Disability

SUMMARY

Important policy issues arise from the high and growing number of people claiming disability benefits for reasons of incapacity for work in OECD countries. Economic conditions play an important part in explaining both the stock of disability benefit claimants and inflows to and outflows from that stock. Employing a variety of cross-country and country-specific household panel data sets, as well as administrative data, we find strong evidence that local variations in unemployment have an important explanatory role for disability benefit receipt, with higher total enrolments, lower outflows from rolls and, often, higher inflows into disability rolls in regions and periods of above-average unemployment. In understanding the nature of the cyclical fluctuations and trends in disability it is important to distinguish between work disability and health disability. The former is likely to be influenced by economic conditions and welfare programmes while the latter evolves in a slower fashion with medical technology and demographic changes. There is little evidence of health disability being related to the business cycle, so cyclical variations are driven by work disability. The rise in unemployment due to the current global economic crisis is expected to increase the number of disability insurance claimants.

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Disability, capacity for work and the business cycle: an international perspective

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1. INTRODUCTION

The study of disability programmes and disability policies has become one of the most important and challenging issues in social policy. For the economist, the analysis of these programmes lies at the intersection of several fields including public economics, labour economics and health economics, and interacts with related areas such as public policy, public health and demography. For the policy-maker, the apparent inexorable rise in the number of disability claimants in a number of countries, and the looming issue of demographic ageing, which has possible consequences for the overall morbidity of the population, heighten the importance of the issue (Lutz *et al.*, 2008; Diamond, 2007).

The costs of disability programmes have grown substantially in recent decades among OECD countries, and the recipiency rates as a proportion of working-age

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population have increased in most of those countries since 1990 (OECD, 2009). In 2005 there were approximately 26 million claimants for disability benefits in the European Union (EU) countries (adding Norway and Iceland), equivalent to approximately 5% of the employed workforce. These numbers have grown by around 5 million since the start of the decade. The direct costs of payments of disability benefits constitute around 2% of EU GDP, but ancillary health expenditures and other associated forms of social protection raise the share of disability-related benefits in GDP still further. In the United States, more than 7.7 million workers receive disability benefits through the Social Security Disability Insurance programme (SSDI), and another 4.4 million through the Supplemental Security Income programme (SSI), as well as over 3 million spouses and children. Furthermore, over 2 million Americans apply to each of these programmes every year.

This paper analyses how economic conditions affect claims for work-related disability benefits in a number of OECD countries.[1] The particular focus is on the relation between work-related disability and the business cycle, as measured by variation in unemployment rates. 'Work-related' does not simply mean claims for disability benefits that arise from narrow work-related causes such as industrial injuries and accidents, but rather the whole range of social insurance-based disability insurance programmes that are available in most developed economies. The paper does not, however, explicitly study programmes that are designed to provide care in the community for the elderly or infirm, and for those that have never worked. It is the trend in disability-related social insurance programmes that has tended to cause most concern to policy-makers, and these programmes form the primary interest here.

1.1. Disability programmes and the business cycle

The main proposition of the paper is that disability insurance programmes have been used to cushion recessions and to alleviate transitions into economic inactivity in regions and times of high unemployment across most OECD countries. Our cross-country results confirm studies in particular countries, such as Beale and Nethercott (1988), Beatty and Fothergill (1996), Black *et al.* (2002), Disney and Webb (1991) and McVicar (2006). In addition, disability programmes have often been used as an alternative to early retirement through pension programmes, either because of restrictions on early retirement through conventional pension plans, or because disability programmes offer more attractive benefit levels or tax treatment of retirement benefits (as suggested by Riphahn, 1997; Blöndal and Scarpetta,

[1] OECD (2006 and 2007) provide an analysis of the disability programmes in seven OECD countries, with very detailed descriptions of the programmes and an excellent exploratory discussion of the possible economic and policy explanations for the particular evolutions of the programmes in those countries. OECD (2009) summarizes and extends many of those discussions and provides the motivational background for more detailed econometric analyses like the ones we present in this paper.

1999; Gruber and Kubik, 1997; Gruber and Wise, 1999, 2004; Haveman and Wolfe, 1984; Haveman *et al.*, 1991; Jiménez-Martin *et al.*, 2006; Jiménez-Martin and Vall-Castelló, 2009). This alternative 'route' into inactivity for older people proved particularly attractive when employers were seeking to shed older workers in periods of recession such as the mid-1970s and the early 1980s.

The link between the size of disability-related social insurance programmes and the business cycle is therefore again of heightened importance since mid-2008 when the world economy entered a major downturn. However, it should not be thought that the business cycle is the only driving force behind the trend in claims for disability benefits. Indeed, for much of the 1990s and the early 2000s, unemployment rates were falling and yet rates of disability claims remained high or even increased in many OECD countries. Other factors, including the trend in the relative generosity of disability benefits relative to other social insurance benefits, and underlying demographic and morbidity trends, are also relevant.

