

Transitions in Disability and Work

GANNON, BRENDA (*) AND NOLAN, BRIAN (**)

(*) *Senior Research Officer, Irish Centre for Social Gerontology/Department of Economics, National University of Ireland, Galway, Ireland.* (**) *Research Professor, The Economic and Social Research Institute, Dublin, Ireland.*

Tfo. +35 391 495 459 - E-mail: brenda.gannon@nuigalway.ie

ABSTRACT

As the extent of disability increases in society, there is an increasing need to understand related consequences in many aspects of social inclusion. In this paper, we provide a rigorous analysis of the transitions into and out of disability and the related consequences for employment. We compare the effect of onset, exit and persistent disability on the probability of employment. This improves our capacity to estimate the effects of disability with precision and allows the channels whereby these effects operate to be traced with more confidence. The results imply that employment policy should focus on the heterogeneity of disabled people, depending on their respective transitions into disability and the duration of their disability.

Keywords: Disability transitions, work, longitudinal data.

Discapacidad y trabajo: una revisión de la evidencia británica

RESUMEN

En comparación con otros países, las tasas de prevalencia de la discapacidad británicas son elevadas y las tasas de empleo para las personas con discapacidad reducidas. Este artículo revisa el impacto de la discapacidad sobre los resultados de mercado de trabajo en el Reino Unido. En primer lugar se establecen el marco legislativo y el contexto político. A partir de ellos, el artículo trata los temas clave de la creciente literatura sobre el tema en cuestión. Finalmente, se destacan los campos considerados más importantes para la investigación futura.

Palabras clave: Disability transitions, work, longitudinal data.

JEL classification: J15, J18, J21

Acknowledgements: The authors would like to thank two anonymous referees for helpful comments on an earlier version of the paper.

Artículo recibido en Marzo de 2006 y aceptado para su publicación en Septiembre de 2006.

Artículo disponible en versión electrónica en la página www.revista-eea.net, ref.: e-25205.

1. INTRODUCTION

As the extent of disability increases in society, there is an increasing need to understand related consequences in many aspects of social inclusion. One aspect that has received particular attention in recent years is the negative association between disability and employment. There is an ongoing shift in thinking about the definition of disability from the older medical model towards a social model, (World Health Organisation, 1999) and there is an increased endeavour for greater integration of disabled people into society. At the same time, many countries have introduced equality legislation to the effect of disallowing discrimination on the basis of several grounds including disability. In Ireland, this legislation was introduced in 1998 but basic published statistics have shown that even though the employment rate increased in general in the economy, similar trends are not evident for people with disabilities. Furthermore, the extent of in-depth research on the relationship between disability and employment has until recently been quite limited, and to date there is no rigorous analysis of the transitions into and out of disability and the related consequences for employment.

Nonetheless, the relationship between disability and labour force participation in a static context has been the focus of much research. Internationally, the first generation of such econometric studies emerged around the late 1970s. To give some US examples, Bartel and Taubman (1979) analysed the effect of health on earnings and labour supply, whereas Chirokos and Nestel, (1985) related annual hours worked to health history. More recent research has emphasised the importance of the way health and limitations are captured, for example Wolfe and Hill (1995) and Madden and Walker (1999). Using the UK Labor Force Survey, Kidd, Sloane and Ferko (2000) analysed the effect of health limitations on the kind of paid work possible. Recent research in Ireland (see Gannon and Nolan, 2004) on the association between disability and labour force participation used data from the Living in Ireland survey 2000. This showed a substantial effect of disability on participation for both men and women, in particular for those with severe or to some extent limiting conditions. However, a cross-sectional “snapshot” of people who report that they are currently affected by chronic illness and disability, will include people with very different experiences of disability. Some will have had a chronic illness or disability since birth, some will have developed a disability or chronic illness recently which will in all likelihood affect them long-term, and others will only experience that disability for a short period. We would expect the impact of these different patterns of disability on employment to be very different. This is in essence why it is important to complement a cross-sectional picture with the analysis of the dynamics of disability over time and how it affects crucial aspects of societal participation.

With longitudinal data we can follow individuals over time, and assess their employment status, as transitions into or out of disability occurs. This improves our

capacity to estimate the effects of disability with precision and allows the channels whereby these effects operate to be traced with more confidence. However, a complete structural model of these dynamics is unreasonably complicated and therefore to date has not been applied to data on disability and employment in any of the international research in this area. The applications that are closest to a complete model can be found in some international studies, for example Bound et al (1999), Lindeboom and Kerkhofs (2002), and Disney et al. (2004). In Ireland, the only comparable research is by Gannon (2005), but once again the model is a reduced form one, as it does not account for the influence of wages.

In this paper, we do not attempt to estimate the theoretical model, but aim to fill in some remaining gaps in the literature with regard to acquired, previous and persistent disability. The added value of this paper to the dynamics of disability and work arises via the explanatory variables. Essentially, the focus of this paper is to compare the effect of onset, exit and persistent disability on the probability of employment. The onset and exit disability variables are defined in terms of two year spells – this ensures we obtain estimates of long-lasting disabilities. Our paper therefore, provides a new contribution to Irish literature¹, and in addition, it goes beyond previous work by Jenkins and Riggs (2003) by incorporating exit from disability and persistence in disability status into the model of work and disability.

In section 2, we set out the theoretical framework of the dynamics of disability and work, and provide a brief review of research from other countries. This is followed in section 3 with a description of the data. In section 4, we present the analytical framework and econometric models for estimating disability transitions and the subsequent probability of employment. Results are provided in section 5 and we provide conclusions and policy implications in section 6.

2. THEORETICAL BACKGROUND

The basic intuition of our model is that disability could influence both an individual's labour supply behaviour and the demand for their labour in the market. Depending on the nature of the disability, it might restrict the range of tasks the person can carry out, increase the costs of working, and affect the incentives faced – most obviously via receipt of disability-related state transfers. On the demand side, employers may be reluctant to employ individuals with a disability, either because

¹ While Gannon (2005) estimated a dynamic model of participation, this paper does not attempt an innovative econometric model. Instead the dynamics are now modelled via the explanatory variables and transitions in work status. Complete dynamics with onset and exit could be problematic with respect to sample sizes but this is a topic for future research.

of concerns about their productivity or because of additional costs associated with accommodating certain types of disability.

