	-0.094 (0.76)	-0.214*** (4.56)
North west	-0.044 (0.49)	-0.127* (1.67)	-0.149*** (4.58)	-0.170 (1.36)	-0.090 (0.80)	-0.168*** (3.86)
Wales	-0.207* (1.79)	-0.238** (2.16)	-0.077* (1.77)	0.140 (0.96)	0.174 (1.29)	-0.118** (2.07)
Scotland	-0.308*** (3.00)	-0.165* (1.93)	-0.192*** (5.70)	-0.117 (0.88)	-0.199* (1.65)	-0.289*** (6.18)
Northern Ireland	0.051 (0.37)	-0.044 (0.31)	0.025 (0.55)	-0.213 (0.98)	0.160 (0.85)	-0.196*** (2.87)
Degree/higher degree	0.203** (2.10)	-0.001 (0.02)	-0.078** (2.30)	0.544*** (3.99)	0.292** (2.52)	0.426*** (8.96)
Other higher education	-0.125 (1.12)	-0.133 (1.40)	-0.169*** (4.18)	0.597*** (4.49)	-0.086 (0.66)	0.289*** (5.54)
A levels	0.004 (0.06)	-0.075 (1.09)	-0.064** (2.14)	0.457*** (3.75)	0.081 (0.73)	0.304*** (6.40)
O levels	-0.031 (0.34)	-0.145* (1.77)	-0.086** (2.54)	0.189 (1.61)	-0.088 (0.86)	0.083* (1.82)
Other qualification	-0.064 (0.73)	-0.174** (2.13)	-0.156*** (4.45)	0.157 (1.26)	-0.106 (0.94)	0.088* (1.75)
Home owned	0.145 (1.45)	0.162* (1.72)	0.160*** (4.47)	-0.125 (0.94)	-0.126 (0.88)	0.076 (1.52)
Home mortgaged	-0.029 (0.31)	-0.027 (0.30)	-0.009 (0.28)	-0.174 (1.45)	-0.029 (0.23)	-0.050 (1.16)
Social housing	-0.196* (1.75)	-0.242** (2.10)	-0.260*** (5.75)	-0.289* (1.89)	-0.009 (0.06)	-0.296*** (4.67)
White	-0.050 (0.37)	-0.154 (1.28)	-0.111*** (2.70)	-0.079 (0.46)	0.483** (2.28)	0.111** (2.01)
Immigrant	0.223* (1.94)	0.039 (0.38)	0.138*** (3.85)	0.126 (0.85)	0.284** (2.25)	0.239*** (5.55)
Other earner	-0.066 (1.20)	-0.050 (1.07)	-0.030 (1.57)	0.232*** (2.66)	0.086 (1.08)	0.012 (0.40)
Agriculture and fishing	0.974*** (6.45)	0.901*** (6.26)	0.970*** (16.60)	0.634** (2.32)	0.331 (1.13)	0.510*** (4.79)
Manufacturing	-0.927*** (8.97)	-0.793*** (8.46)	-0.744*** (18.78)	-0.706*** (4.95)	-0.590*** (4.41)	-1.026*** (19.01)

(continued)

Table 3. Continued

	Males			Females		
	Work-limited	Nonwork-limited	Nondisabled	Work-limited	Nonwork-limited	Nondisabled
Construction	0.606*** (6.29)	0.549*** (6.24)	0.662*** (17.97)	-0.795*** (2.71)	-0.467** (2.27)	-0.664*** (7.66)
Distribution and hotels	-0.223** (2.34)	-0.017 (0.20)	-0.041 (1.08)	-0.607*** (5.59)	-0.597*** (5.54)	-0.751*** (18.97)
Transport and communication	-0.146 (1.43)	-0.141 (1.46)	-0.244*** (5.86)	-0.834*** (3.95)	-0.674*** (3.64)	-0.892*** (13.11)
Banking and finance	-0.087 (0.87)	0.142 (1.64)	0.027 (0.73)	-0.495*** (4.22)	-0.500*** (4.50)	-0.685*** (17.15)
Public administration	-1.106*** (9.56)	-0.785*** (7.84)	-0.812*** (19.14)	-1.381*** (12.35)	-1.036*** (10.20)	-1.238*** (32.94)
No. of children	0.024 (0.82)	0.092*** (3.70)	0.095*** (10.21)	0.120*** (2.99)	0.114*** (3.07)	0.117*** (9.12)
Constant	-0.921*** (3.70)	-1.307*** (5.64)	-1.421*** (17.00)	-1.981*** (5.59)	-2.408*** (6.74)	-1.660*** (15.05)
Observations	4113	6140	35 759	3435	4914	31 286
Log likelihood	-1758.87	-2358.73	-13 917.22	-902.28	-1031.77	-7155.96
Wald $\chi^2(38)$	729.25	788.52	5237.67	323.67	233.49	2091.47
Pseudo R^2	0.172	0.143	0.158	0.152	0.101	0.128