In the context of this rising trend, several high profile studies, such as Autor and Duggan (2003, 2006) and Burkhauser and Daly (2001) in the United States, and OECD (2006, 2007 and 2009) more generally, have pointed to trends in the relative generosity of disability benefit programmes as an important explanatory variable in explaining the trend in claimant numbers. In addition, low exit rates from receipt of disability benefits may induce 'ratchet' effects by which the stock remains high after periods of high inflows during economic downturns. The underlying character of this trend, and the need for action, has therefore been noted by the OECD:

> Sickness and disability policy should be a key economic concern in all OECD countries... Medical conditions are increasingly proving an obstacle to raising labour force participation rates and keeping public expenditures under control... Unemployment has fallen to very low levels in recent years in the OECD area, yet nowhere has this drop translated into more jobs for disabled people. With increasingly stricter work requirements in unemployment and social assistance programmes, and gradual retrenchment of early retirement systems, the pressure on long-term sickness and disability schemes has increased. This has in turn led to rising numbers of working-age people drawing these benefits and more public spending on them. There is now an urgent need to address this 'medicalisation' of labour market problems. (OECD, 2006, p. 5)

1.2. Disability and the capacity for work

A key issue is the connection between disability and the capacity for work. We think it useful to make a distinction between work disability and health disability. The former is likely to be influenced by economic conditions and by welfare programmes while the latter evolves in a slower fashion with medical technology and demographic changes.

The seminal work on the incidence of disability is that of Nagi (1964, 1969 and 1991), supplemented by the classifications by the WHO (1980).[2] Nagi argues that a health disability can have many sources and many different impacts on the ability of an individual to function in society. While many disabling conditions have at source a serious health problem resulting from an illness or an accident, in many other cases they are congenital or arise as the result of conditions which might not affect the general health of the individual. The evolution of *health* disability can in general be identified through the changes in objective health measures in a given population.

In contrast, one of the main challenges of defining *work* disability as a condition that limits or even prevents work is that measured or self-reported work disability can be a function of the type of work and the attitudes of the individual towards the labour market and life in general. Work disability is a socially evolving concept, related to how society and employers accommodate the needs of individuals with certain conditions, including availability of part-time work and possible incentives to employer hiring or re-hiring of individuals with a disability.[3] In addition, work disability is also a function of individuals' willingness to continue their attachment to the labour force and can thereby also be a function of economic conditions. Crucially, too, while certain types of health disability may be regarded as 'absorbing states', 'work disability' is potentially a temporary state.[4] This may be an important consideration when designing the administration and incentive structure of a disability insurance programme.

Assessing the potential impact of economic conditions on work disability while controlling for country-level incentive structures, and where possible for the individual-specific characteristics of the populations under investigation including health disability, is the main objective of this study. Given differences in official definitions of disability across countries then, for the size of the programmes to change significantly over the business cycle, it must be the case that the pool of eligible individuals in the programmes and outside of the programmes evolves over the cycle (i.e. induced entry and, possibly, exit). Of course, this variation in the pool of applicants can be the result of strategic actions by governments (especially by European governments), which in specific circumstances can see it as politically beneficial to relax eligibility conditions for the disability rolls in order to keep the unemployment rate from increasing too sharply (see Hassink *et al.*, 1997; Westerhout, 2001; Koning

[2] Recent discussions of the definition of disability can be found in Wunderlich *et al.* (2002), Social Security Advisory Board (2003) and Burkhauser *et al.* (2003).

[3] Labour demand-side considerations, while important, are not the focus of our work, mainly due to the difficulty identifying them separately from local economic conditions and time effects in the data sets we are using. We thank A. van Soest for his comments on this issue, which provide us with a roadmap for extending our work to better account for this issue. Stapleton and Burkhauser (2003), and Kapteyn *et al.* (2007) discuss this issue in more detail. Koning (2009) provides an interesting analysis of the consequences of letting employers bear part of the cost of disability, with sizeable reductions in the inflow into disability in the Netherlands at the beginning of this decade.

[4] By an 'absorbing state', we mean that the probability of the individual subsequently exiting that state is close to zero.

and van Vuuren, 2007, 2008). While it is thereby easy to understand that disability applications are likely to increase during recessions, the likelihood of seeing considerable changes in the number of individuals receiving benefits depends on government policies implemented to deal with the flow of individuals who struggle to keep their jobs during bad economic times, and on the incentives set up in the first place by the disability programmes to screen individuals.

Finally, while it is natural to focus on the effects that recessions can have on the cost of social insurance programmes, we should also not forget the effects of the good times on these programmes. Disability programmes have to be flexible enough to benefit from the good phase of the cycle, in order to compensate for their increased cost during recessions. In order to do that, systems have to be structured to allow individuals to go back to work easily without excessive penalty. Budgetary savings can be considerable if the system is designed to keep as many people working as possible.