In this paper, we wish to analyse the dynamics of disability and work, so therefore require a theoretical model that can accommodate changes in disability status and work status throughout the lifetime of an individual. To this end, the dynamics are motivated by an underlying lifecycle model, where the choice between consumption and leisure is considered as a lifetime decision, and we assume that individuals maximise their expected utility over their lifetime. Following [Bound et al, 1999], in general, the work equation is based on the assumption that individuals maximise a utility function given by:

$$\max E_t \sum_{j=t}^T \beta^{j-t} U(C_j, L_j, Z_j) \quad [1]$$

where C_j and L_j are consumption and leisure in period j respectively. Z_j is a vector of taste shifters and includes disability. Other variables in Z_j include age, education, gender and household composition. Over the lifecycle, it is likely that age and gender will influence the decision to work. This will be further influenced by family commitments and the number of children per household. While higher education levels will most likely lead to higher work probabilities, we should bear in mind that the interaction between education and disability is also complex. The utility function is then maximised subject to an intertemporal budget constraint:

$$A_{j+1} = (W_j H_j - C_j) + (1 + r_{j+1}) A_j \quad [2]$$

where W_j is the wage, H_j is hours of work, A_j represents assets, and r_j is the rate of interest. An empirical model may be used to show how individuals compare the utility between two different states, for example, working and not working. Solving this model provides an expression for optimal leisure as a function of W , H , A_j and Z_j . Our model maximises equation [1] subject to a less comprehensive budget constraint than specified in [2]. Our models will obtain estimates from reduced form models however as we do not have full information on wages and assets included into the model. A full structural model would require a much better data source.

The dynamic model allows us to capture the effects of both current and past disability on current employment status. Since disability may be expected to reduce wages and increase disutility of work we would expect current disability to be negatively related to current participation. For individuals who have different expectations about future disability depending on the duration of their disability, those with a disability that is

expected to persist are less likely to participate in the future. This model implies larger effects of persistent disability. Previous disability may also be significant if transition to exit takes time or if there is state dependence in unemployment. In this case we might expect to see different behaviour across two individuals neither of whom are disabled today if past disability had caused one of them to leave the labour force in the past. In this case, we therefore would also expect negative effects of exit from disability.

The dynamics of disability and work are further confounded by the presence of the 'selection effect'. Jenkins and Rigg, (2003) provide a useful account of this problem that occurs when analysing the effect of onset of disability. The hypothesis is that some of the economic disadvantage observed among individuals currently with a disability, could be due to the presence of disadvantage before they became disabled. Current unemployment could reflect a pre-existing disability, rather than or as well as, the effects of the disability itself. It is possible that the onset of a disability selects from those individuals who are at risk of becoming disabled, i.e. those who are already disadvantaged in terms of employment. For this reason, we will focus on the sample of those at risk of becoming disabled when analysing the effect of onset. Similarly, we use the pool of individuals at risk of exit to explore the impact of exit from disability.

Our measure of disability is self-reported and to obtain a causal effect of disability on participation, this should be exogenous. However, the possible endogeneity of self-reported health, which we have to rely on, has been noted in a number of studies (see for example, Bound (1991) and Lindeboom and Kerkhofs (2002)). Those not active in the labour market might be more likely than others (with the same actual disability status) to report themselves as disabled, for several reasons. One is that the presence of a limiting disability provides a justification for not being in work that is less open to stigmatisation. Another is that the individual may be in receipt of benefits that are linked to the presence of disability or incapacity to work, which could well affect their reporting behaviour. This could bias the results of the analysis which treats self-reported health as exogenous. Previous work has investigated this issue in a dynamic model, showing that endogeneity arising from unobserved effects contribute substantially towards the base effect of disability, with much of this due to state dependence, (Gannon 2005).

The results presented in this paper thus represent a foundation on which more complex dynamic models of participation can be built, and complement the results from Gannon (2005). Although the econometric methodology is not as advanced, we can reasonably deduct that in both papers selection effects are important. This paper however follows Jenkins and Riggs (2003) by defining disability onset as having a disability for at least two consecutive years. This measure of disability is more favourable as it eliminates at least some of the potential measurement from the yearly data. Nonetheless, we acknowledge that we are still relying on the self-reported variable and also that the dynamics are not complete without allowing for both dynamics of work and disability variables.

3. DATA

The data on disability and labour force participation used in this paper are from the Living in Ireland Survey 1995-2001. The Living in Ireland Survey is the Irish component of the European Community Household Panel, conducted by the ESRI for Eurostat. The survey commenced in 1994, and has been carried out each year up to 2001. The question posed about illness or disability in the initial, 1994 survey was slightly different so we do not use that year's results, basing our analysis on the seven years from 1995 to 2001. We wish to focus on individuals of working age, hence we exclude those aged 65 and over in order to avoid including retirement in the non-employment category. This leaves us with a total of 2309 adults aged 15-65 who responded fully in each wave².

In the Living in Ireland survey, detailed information on current labour force status was obtained, and for current purposes the crucial distinction this allows us to make is between those who were at work or not at work (unemployed or inactive). A measure of disability can also be constructed from the Living in Ireland survey on the basis of individuals responding to the following question:

“Do you have any chronic physical or mental health problem, illness or disability?”

It may well be that not only the presence of such an illness or disability but also the extent to which it limits or restricts a person may be important, and the survey allows us to distinguish individuals in terms of those with either severe, some or no limitations in daily activities. Previous research (Gannon and Nolan, 2004, Gannon, 2005) has exploited the differences in severity of limitations, but in this paper because we are analysing transitions the number of observations will not support in-depth analyses of severity.

In table 1 we present the aggregated transitions for people with disabilities and show that at least 5% move into disability state, and over 30% move out of a disability state. These proportions relate to transitions into and out of a one-year disability, but later on in the paper, we explain the proportions in each disability transition, that is onset for two years, exit after two years, or persistent disability and discuss some relevant individual characteristics.

Table 1: Transitions in disability status, age 15-64, Living in Ireland Survey 1995-2001

	No Disability t (%)	Disability t (%)
No disability t-1	94.7	5.1
Disability t-1	32.5	67.5

² Our panel is balanced to ensure we obtain a complete disability trajectory for each individual. Non-random attrition was tested for using the inverse probability weight approach suggested by Wooldridge (2002). The results find no evidence to suggest that our disability estimates are affected by non-random attrition.