Notes: Specifications include quarter dummies (not reported). *t*-statistics are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% level, respectively.

Table 4. Bivariate probit estimates of employment and self-employment – males

	Work-limited disabled		Nonwork-limited disabled		Nondisabled	
	Self-employment	Employment	Self-employment	Employment	Self-employment	Employment
Aged 25–34	0.260 (1.59)	0.198*** (2.66)	0.261* (1.67)	0.522*** (4.94)	0.389*** (6.62)	0.549*** (16.74)
Aged 35–44	0.446*** (2.69)	0.157** (2.14)	0.507*** (3.10)	0.584*** (5.38)	0.610*** (9.52)	0.602*** (16.24)
Aged 45–54	0.713*** (4.58)	-0.062 (0.83)	0.687*** (4.02)	0.654*** (5.87)	0.763*** (11.77)	0.513*** (12.78)
Aged 55+	0.974*** (6.36)	-0.506*** (6.54)	0.950*** (6.35)	-0.075 (0.69)	1.056*** (19.54)	-0.084** (2.00)
Single	-0.242** (2.17)	-0.108* (1.93)	-0.039 (0.43)	-0.178* (1.88)	0.012 (0.31)	-0.125*** (2.96)
Married	-0.166** (2.04)	0.096** (1.99)	-0.118 (1.62)	0.007 (0.09)	-0.017 (0.50)	0.060 (1.58)
North	-0.057 (0.38)	-0.407*** (6.48)	-0.118 (1.15)	-0.266*** (2.64)	-0.110** (2.50)	-0.225*** (5.18)
Yorkshire and Humberside	0.007 (0.07)	-0.181*** (3.33)	-0.153** (2.03)	-0.031 (0.36)	-0.160*** (4.86)	-0.049 (1.35)
East Midlands	-0.086 (0.79)	-0.157** (2.57)	-0.036 (0.45)	0.018 (0.18)	-0.133*** (3.74)	-0.027 (0.67)
East Anglia	-0.023 (0.19)	-0.090 (1.11)	-0.321*** (2.63)	-0.043 (0.34)	-0.070 (1.55)	-0.022 (0.41)
South West	-0.071 (0.81)	-0.020 (0.33)	0.042 (0.56)	-0.002 (0.02)	0.010 (0.31)	0.019 (0.48)
West Midlands	-0.071 (0.75)	-0.123** (2.20)	-0.095 (1.20)	-0.111 (1.28)	-0.086*** (2.70)	0.036 (0.98)

(continued)

Table 4. Continued

	Work-limited disabled		Nonwork-limited disabled		Nondisabled	
	Self-employment	Employment	Self-employment	Employment	Self-employment	Employment
North West	0.040 (0.37)	-0.297*** (5.62)	-0.093 (1.24)	-0.162** (2.03)	-0.130*** (4.04)	-0.088** (2.51)
Wales	-0.076 (0.49)	-0.423*** (6.60)	-0.219** (2.07)	-0.066 (0.59)	-0.053 (1.23)	-0.153*** (3.33)
Scotland	-0.206 (1.51)	-0.297*** (5.22)	-0.118 (1.40)	-0.191** (2.23)	-0.175*** (5.24)	-0.056 (1.49)
Northern Ireland	0.177 (1.11)	-0.472*** (6.22)	0.017 (0.12)	-0.384*** (2.73)	0.044 (1.00)	-0.157*** (3.15)
Degree/higher degree	-0.039 (0.18)	0.840*** (14.37)	-0.022 (0.28)	0.139* (1.71)	-0.122*** (3.59)	0.302*** (9.03)
Other higher education	-0.322* (1.80)	0.717*** (10.89)	-0.108 (1.18)	-0.084 (0.94)	-0.209*** (5.25)	0.296*** (6.84)
A levels	-0.153 (1.11)	0.523*** (13.30)	-0.124* (1.83)	0.315*** (4.58)	-0.123*** (3.82)	0.378*** (12.41)
O levels	-0.186 (1.29)	0.515*** (10.47)	-0.163** (2.08)	0.170** (2.07)	-0.131*** (3.83)	0.281*** (8.48)
Other qualifications	-0.177 (1.53)	0.365*** (8.02)	-0.207*** (2.63)	0.240*** (2.94)	-0.201*** (5.71)	0.281*** (8.17)
Home owned	0.116 (1.17)	0.080 (1.43)	0.225** (2.45)	-0.348*** (3.68)	0.186*** (5.32)	-0.184*** (5.03)
Home mortgaged	-0.129 (1.10)	0.397*** (7.35)	-0.072 (0.83)	0.267*** (2.87)	-0.042 (1.32)	0.241*** (7.20)
Social housing	-0.005 (0.03)	-0.552*** (9.91)	-0.114 (0.92)	-0.488*** (4.80)	-0.114* (1.94)	-0.588*** (15.67)
White	-0.105 (0.78)	0.239*** (3.13)	-0.218* (1.85)	0.372*** (3.11)	-0.150*** (3.68)	0.279*** (6.93)
Immigrant	0.248** (2.25)	-0.128* (1.81)	0.029 (0.29)	0.002 (0.01)	0.146*** (4.21)	-0.113*** (2.94)
Other earner	-0.202* (1.77)	0.514*** (16.10)	-0.147** (2.50)	0.521*** (10.78)	-0.090*** (3.73)	0.390*** (18.72)
Agriculture and fishing	0.922*** (5.55)		0.856*** (6.08)		0.931*** (15.70)	
Manufacturing	-0.871*** (6.63)		-0.741*** (7.63)		-0.713*** (17.30)	
Construction	0.570*** (5.36)		0.521*** (6.08)		0.637*** (17.12)	
Distribution and hotels	-0.210** (2.29)		-0.016 (0.19)		-0.041 (1.13)	
Transport and communication	-0.135 (1.38)		-0.123 (1.35)		-0.232*** (5.77)	
Banking and finance	-0.079 (0.84)		0.140* (1.72)		0.024 (0.68)	
Public administration	-1.041*** (6.92)		-0.731*** (7.08)		-0.780*** (17.78)	
No. of children	0.013 (0.45)	0.027 (1.39)	0.086*** (3.50)	0.024 (0.62)	0.090*** (9.69)	0.005 (0.35)
Child <5		0.116* (1.67)		-0.018 (0.16)		0.070* (1.86)
Constant	-0.304 (0.56)	-0.775*** (6.16)	-0.903*** (3.17)	0.333* (1.67)	-1.076*** (8.42)	0.303*** (4.05)
ρ		-0.433		-0.588		-0.520
		LR ($\rho=0$): $\chi^2(1) = 1.40$ ($p = 0.237$)		LR ($\rho=0$): $\chi^2(1) = 4.49$ ($p = 0.034$)		LR ($\rho=0$): $\chi^2(1) = 11.29$ ($p = 0.001$)
Observations		9558		6891		39 554
Censored obs.		5445		751		3795
Log-likelihood		-6859.44		-4290.39		-24 413.18
Wald $\chi^2(38)$		708.86		725.08		4177.63

Notes: See footnotes of Table 3.