As noted in previous research, the effects of disability on labour force participation may differ among individuals depending on other characteristics for example age or education. We therefore include measures of gender, age, education and household composition in our analysis. These variables are defined in detail in Table A1.

4. METHODOLOGY AND ESTIMATION PROCEDURES

In estimating the transitions in disability and associated work patterns, we need to consider two aspects in the methodology. Firstly, we explain the definition of ‘onset’ and ‘exit’ used in this paper, and secondly, we explain the appropriate models that are used in (a) determining both the factors associated with disability transitions, and (b) predicting the probability of employment.

We now outline the analytical framework that we employ in assessing the impact of disability on employment, the rationale for this approach and what it involves. This framework is used to address the core question towards which the study is directed: what impact does disability have on an individual’s employment probability? It is particularly useful to be able to look at movements into chronic illness or disability - which following Jenkins and Rigg (2003) we label as ‘onset’ – because we can then see what happens to the outcomes we are interested in, i.e. employment as disability occurs. In doing so it is helpful to first identify all those individuals who are “at risk of onset” at a particular point, and see how many actually experience onset. We can then compare the outcomes of interest for those experiencing onset with those who were “at risk” but did not experience it. Those who are already reporting disability are not by definition “at risk” – we cannot observe them experiencing onset.

As well as analysing what happens when someone starts a period of disability, it is also valuable to be able to capture the extent to which labour force status changes when a disability spell ends. Adopting the same approach as with onset, we can compare those observed in the panel survey to “exit” disability with those “at risk” of exiting who did not do so. To be “at risk” of exit, one then clearly has to be reporting a chronic illness or disability; taking all those who could have exited, the comparison is between those who do and do not experience exit.

Looking at disability onset and exit, while very informative will not capture the impact of how long a disability lasts. To explore the impact of persistent, long-term disability we will complement our analysis of the impact of disability onset and exit by also examining those who report a chronic illness or disability throughout the period covered by the panel survey, in each year from 1995 to 2001. So the analytical framework to be adopted involves looking in turn at the impact of disability onset, disability exit, and long-term or persistent disability on the outcome of interest, i.e. employment.

4.1. Model of disability transition

The second methodological aspect of this paper defines the appropriate econometric models used in estimating the probability of onset, exit or persistent disability, and the main model of interest – the probability of work. Firstly, the disability transitions and persistent disability are estimated using a logistic regression. By using such a model, we can directly compare our results to a similar model using UK data in Jenkins and Rigg (2003). Estimation of models on disability requires the knowledge of true disability status of an individual. Generally, such data is not available and instead we use a proxy for disability – self-reported disability status³. We therefore estimate a latent variable model and probabilities are calculated as:

$$D_{it}^* = X_{it}\beta + u_{it} \quad [3]$$

where D_{it}^* is the underlying latent variable that indexes the measure of disability, u_{it} is the random error term with a logistic distribution, X_{it} is a column vector of explanatory variables, and β is a column vector of parameters to be estimated. The dependent variable is $d_{it} = 1$ if $D_{it}^* > 0$ or $d_{it} = 0$ if $D_{it}^* < 0$. This model is estimated as a maximum likelihood logit model and

$$P(d_{it} | X_{it}) = \frac{e^{X_{it}\beta}}{1 + e^{X_{it}\beta}} \quad [4]$$

For comparison with similar research in the UK (Jenkins and Rigg, 2003) we present the results as log odds, expressed as a linear function of the explanatory variables:

$$\ln\left(\frac{p(d_{it} | X_{it})}{1 - p(d_{it} | X_{it})}\right) = X_{it}\beta \quad [5]$$

The effect of a unit change in X on the log odds of the event occurring is thus given by the β coefficient. Because we are using panel data, we estimate a pooled logistic model and adjust the standard errors for clustering at the individual level.

³ The issue of measurement error in the disability variable will be dealt with in future research.

4.2. Model of work decision

The next model we estimate is similar to that presented in Gannon and Nolan (2004), but we now extend this to pooled panel data. The theoretical model assumes that an individual's work decision is determined by a comparison of the offer wage and their reservation wage, where they will work if the offer wage is higher. We do not directly observe the reservation wage, but we do know the outcome of their work decision, so our dependent variable is a dichotomous variable distinguishing those in employment from those not in employment. The structure of the error term in the labour force participation model determines the appropriate model of estimation. We assume the error is normally distributed, and use a maximum likelihood pooled probit model to predict the probability of work. The dependent variable is $y_{it}=1$ if

$Y_{it}^* > 0$ or $y_{it}=0$ if $Y_{it}^* \leq 0$, and the latent variable equation is

$$Y_{it}^* = X_{it}'\beta + u_{it}. \quad [6]$$

Y_{it}^* is the underlying latent variable that indexes the measure of work, u_{it} is the normally distributed stochastic error term, X_{it} is a column vector of explanatory variables, and β is a column vector of parameters to be estimated. Again, this is estimated as a pooled model, so we adjust the standard errors for clustering at the individual level.

The estimated co-efficients from the probit model provide an indication of the direction of effect of an explanatory variable on this probability. In order to determine the change in predicted probabilities in percentage points, that are associated with changes in the explanatory variables, we present also the partial effects. Marginal probability effects are the partial effects of each explanatory variable on the probability that the observed dependent variable equals 1. Firstly, we determine the probability of labour force participation as

$$P(Y_{it} = 1 | X_{it}) = F(X_{it}'\beta) = \Phi(X_{it}'\beta). \quad [7]$$

If the explanatory variable is continuous, then we calculate the marginal probability effect with respect to X_{itk} as:

$$\frac{\partial P(Y_{it} = 1)}{\partial X_{itk}} = \frac{\partial \Phi(X_{it}'\beta)}{\partial X_{itk}} = \phi(X_{it}'\beta) \frac{\partial X_{it}'\beta}{\partial X_{itk}} = \phi(X_{it}'\beta) \beta_k, \quad [8]$$

where k is the k -th element in X_{it} , and ϕ is the standard normal density function and the X_{it} is calculated at the means of the independent variables.