Table 5. Bivariate probit estimates of employment and self-employment – females

	Work-limited disabled		Nonwork-limited disabled		Nondisabled	
	Self-employment	Employment	Self-employment	Employment	Self-employment	Employment
Aged 25–34	1.063*** (4.17)	0.076 (1.01)	0.471** (2.08)	0.575*** (6.64)	0.461*** (7.44)	0.449*** (15.13)
Aged 35–44	1.048*** (4.07)	–0.035 (0.46)	0.866*** (3.52)	0.708*** (7.75)	0.702*** (10.65)	0.544*** (16.62)
Aged 45–54	1.319*** (5.11)	–0.218*** (2.81)	0.913*** (3.80)	0.553*** (5.87)	0.821*** (12.29)	0.370*** (10.51)
Aged 55+	1.511*** (5.35)	–0.503*** (6.08)	1.042*** (4.55)	0.147 (1.47)	0.896*** (12.16)	–0.039 (0.96)
Single	0.109 (0.81)	–0.123** (2.25)	0.130 (1.01)	–0.029 (0.37)	0.032 (0.66)	–0.151*** (4.54)
Married	0.126 (1.09)	–0.176*** (4.12)	0.180 (1.59)	–0.210*** (3.31)	0.129*** (3.09)	–0.277*** (9.52)
North	–0.016 (0.10)	–0.241*** (3.66)	–0.251 (1.51)	–0.090 (1.01)	–0.380*** (5.86)	0.000 (0.01)
Yorkshire and Humberside	–0.227* (1.67)	–0.150*** (2.63)	–0.086 (0.76)	0.087 (1.20)	–0.209*** (4.54)	0.048 (1.62)
East Midlands	–0.154 (1.04)	–0.167*** (2.65)	–0.024 (0.19)	–0.023 (0.28)	–0.083* (1.76)	0.100*** (2.99)
East Anglia	–0.311 (1.47)	–0.103 (1.19)	–0.271 (1.31)	0.113 (0.96)	–0.044 (0.74)	0.115*** (2.68)
South west	–0.169 (1.36)	–0.045 (0.76)	0.132 (1.28)	0.040 (0.53)	0.072* (1.79)	0.070** (2.23)
West Midlands	–0.049 (0.39)	–0.155*** (2.73)	–0.093 (0.75)	0.026 (0.35)	–0.211*** (4.51)	0.039 (1.30)
North west	–0.164 (1.19)	–0.226*** (4.11)	–0.082 (0.71)	0.114 (1.57)	–0.163*** (3.74)	0.106*** (3.61)
Wales	0.149 (0.91)	–0.305*** (4.56)	0.174 (1.29)	0.015 (0.16)	–0.113** (1.97)	0.122*** (3.05)
Scotland	–0.110 (0.75)	–0.261*** (4.46)	–0.198* (1.65)	0.009 (0.13)	–0.282*** (6.01)	0.134*** (4.31)
Northern Ireland	–0.199 (0.82)	–0.451*** (5.75)	0.172 (0.90)	0.213 (1.53)	–0.199*** (2.92)	–0.048 (1.19)
Degree/higher degree	0.511* (1.68)	1.046*** (16.94)	0.335* (1.89)	0.715*** (9.46)	0.467*** (8.79)	0.769*** (26.38)
Other higher education	0.567** (1.98)	0.943*** (16.48)	–0.041 (0.21)	0.675*** (8.74)	0.333*** (5.71)	0.830*** (24.80)
A levels	0.432* (1.78)	0.756*** (15.29)	0.119 (0.73)	0.592*** (8.69)	0.338*** (6.56)	0.596*** (21.24)
O levels	0.167 (0.77)	0.635*** (14.76)	–0.051 (0.33)	0.539*** (9.15)	0.114** (2.31)	0.501*** (20.47)
Other qualifications	0.138 (0.69)	0.545*** (11.77)	–0.078 (0.55)	0.370*** (5.84)	0.113** (2.16)	0.395*** (14.38)
Home owned	–0.126 (0.95)	0.071 (1.16)	–0.130 (0.91)	–0.031 (0.39)	0.071 (1.43)	–0.061* (1.89)
Home mortgaged	–0.183 (1.33)	0.310*** (5.49)	–0.005 (0.03)	0.452*** (6.13)	–0.033 (0.75)	0.371*** (13.53)
Social housing	–0.272 (1.30)	–0.476*** (8.11)	–0.024 (0.15)	–0.139* (1.75)	–0.320*** (4.94)	–0.296*** (9.54)
White	–0.087 (0.48)	0.251*** (3.25)	0.501** (2.32)	0.277*** (2.85)	0.130** (2.31)	0.282*** (8.80)
Immigrant	0.131 (0.85)	–0.190*** (2.68)	0.265* (1.87)	–0.278*** (3.40)	0.227*** (5.18)	–0.216*** (7.25)
Other earner	0.218 (1.47)	0.458*** (13.14)	0.109 (1.02)	0.371*** (8.04)	0.027 (0.86)	0.289*** (14.92)
Agriculture and fishing	0.634** (2.32)		0.332 (1.14)		0.508*** (4.78)	
Manufacturing	–0.706***		–0.588***		–1.023***	