Most of our explanatory variables are dichotomous dummy variables so the marginal probability effects may be interpreted as the change in probability of labour force participation resulting from a change in one category of a variable to another, and we calculate these effects for a discrete variable X as

$P(Y_{it} = 1 | x_{itk} = 1) - (P(Y_{it} = 1 | x_{itk} = 0) = \Phi(X_{1it}\beta) - \Phi(X_{0it}\beta)$, where X_{1it} is a vector of explanatory variables with $X_{itk} = 1$, and X_{0it} is a vector of explanatory variables with $X_{itk} = 0$. X_{1it} and X_{0it} are calculated at the means of the independent variables⁴.

5. RESULTS

5.1. Disability Transitions

Before presenting the results of the logistic model, we first look at those actually observed in the panel survey to experience onset, exit and persistent disability and show some summary statistics. A total of 2,309 adults aged 15-65 were followed throughout the period from 1995 to 2001, so we have $(2,309 \times 7) = 16,163$ observations in all. Out of these observations or “person-waves”, the respondent reported having a chronic illness or disability in 2,489 cases or 16% of the total – so that is the average cross-sectional disability rate over the period. However, not all the observations will be included as “at risk of onset” – because some people reported disability throughout and thus were never “at risk” in that sense, for example. We provide numbers of observations and adults in onset and exit disability states in Table A2. This shows that 1,972 persons were “at risk of onset” over a total of 6,997 observations or person-waves when we use a two-year definition of “at risk”. A total of 166 individuals are then observed to experience onset, in other words start reporting the presence of a chronic illness or disability and do so for at least two years in a row. The number of persons “at risk of exit” is much smaller than the numbers at risk of onset. However, a higher proportion then exit: 138 exits are observed, out of a total of 755 “opportu-

⁴ Alternatively, we could estimate the marginal effects at every observation and then use the sample average of the individual marginal effects, but in large samples both approaches give the same answer, (Greene, 2000).

nities to exit” – occasions when someone in the sample had reported disability in the previous two years and was then observed for two more years. In terms of persistent disability, there are 124 individuals in the sample reported disability in each year from 1995 to 2001, representing almost 6 per cent of all respondents.

In Table 2 we present some summary statistics for individuals in each of the three disability states. Onset of chronic illness/disability is more likely to be reported by older people and by those with lower levels of education qualifications. The probability of onset rises sharply for those over 55 years of age and is much higher for those with no educational qualifications beyond primary level than for those with higher attainment levels – which is in itself associated with age, since older people have lower levels of education on average than younger ones. The opposite pattern to that seen for those experiencing onset is evident for people with an exit from disability. The percentage exiting (as a proportion of all those at risk) seems to fall with age and with level of educational attainment. It also suggests women were more likely to exit than men. Looking in a descriptive fashion at the characteristics of those experiencing disability throughout the panel, we see from Table 2 that persistent disability is most frequent in the older age groups and the lowest educational attainment categories.

Table 2: Onset of Chronic Illness/Disability by Selected Characteristics age<65

	% at risk and experiencing onset of chronic illness/disability	% at risk and experiencing exit from chronic illness/disability	% experiencing persistent chronic illness/disability
Gender			
Men	1.9	9.4	6.2
Women	2.1	16.6	4.0
Age			
15-24	0.6	20.0	1.5
25-34	1.7	20.0	3.2
35-44	1.3	12.7	4.0
45-54	1.7	13.7	6.8
55-64	3.9	8.5	7.5
Education			
Primary/none	3.5	9.5	10.0
Secondary	1.5	15.3	3.3
Third level	1.2	21.8	2.0

We can look further into the incidence of onset, exit or persistent disability for each type of characteristic while controlling for the influence of other individual and household characteristics by estimating the logistic model. In column 1, we predict the likelihood that someone who was at risk of onset will then report a chronic illness or disability, depending on a set of characteristics that we believe might affect that probability. The explanatory variables we use include age, gender, education, labour force status and household composition. Since some of these (for example labour force status) may well be influenced by chronic illness or disability, for those with a disability onset we use values for the explanatory variables measured two years

before onset, while for those with no onset we use the values in the first year they are observed in the panel, i.e. 1995. The results show that age is statistically significant in predicting onset, with the likelihood of onset increasing sharply as one moves from below 45 to 45-54, and then 55-64. Having no educational qualifications increases the odd of becoming disabled, most likely this effect is channelled via the subsequent occupational choice and/or social disadvantage. Individuals in households with one child are more likely to have an onset of disability. This is an unexpected result and may be correlated with gender and/or the number of adults in a household. The other socio-demographic characteristics are not statistically significant in distinguishing those who experience onset – the small number of cases observed to do so reduces the likelihood of detecting such effects. With the exception of the result for one child and working these results are similar to those found by Jenkins and Rigg (2003) using the BHPS data.

The relationship between poverty and disability onset is of particular interest. Onset might well lead to an increased risk of entering poverty, but the relationship may also work the other way: people already in poverty may be more susceptible to chronic illness/disability onset, as the extensive research literature on health inequalities suggests (Burchardt, 2003). To explore this we tested income poverty status before onset as an explanatory variable. This was measured by whether the individual was in a household falling below 60% of median income in the sample, which is a widely used measure of poverty. This turned out to be significant, with individuals living in such households 1.7 times more likely to experience onset of chronic illness or disability than others.

The causal relationship between poverty, education, labour force status and the onset of chronic illness/disability is of course a very complex one, with all these outcomes being inter-linked and each both affecting and potentially affected by disability. The relatively small numbers in the surveys observed with disability onset limit the depth in which this can be explored, but these results provide useful background to the analysis of what happens to employment as onset occurs. As well as analysing what happens when someone starts a period of disability, we look at what happens to employment when a disability spell ends, and so we now turn to how that is captured in the survey and how many people are observed as “exiting” disability.

In the same table, column 2, we present estimates for the probability of exit from a disability. However, we do not find significant age (except for those aged 35-44) or education effects; it does suggest that women, those who are in work (prior to exit) and those with two or more children are more likely to exit disability.⁵ The significant effect of age 35-44 could be related to labour market status, and the importance of returning to work following a short-term disability.

⁵ Poverty status was also tested in the statistical model, but unlike the results for disability onset did not prove significant in predicting exit.