(continued)

Table 5. Continued

	Work-limited disabled		Nonwork-limited disabled		Nondisabled	
	Self-employment	Employment	Self-employment	Employment	Self-employment	Employment
Construction	(4.94) -0.794*** (2.70)		(4.38) -0.465** (2.26)		(18.94) -0.662*** (7.67)	
Distribution and hotels	-0.607*** (5.57)		-0.595*** (5.47)		-0.749*** (18.91)	
Transport and communication	-0.834*** (3.95)		-0.674*** (3.64)		-0.890*** (13.10)	
Banking and finance	-0.495*** (4.21)		-0.499*** (4.47)		-0.684*** (17.13)	
Public administration	-1.380*** (12.25)		-1.033*** (9.82)		-1.233*** (32.47)	
No. of children	0.124** (2.48)	-0.088*** (4.57)	0.093 (1.20)	-0.292*** (11.72)	0.099*** (5.69)	-0.256*** (28.05)
Child <5		-0.434*** (6.99)		-0.555*** (8.60)		-0.684*** (31.44)
Constant	-1.915*** (2.93)	-0.694*** (5.44)	-2.543*** (4.77)	-0.342** (2.08)	-1.767*** (13.89)	-0.000 (0.00)
ρ		-0.048 LR($\rho=0$): $\chi^2(1)=0.01$ ($p=0.903$)		0.178 LR($\rho=0$): $\chi^2(1)=0.09$ ($p=0.761$)		0.153 LR($\rho=0$): $\chi^2(1)=2.35$ ($p=0.126$)
Observations		8988		6277		39 866
Censored obs.		5553		1363		8580
Log likelihood		-5705.43		-3750.77		-23 757.47
Wald $\chi^2(38)$		263.45		203.85		1831.17

Notes: See footnotes of Table 3.

by gender. For males, the general relationship is one in which the probability of being in employment is higher for individuals with qualifications, whilst the converse applies when considering the dichotomy between self-employment and wage employment.²⁶ In contrast, for females, qualifications increase both the probability of being in work and of being self-employed, and the effect is stronger for the work-limited disabled than the other disability groups.

However, for both men and women, the number of dependent children in the household is consistently and positively related to the probability of being in self-employment for most of the disability subgroups. Whilst the precise mechanism underlying this result for men is unclear, for women it presumably derives from the fact that self-employment offers the greater flexibility some women require in order to combine work and child-rearing responsibilities.

A further interesting feature of the results concerns the roles of ethnicity and immigrant status. For males, the data indicate that nonwhites and immigrants are less likely to be in work, but where

they are, they are more likely to be in self-employment. For females, in contrast, the pattern which emerges is one in which those from ethnic minorities are less likely both to work and to be self-employed, while for immigrants, self-employment is the more likely outcome. Thus, the results for men are entirely in accordance with those previous studies both for the UK and elsewhere which suggest that among ethnic minorities, self-employment is, at least in part, a response to discrimination in the labour market (e.g. Clark and Drinkwater, 1998). For females, a more subtle picture emerges, possibly reflecting cultural values and norms.

Finally, it should be noted that there is a powerful role for the industry group in the self-employment equation. As might be expected, self-employment is more likely, *ceteris paribus*, among workers in agriculture and fishing, and for males, also in construction relative to the base group ('Other' industries including other services and energy/water), and generally less likely in other sectors such as distribution and hotels (particularly for females) and public administration.

²⁶ There is one exception, for the work-limited disabled being qualified at degree level has a positive effect on self-employment in the probit model.

Table 6. Probit decomposition of the probability of self-employment by disability status

Predicted probability of self-employment	Males	Females
Disabled work-limited	0.212	0.093
Disabled nonwork-limited	0.165	0.063
Nondisabled	0.174	0.073
$(\hat{S}_{D_1} - \hat{S}_N)$	0.038	0.020
$(\hat{S}_{D_1} - \hat{S}_N)_{\text{explained}}$	0.022 (58%)	0.003 (15%)
$(\hat{S}_{D_1} - \hat{S}_N)_{\text{unexplained}}$	0.016 (42%)	0.017 (85%)
$(\hat{S}_{D_2} - \hat{S}_N)$	-0.009	-0.010
$(\hat{S}_{D_2} - \hat{S}_N)_{\text{explained}}$	0.018 (-206%)	0.001 (-5%)
$(\hat{S}_{D_2} - \hat{S}_N)_{\text{unexplained}}$	-0.027 (306%)	-0.011 (105%)
$(\hat{S}_{D_1} - \hat{S}_N)_{\text{unequal treatment}}$	-0.027	-0.011
$(\hat{S}_{D_1} - \hat{S}_N)_{\text{accommodation}}$	0.043	0.028

Notes: Differences in characteristics and parameters given by Equations (4) and (5), respectively. The remaining components are calculated as follows: $(\hat{S}_{D_1} - \hat{S}_N)_{\text{unexplained}} = \text{unequal treatment} + \text{accommodation}$;
 $(\hat{S}_{D_2} - \hat{S}_N)_{\text{unexplained}} = \text{unequal treatment}$;
 $(\hat{S}_{D_1} - \hat{S}_N)_{\text{unexplained}} - (\hat{S}_{D_2} - \hat{S}_N)_{\text{unexplained}} = \text{accommodation}$.

Decomposition results

As described in Section III, the predicted probability of self-employment is decomposed using the estimates from both the probit and bivariate probit models. Table 6 presents the decomposition results based on the probit estimates. The predicted rate of self-employment for work-limited disabled males in employment is 21.2%, while it is approximately 17% for both the nonwork-limited disabled and the nondisabled. Among females, the corresponding rates are lower at 9.3%, 6.3% and 7.3%, respectively. Thus, the raw difference in the predicted probability of self-employment between the work-limited and nondisabled is 3.8% and 2.0 percentage points for males and females, respectively. For men at least, part (58%) of this difference is due to differences in the characteristics between the groups.²⁷ The remaining (unexplained) gap, of just under 2 percentage points for both males and females includes the influence of unequal treatment and preference or accommodation factors. Under the assumptions of DeLeire, the measures of unequal treatment, identified from the (unexplained component of the) nonwork-limited decomposition, are negative for both males and

females.²⁸ This suggests that consumer discrimination may be more important than discrimination in the salaried sector and act to push the disabled into paid employment, or that the entire disabled group have preferences favouring waged employment (for example, due to the security of sickness pay). Imposing this measure of unequal treatment on the work-limited disabled as described earlier allows the accommodation effect to be identified as 4.3 percentage points for males and 2.8 percentage points for females. That is, for men, if discrimination in sector choice were absent, the work-limited disabled would be 2.7 percentage points *more* likely to be self-employed, but if accommodation factors were absent, they would be 4.3 percentage points *less* likely to enter self-employment.

The same pattern of results is observed, if instead, the bivariate probit decomposition is considered. Table 7 reports the predicted conditional self-employment probabilities. Elements on the leading diagonal are the conditional self-employment predictions for each group on the basis of their own coefficients. The remaining elements indicate how these probabilities would change were alternative coefficient vectors applied to the self-employment equation holding all other components constant, and in particular, the employment probabilities. For example, a nondisabled male has a self-employment probability of 23.3% evaluated at their own employment probability, but applying the work-limited disabled self-employment coefficients (β_{D_1}). For the same employment probability, the conditional self-employment probability evaluated at the nonwork-limited disabled self-employment coefficients (β_{D_2}) is considerably lower at 15.0%.