The regression analysis presented in column 3, suggests that those with low education and those aged 35 or over are indeed more likely than better educated and/or younger respondents to have experienced persistent disability. On the other hand, women, those who were in work when first observed in 1995, and those with two or more children have a reduced probability of experiencing persistent disability.⁶

Table 3: Logistic Regression Model of Onset of Chronic Illness/disability

	Odds Ratio		
	Probability of Onset of disability	Probability of exit from disability	Probability of persistent disability
Female	1.2350	2.2120*	0.3456**
No education qualifications	1.5093**	0.7104	2.0133**
Working	1.1724	1.9657**	0.1743**
Two adults	0.9636	1.2772	0.8422
Three + adults	0.9683	0.7861	0.8464
One child	0.5941**	1.3389	0.7011
Two+ children	1.0191	1.8612*	0.5147**
Age 25-34	1.8902	0.3878	2.6970*
35-44	1.7494	0.3162**	4.3517**
45-54	2.7234***	0.4785	3.6792**
55-64	6.7983**	0.4225	2.1617
Year	1.0434	0.8302*	0.9981
N	6997	755	15332
Pseudo R-squared	0.0492	0.0657	0.1277

** Statistically significant at 5% level * Statistically significant at 10% level

Reference category: male, education qualification beyond primary, not working, single adult household, no children, aged 15-24.

5.2. Disability transitions and work

Our aim now is to make use of the dynamic information in relation to disability onset, exit and persistence to deepen our understanding of the impact of disability on paid work. Cross-sectional analysis has shown that those reporting a chronic illness or disability are much less likely to be in employment than those who say they have no such illness or disability. Gannon and Nolan (2004a) showed that about 40% of those reporting a longstanding/chronic illness or disability and of working age in the Living in Ireland Survey were in employment, with the remainder mostly not active in labour force (rather than unemployed). This compared with an employment rate of close to 70% for those not reporting such a condition. Other data sources such as the Census of Population and the Quarterly National Household Survey also show people with disabilities having much lower employment rates than others. These figures are 23.2 and 40.4 per cent respectively (see National Disability Authority, 2005)⁷.

⁶ Once again we also tested poverty status in the statistical model but it was not significant in this case.

⁷ The explicit inclusion of long-term illness in the Living in Ireland Survey and Quarterly

Very much the same picture is seen if we use the full information obtained over the life of panel from 1995-2001 to capture the cross-sectional relationship between disability and employment. If we look over the full dataset at the labour market status of an individual when he or she was reporting the presence of chronic illness or disability, we find that 42% of those reporting illness/disability were in employment at that time, and more than half were inactive in labour force terms, with only 5% unemployed. By contrast, the employment rate was 69% for those not then reporting chronic illness or disability.

However, some key points must be kept in mind in interpreting this cross-sectional pattern for people with disabilities. Not all of that difference in employment rates may be attributable to the presence or absence of disability per se, because those who report disability may also have other characteristics that disadvantage them in the labour market – for example in terms of age, gender, education and skills, or geographic location. Interpretation is further complicated by the fact that some of those other disadvantages may themselves sometimes have been affected by the presence of a long-standing disability – for example, the level of education and skills acquired. Finally, it is not so much the presence of disability itself as the extent to which it restricts the individual and the way that is perceived in the labour market, as well as the extent of broader societal barriers to participation, that matter in terms of employment outcomes.

We now build on those results to deepen the dynamic analysis of disability and labour force participation. It builds on our previous work by carrying out a more in-depth statistical investigation of the impact of disability onset and persistent disability, by incorporating disability exit, and by extending the period of analysis as data for 2001 is now available. We start in by comparing the employment probability of persons reporting an onset of disability with those who were at risk but did not experience onset. We then look at employment rates for those who “exit” from a spell of chronic illness or disability. The next section focuses on the labour force situation of those who reported persistent disability over the course of the panel survey.

Table 4 shows the work status of such individuals one year before the onset of illness/disability, in the year of onset, and in the year following onset of the illness/disability.

National Household Survey increases the proportion of people with disabilities, compared to the Census of Population. About one-quarter of people from the former surveys say they are not restricted in daily activities or work – therefore, this increases the proportion in employment.

**Table 4: Employment Status for Those With Onset of Disability,
Living in Ireland Surveys 1995-2001**

	1 year before onset	Year of onset of chronic illness/disability	Year after Onset
	%	%	%
Employed	61.4	46.4	42.8
Non-employed	38.5	53.6	57.2
N=166			

We see that around 60% of those who become ill or disabled were in employment in the years before onset. Their employment rate falls to about 46% in the year of onset of the illness or disability. One year after onset the employment rate remains well below what it was before the onset of chronic illness or disability, and the inactivity rate is over half compared with one-third before onset. These results are broadly similar to those presented in Gannon and Nolan (2004a) using data from 1995 to 1999, but can be taken with more confidence because they are based on a greater number of cases in the longer panel now available.⁸

These figures, although still based on only a relatively small number of cases in the data, certainly suggest that onset of disability is indeed associated with a substantial decline in the employment rate. Two further points are worth noting about the level of their employment rate before and after onset. The first is that even before onset their employment rate was below the overall average, at about 60% rather than 70%. Secondly, though, their employment rate in the year after onset, at just over 40%, is as low as the overall average for all those reporting chronic illness or disability, which will include some people who have been in that situation for much longer (as well as some only reporting it for the first time). So in terms of the 40%-70% contrast in employment rates between those with versus without a disability highlighted earlier, for these individuals about two-thirds of that gap seems to be reasonably attributable to the onset of disability and the fact that it has lasted at least over two waves of the panel; the remaining one-third of the gap is then attributable to “selection effects” – the pre-existing labour market disadvantages that these individuals had, in terms of education etc., before onset.

It is particularly interesting to know what distinguishes the people who leave employment following onset of a chronic illness or disability from those who do not, so we look at their profiles in terms of some key characteristics. Table 5 compares the profile of those who leave employment in the year of onset, those who remain employed in the year of onset but have left by the following year, and those who remained in employment throughout. We see that women and persons with no educational qualifications constitute a much higher proportion of those who leave employment than of those who do not. On the other hand the groups are not markedly different in terms of age or family composition. Unfortunately the sample sizes in these different

⁸ See Gannon and Nolan (2004a) Table 7.8, p. 50.

groups are not large enough to support a formal statistical analysis to see whether these suggestive differences are in fact significant in statistical terms.

Table 5: Characteristics of Those Experiencing Onset of Chronic Illness/Disability by Employment Status, Age 15-65

	Employed in year before onset, not employed in year of onset	Employed in year before and year of onset, not employed in year after onset	Employed in year before, of and after onset
	%	%	%
Female	59	64	40
No qualifications	45	54	29
Mean age	45	52	46
Mean number of children	1.0	0.6	0.8
Mean number of adults	2.4	2.7	2.5
N	102	77	71

We now estimate a probit model to see how much disability onset seems to affect the probability of leaving work having been employed in the previous year. This allows us look at the contribution which disability onset on its own makes, having controlled for other factors. It calculates probabilities relative to the omitted reference category, and the results are in Table 6 in terms of the implied marginal effects of each variable compared with someone who did not experience onset, is a man, is in the omitted age category of under 25 etc.

The first column of the table shows that if the only explanatory variable included in the model is disability onset, then individuals with an onset are 23 percentage points more likely to stop working than the omitted category, who were at risk but did not experience onset. About 5% of that reference category stopped working from one year to the next, so this is the baseline figure against which the effects of an onset of chronic illness or disability are assessed. This means that about 28 per cent of people with an onset will stop work compared to only 5 per cent of those without an onset.

Table 6: Onset of Chronic Illness/Disability and Probability of Stopping Work, Age 15-65

	Onset of Chronic Illness/Disability Only	+Personal Characteristics	+Household circumstances	+Education
Onset of chronic illness/disability	0.2314**	0.2082**	0.2043**	0.1939**
Female		0.0650**	0.0649**	0.0673**
Age 25-34		-0.0233**	-0.0224**	-0.0247**
35-44		-0.0292**	-0.0351**	-0.0391**
45-54		-0.0291**	-0.0309**	-0.0369**
55-64		0.0010	0.0081	-0.0057
2 adults in household			-0.0040	-0.0012
3 or more adults in household			0.0060	0.0059
1 child in household			0.0088	0.0078
2 or more children in household			0.0309**	0.0296**
No education qualifications				0.0357**
Year	-0.0032	-0.0034	-0.0029	-0.0024
R squared	0.0261	0.0769	0.0843	0.0919
N	4802	4802	4802	4802

** Statistically significant at 5% level * Statistically significant at 10% level

When we control for age and gender in the second column, we see that women and older workers are more likely to stop working, and when this is taken into account the estimated effect of disability onset falls slightly to 20 percentage points. In the third column we incorporate some household characteristics as explanatory variables, and see that individuals in households with two or more children are more likely to stop working, but the estimated effect of disability is not affected. In the final column we introduce having no educational qualifications and this does increase the individual's probability of stopping work, but once again this makes no difference to the impact of disability onset. So the results of formal statistical analysis confirm the broad picture conveyed by the comparison of employment rates before and after disability onset, that a reduction of about 20 percentage points is associated with onset.

As noted earlier, it is not only the presence but also the severity of a chronic illness or disability that may be critical in determining its impact. We can examine this by replacing the variable capturing disability onset with three variables, for onset of a chronic illness or disability that hampers the person in their daily activities severely, to some extent, or not at all. The results show that those reporting onset but not hampered in daily activities have a lower probability of working by 10 percentage points, compared to those without an onset of chronic illness or disability. For those who are hampered severely or to some extent by the chronic illness or disability, the percentage predicted to be working is much lower; the predicted impact of onset of a hampering disability is now a reduction of the order of 30 percentage points, controlling for other factors. There are however very few cases where we observe onset of a severely hampering disability, so the effect of onset of a disability that hampers severely versus to some extent cannot be reliably distinguished.

As well as the individual's own characteristics and their household composition, it might well be that the economic circumstances in which they find themselves affect whether they stay in employment having experienced onset of disability. In particular, being in a disadvantaged household before onset may affect the relationship between disability onset and employment. We tested for such an effect by including as an additional explanatory variable whether in the year before onset the person was in a household falling below 60% of median income. The results show that coming from such a household does increase the likelihood that the person will stop working, by about 7 percentage points. This may be related to a range of factors such as disability or education levels. Those who experience disability onset may do so because their level of income was so low that leaving their jobs and becoming dependent on social transfers is a profitable option. Their reservation wages may be pushed up, therefore hindering their labour participation. In our model, the effects of onset remain the same when include previous poverty status – however, due to the potential endogeneity of poverty status, it is difficult to conclude whether or not those in lower income are more likely to leave work after disability onset⁹.

⁹ Earlier on in this paper, we saw that poverty does impact on disability onset, so there is a

If the likelihood of being in work declines substantially when disability onset occurs, It is also clearly of interest to look at what happens when someone who has been reporting a chronic illness or disability stops doing so – does their employment rate go back up? We now turn to exit from disability and the probability of being in work. In terms of exit from disability, we found there were 72 cases in the sample aged under 65 who reported a chronic illness or disability for two years and then reported no such illness or disability for the next two years, and Table 7 shows the employment rate for these people in the year before disability “exit”, the year of exit, and the following year. We see that 50 per cent were employed when they reported the chronic illness or disability. This rose to 58 per cent in the year they stopped reporting such an illness or disability, and was slightly lower in the next year. This is quite a substantial increase in the employment rate when we consider that we have concentrated on those who had the chronic illness or disability for at least two years, and also does not suggest any significant lag between exit from that status and the increase in proportion employed, though it is of course confined to those who then remain free of disability over the two-year period.

Table 7: Employment Status for those Exiting from Chronic Illness/Disability

	Year Before Exit	Year of Exit from Chronic Illness/Disability	Year after Exit
	%	%	%
Employed	50.0	58.3	56.2
Non-employed	50.0	41.7	43.8
Inactive			
N=72			

We then estimate a probit model of the probability of being in work for the entire sample of individuals who had a chronic illness or disability for the previous two years. The results in Table 8 show that those who exit disability are 10 percentage points more likely to be in work than those at risk who do not exit. However, when we enter additional explanatory variables to control for other factors such as age, gender, and having no educational qualifications, the effect of exiting disability was no longer significant. Individuals who exited from disability had the same probability of getting work as other individuals who were at risk of exit but did not recover from their disability. This implies the longer-term effects of disability are also significant in terms of future employment.

plausible hypothesis that people from lower incomes will be more likely to leave employment once they acquire a disability. The relationship between poverty, disability and education is complex, and warrants a complete model that is beyond the scope of this paper.