These predicted conditional probabilities can be used to isolate the contributions of discrimination and accommodation to the unexplained gap between the conditional self-employment probabilities. For males, the impact of discrimination is found to be negative, consistent with the above results; self-employment rates for the nondisabled evaluated at the nonwork-limiting disabled self-employment coefficients would actually be approximately 2.4 percentage points lower. More importantly, however, there is clear evidence of a substantial increase in the probability of self-employment (nearly 6 percentage points) if the nondisabled behaved like the

²⁷ The detailed decomposition indicates that it is the disabled being older on average that has the most important contribution to the characteristic effect.

²⁸ The detailed decomposition of the coefficient effect encountered a situation common in the literature whereby a substantial proportion of the difference resides in the constant. While we focus our discussion on the overall coefficient gap, for reference, the larger contributions by other (groups of) variables are typically associated with age, qualifications and ethnicity; for males, a role is also apparent for marital status, while for females the presence of another household income earner matters for the work-limited disability case.

Table 7. Decomposition of bivariate probit conditional predictions of self-employment by disability status

	Coefficient vector on self-employment equation		
	$\hat{\beta}_{D_1}$	$\hat{\beta}_{D_2}$	$\hat{\beta}_N$
<i>Males</i>			
Disabled work-limited	0.212	0.124	0.147
Disabled nonwork-limited	0.262	0.165	0.189
Nondisabled	0.233	0.150	0.174
$(\hat{S}_{D_1}^C - \hat{S}_N^C)_{\text{unexplained}}$	0.059		
$(\hat{S}_{D_2}^C - \hat{S}_N^C)_{\text{unexplained}}$	-0.024		
$(\hat{S}_{D_1} - \hat{S}_N)_{\text{unequal treatment}}$	-0.024		
$(\hat{S}_{D_1} - \hat{S}_N)_{\text{accommodation}}$	0.083		
<i>Females</i>			
Disabled work-limited	0.093	0.054	0.067
Disabled nonwork-limited	0.103	0.063	0.075
Nondisabled	0.102	0.061	0.073
$(\hat{S}_{D_1}^C - \hat{S}_N^C)_{\text{unexplained}}$	0.029		
$(\hat{S}_{D_2}^C - \hat{S}_N^C)_{\text{unexplained}}$	-0.012		
$(\hat{S}_{D_1}^C - \hat{S}_N^C)_{\text{unequal treatment}}$	-0.012		
$(\hat{S}_{D_1}^C - \hat{S}_N^C)_{\text{accommodation}}$	0.041		

Notes: Calculated from Equations 7 and 8 and estimates in Tables 4 and 5. Remaining components calculated as follows:

$$\begin{aligned}
 (\hat{S}_{D_1} - \hat{S}_N)_{\text{unexplained}} &= \text{unequal treatment} + \text{accommodation}; \\
 (\hat{S}_{D_2}^C - \hat{S}_N^C)_{\text{unexplained}} &= \text{unequal treatment}; \\
 (\hat{S}_{D_1}^C - \hat{S}_N^C)_{\text{unexplained}} - (\hat{S}_{D_2}^C - \hat{S}_N^C)_{\text{unexplained}} &= \text{accommodation}.
 \end{aligned}$$

work-limited disabled when entering employment type. Therefore, the influence of accommodation, which represents the difference between the two figures, amounts to over 8 percentage points. In the case of females, the unexplained gaps are similarly signed, but, both are smaller, and suggest discrimination (1.2 percentage points) and accommodation (4.1 percentage points) factors play a smaller role in absolute terms (but of a similar *relative* order of magnitude).

V. Conclusions

This article has examined why for those in work, self-employment rates are higher for those with work-limiting disabilities than for the nondisabled. It was argued that this may reflect the opportunities self-employment affords for the former to accommodate their disability by choosing times, hours and locations of work.

Using data from the UK LFS, the probability of self-employment is decomposed between three disability groups along the lines suggested by DeLeire (2001). Importantly, the DeLeire technique allows for the separation of the effect of accommodation from

the influence of discrimination on conditional self-employment probabilities. After controlling for characteristics, the nonwork-limited disabled are less likely to be in self-employment than the nondisabled, which suggests *consumer* discrimination may be important. However, particularly for men, we find strong evidence of the work-limiting nature of disability being an important positive influence on self-employment, consistent with our main hypothesis that self-employment offers greater opportunities for individuals to accommodate their disability.

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