This increase in the probability of being in employment is smaller than the reduction associated with disability onset that we estimated in the previous section. There is no reason to expect that one would simply offset the other; apart from anything else, the same people do not simply “flow” into and out of disability, since some of those experiencing onset do not exit. In addition, even if the same people were involved it could well be that different processes operate in the labour market in terms of employment retention on disability onset versus returning to employment on disability exit.

Table 8: Exit from Chronic Illness/Disability and Probability of Being in Work, aged 15-65

	Exit from Chronic Illness/Disability only	+ personal characteristics	+ household characteristics	+education
Exit from chronic illness/disability	0.1039**	0.0723**	0.0693*	0.0574
Female		-0.0372	-0.0263	-0.0371
Age 25-34		-0.0819**	-0.0778**	-0.0688**
35-44		-0.1093**	-0.1045**	-0.0932**
45-54		-0.1871**	-0.1991**	-0.1611**
55-64		-0.3434**	-0.3654**	-0.3162**
Two adults			-0.0218	-0.0295
Three + adults			0.0282	0.0154
One child			-0.0485*	-0.0471*
Two+ children			0.0217	0.0214
No education qualifications				-0.0676**
Year	-0.0247**	-0.0097	-0.0087	-0.0092
Pseudo R ²	0.0273	0.1950	0.2276	0.2510
N	488	488	488	488

** Statistically significant at 5% level * Statistically significant at 10% level

Over the life of the panel survey, 124 individuals of working age reported a chronic illness or disability throughout. As we saw earlier, these individuals are more likely than those with shorter or no experience of disability to be male, older, and have low education levels. Over half of those reporting chronic illness or disability throughout were not working in any of the survey waves. This compares with 25% for those who reported disability onset during the period, and 18% for those not reporting any chronic illness or disability throughout the panel. Differences in the number of years spent employed or non-employed could be partly due to other characteristics such as gender, age or education, so we now estimate formal statistical models to try to disentangle these effects. We take all working-age adults in the sample, and look at the probability that they were in employment in a given wave of the panel – so the number of observations is again the total number of adults by the number of waves we observe them. In Table 9 we estimate the model to look at the effect of persistent disability on the probability of being at work. The first point of comparison is with those reporting no disability throughout the panel, and these are used as the reference category. Secondly, it is also of interest to compare those experiencing

persistent disability with those who reported disability onset, disability exit, and other durations or trajectories of disability over the life of the panel, so these are also included among the variables in the estimated model.¹⁰ Each adult is included in the regression each time they are observed in the panel – so someone reporting onset will be counted first as a person without disability and then as a person who has reported onset; their labour force status at each of those points in time is what the model seeks to understand. We look first at the results when only the variables relating to disability are included, and then at what happens to these estimates when other individual and household characteristics are added to the model as explanatory factors.

Table 9: Persistent Chronic Illness/Disability and Probability of Being in Work

	Pr(Working) Base	Personal Characteristics	Household Circumstances	Education
Chronic illness/disability for entire panel	-0.4190**	-0.4695**	-0.4387**	-0.4138**
Disability onset	-0.2621**	-0.2204**	-0.2032**	-0.1865**
Disability exit	-0.1421**	-0.1044**	-0.0688	-0.0554
Other disability trajectory	-0.1428**	-0.1041**	-0.0840**	-0.0678**
Female		-0.3547**	-0.3715**	-0.3808**
Age 25-34		0.0984**	0.0987**	0.1181**
35-44		0.0586**	0.0789**	0.1052**
44-54		-0.0165	-0.0121	0.0348
55-65		-0.2433**	-0.2712**	-0.2008**
Adult2			-0.0183	-0.0301
Adult3			-0.0546	-0.0558
Child1			-0.0013	0.0025
Child2			-0.0573**	-0.0523**
Poor in previous year			-0.3858**	-0.3561**
No education qualifications				-0.1403**
Year	0.0213**	0.0279**	0.0281**	0.0260**
N	15332	15332	15321	15321
R squared	0.0422	0.1780	0.2366	0.2460

** Statistically significant at 5% level * Statistically significant at 10% level

We see in the first column that persistent disability has a marked impact on the probability of being in work, reducing it by 42 percentage points compared with the reference category. That category comprises those reporting no disability throughout the panel, and for those individuals 70% were in employment in a given wave. This

¹⁰ This could be, for example, someone reporting disability but for only one year – since we only count it as an “onset” if it lasts at least two years – or someone reporting disability in six out of the seven years – since we only count an “exit” lasting two years or more will be counted in this “other” category in the years they are reporting disability, and in the reference category in the other years. Similarly, someone reporting chronic illness or disability every second year will fall into this other category when they are reporting disability.

means that for those who always reported a disability, the predicted employment rate is only 28% (that is, 70%-42%). Controlling for age and gender (in column 2) actually increases the estimated effect of persistent disability, but when household characteristics and the individual's education levels are included (in columns 3 and 4) that effect falls back again to about the level seen without any controls. So the impact of persistent disability throughout the panel survey on the likelihood of being in work is very substantial indeed.¹¹ (As explained earlier, capturing the severity of persistent disability for individuals over the period proved difficult since it proved quite variable from one year to the next, so we have not sought to incorporate that into our analysis of persistence.)

The results also show that those who reported disability onset, disability exit or other disability trajectories are less likely to be in employment in a given wave than those who reported no disability, but that gap is considerably less than for those persistently reporting disability. (The point of reference being used here for these people is not the same as in the earlier analysis focused on onset and exit, where the comparison was with those "at risk"; we include them here where the reference group is those experiencing no disability in order to allow a direct comparison with the impact of persistent disability.)

6. CONCLUSIONS

This paper has sought to deepen our understanding of differences in employment rates between people with and without disabilities, in a dynamic perspective. We aimed to differentiate the transitions into and out of a disability state. Analysis of the characteristics associated with an increased risk of onset showed that older people are more likely to become ill or disabled. Having been in a low-income household in the previous year was also associated with an increased probability of disability onset. Among all those "at risk", persons initially in work seemed more likely than others to report exiting disability. Those experiencing persistent disability were seen to be disproportionately older and poorly educated.

We then examined what happens to employment after an "onset" of disability. Having taken a range of personal and household characteristics into account, the onset of disability was associated with a decline of about 20 percentage points in the probability of being active in the labour force. We then focused on those observed in

¹¹ Note that in looking at the impact of different disability experiences Gannon and Nolan (2004a) looked at the employment rate in 2000 of those who had experienced persistent disability (and other durations), whereas here we have incorporated employment over the entire period from 1995 to 2001.

the panel “exiting” chronic illness or disability. Further analysis of these individuals confirmed that exiting disability was associated with an increase of about 7 percentage points in the probability of being in employment, having controlled for personal and household characteristics. Finally, we showed that persistent disability - reporting chronic illness or disability throughout the seven years of the panel survey - was associated with a greatly reduced likelihood of being in employment. Only 13% of these individuals were in employment throughout the period. When a range of personal and household characteristics was taken into account, such persistent disability was shown by statistical analysis to be associated with a 42 percentage point reduction in the likelihood of being in employment.

These findings deepen our knowledge and understanding of the impact of disability on employment. They complement the evidence from previous research about the impact of persistent disability in the probability of being in work. Furthermore, they quantify the impact of disability onset, exit and persistence of disability on employment probability, having taken other characteristics of the individual and their household into account. They show that not only persistent disability but also disability onset are associated with a very substantial reduction in the likelihood that someone will be in employment. This poses a major challenge for policy in relation to tackling the many-faceted barriers to obtaining and maintaining employment that face people with disabilities.

While this paper aimed to explore various strands of disability duration, we acknowledge the caveat that self-reported disability may be endogenous with respect to employment status. Furthermore, if reporting of disability in the survey is prone to measurement error, the true effect of disability may be inaccurately estimated. In this paper disability is treated as exogenous, and our results therefore provide a foundation on which to build more complex dynamic models. To estimate a complete dynamic model with these variables onset, exit and persistent disability, could be problematic due to the small number of cases in the disability trajectories, but this will be explored in future research.

7. REFERENCES

- BARTEL, A. AND TAUBMAN, P., 1979. "Health and Labour Market Success: The Role of Various Diseases" *The Review of Economics and Statistics* 1979, LXI (1): 1-8.
- BOUND, J, SCHOENBAUM, M., STINEBRICKNER, T.R. AND T. WAIDMANN. The Dynamic Effects of Health on the Labor Force Transitions of Older Workers. *Labour Economics*, 1999, 6(2): 179-202.
- BURCHARDT, T. (2003), *Being and becoming: Social Exclusion and the onset of disability*. Centre for Analysis of Social Exclusion, Report 21, London School of Economics.
- CHIROKOS, T. AND NESTEL, G., 1985. "Further Evidence on the Economic Effects of Poor Health" *The Review of Economics and Statistics*, LXVII(1): 61-69.
- DISNEY, R., EMMERSON, C. AND M. WAKEFIELD. III Health and Retirement in Britain: A panel data-based analysis, 2004. *IFS Working paper*.
- GANNON, B. (2005), "A dynamic analysis of disability and labour force participation in Ireland 1995-2000", *Health Economics*, 14, 925-938.
- GANNON, B. AND B. NOLAN (2004a), *Disability and Labour Market Participation*, Equality Authority: Dublin.
- GANNON, B. AND B. NOLAN (2004b), "Disability and Labour Market Participation in Ireland", *Economic and Social Review*, 35 (2), 135-155, 2004.
- JENKINS, S. AND J. RIGG (2003). *Disability and Disadvantage: Selection, onset and duration effects*, ISER Working paper 2003-18, University of Essex.
- KIDD, M., SLOANE, P. AND I. FERKO.KI, 2000. "Disability and the labour market: an analysis of British males" *Journal of Health Economics*, 19:961-981.
- LINDEBOOM, M. AND M. KERKHOF. Subjective Health Measures, Reporting Errors and the Endogenous Relationship between Health and Work. IZA Discussion Paper No. 457, March 2002.
- NATIONAL DISABILITY AUTHORITY, *DISABILITY AND WORK: The picture we learn from official statistics*, 2005, Disability Research Series 1, National Disability Authority, Dublin.
- WORLD HEALTH ORGANISATION, *ICIDH-2 INTERNATIONAL CLASSIFICATION OF FUNCTIONING AND DISABILITY*, 1999, Beta 2-Draft, Full Version, Geneva.

Appendix 1

Table A1: Variable definitions and summary statistics

Variable	Definition
Disability Onset	=1 if at risk (no disability) for two years, followed by onset of disability that continues for two years, =0 otherwise
Disability Exit	=1 if at risk (disabled) for two years, followed by exit from disability that continues for two years, =0 otherwise
Persistent Disability	=1 if report a disability in each year of panel, =0 otherwise
Other Disability Trajectory	=1 if report other transitions into and out of disability, =0 otherwise (Base category=no disability in any year)
Employed	=1 if employed, =0 otherwise
Age 15-24	=1 if aged 15-24 years, =0 otherwise
Age 25-34	=1 if aged 25-34 years, =0 otherwise
Age 35-44	=1 if aged 35-44 years, =0 otherwise
Age 45-54	=1 if aged 45-54 years, =0 otherwise (Base category=aged 55-64 years)
No educational qualifications	=1 if have no educational qualifications or highest level of education completed is primary, =0 otherwise (Base category= highest level of education completed is secondary or third level)
2 adults in household	=1 if 2 adults in household, =0 otherwise
3+ adults in household	=1 if 3 or more adults in household, =0 otherwise (Base category = single adult household)
1 child in household	=1 if 1 child in household, =0 otherwise
2+ children in household	=1 if 2 or more children in household, =0 otherwise
Poverty	=1 if net household income falls below 60% of median income

**Table A2: Onset and Exit in Chronic Illness/Disability,
Living in Ireland Survey 1995-2001**

	Total at risk	Onset of chronic illness/disability	At risk but no onset
Number of Persons	1,972	166	1,806
Number of person-waves	6,997	166	6,831
% of total person-waves	100	2.4	97.6
	Total at risk	Exit from Chronic Illness/Disability	At risk but no exit
Number of Persons	333	96	237
Number of person-waves	755	96	659
% of person-waves	100	13.0	87.0