1.3. Structure and main findings of the paper

The empirical strategy to test these various propositions is as follows. We first examine whether there is a relationship between, on the one hand, disability claim rates and disability claim transition rates and, on the other hand, unemployment rates. This is done across a number of economies, using both cross-country and country-specific panel data. In doing this, we look for broad relationships within and across OECD countries by using large-scale household data sets, rather than focusing on the consequences of specific institutional settings (such as the design of disability benefit regimes within countries). This paper is not, therefore, primarily a study of incentives within country-specific benefit regimes.

The general strategy in the cross-country analysis is to control for individual characteristics and to condition on country effects and a common time trend. Although alternative specifications are tested, primary identification is obtained off time-varying within-country spatial differences in unemployment rates. We show that there is a robust relationship between unemployment rates and disability claims, and also a reasonably strong relationship between outflows from disability insurance registers and spatial unemployment rates. In contrast, the statistical relationship between inflow rates and unemployment rates is sometimes weaker in Europe, but stronger in the United States.

These relationships are then explored using panel data and administrative data in four countries with very different institutional settings: Germany, Spain, the United Kingdom and the United States. The results from these studies broadly confirm the findings of the cross-country panel data studies.

The next consideration is whether these relationships in work disability may arise from, or be affected by, changes in health disability over time. For example, the stress associated with seeking or retaining employment in areas where work is hard

to find may have an adverse effect on individual health. In other words, one hypothesis is that changes in work and health disability are highly correlated and vary across differences in unemployment rates. To test this hypothesis, we initially look at general self-reported disability measures. We show, using Labour Force Survey data, that there is a correlation, albeit non-linear, between general measures of self-reported disability and unemployment rates. The paper also examines whether including such general individual self-reported health states affect the relationship between disability insurance claims and unemployment rates that we have already identified.

A natural problem with broad self-reported measures of general 'health disability' is that they suffer from various forms of response bias; notably that individuals who receive disability benefits have an incentive to report a health disability, especially where the 'gateways' to access disability benefits do not adequately screen health disabilities, for whatever reason. In addition, individuals may simply rationalize or 'justify' their health *ex post* as characterized as poor in situations where jobs are hard to find. Self-reported general measures of poor health may therefore be poor 'proxies' for underlying health disability, as argued (to support it, or prove otherwise) by many studies including Bound (1991), Bound *et al.* (1999), Dwyer and Mitchell (1999), Benítez-Silva *et al.* (2004), Baker *et al.* (2004), Disney *et al.* (2006), and so on.

In the light of this possibility, the interaction between 'health disability' and 'work disability' is examined further by using some of the individual country panels to look at variations in more 'objective' measures of health disability across different levels of unemployment. And it finds very little evidence that these measures of individual disabilities are correlated with unemployment rates – indeed, if anything, the opposite is the case for many forms of incapacity and ill-health. This result accords with other statistical and epidemiological literature which notes that accident-related disabilities and the onset of physical incapacities are often *pro-cyclical* – that is, associated with periods of high economic activity. The exception – and it is an important one – is certain types of stress, depression and mental health issues, which are often related to factors such as an unemployed member of the household or the threat of unemployment (though other indicators of 'boom' periods, such as high household indebtedness, may also be a contributing factor).

These results, when we incorporate health measures, suggest two conclusions. First, that the changes in health disability and work disability over the business cycle are not positively correlated – changes in health disability are not the primary drivers of changes in spells of disability benefit receipt over the cycle. Second, the observed correlation between overall self-reported health and unemployment rates may indeed be some form of reporting bias or justification bias, insofar as the correlation of the risk of unemployment with individual specific (physical) health conditions is more likely to be negative. This provides strong support for the idea that other factors, most notably explicit or implicit changes in the rules by which disability benefit

eligibility is determined over the business cycle, must be the primary drivers of the relationship between disability benefit receipt and the unemployment rate.

The paper concludes with a tentative discussion of the policy issues that arise from these findings. Two broad conclusions stand out. First, the disability insurance regime must be based on a clear understanding of the differing character of work and health disability. For example, tight (or tightening of) screening of new applicants for benefits on the presumption that disability, once accepted, will be of long duration, will not handle the potential cyclicality of the underlying demand for disability benefits. Second, disincentives to return to work may be considerable for benefit recipients if health and work disability are confused. For example, consideration could be given to easing this transition by paying some health-related disability benefits independent of work status, for example, or to consider more carefully an 'availability of work' test rather than simple tests based on 'health-work capacity'.

2. PREVALENCE OF DISABILITY ACROSS EUROPEAN COUNTRIES

This section explores the relationship between receipt of disability benefits (DB) and the business cycle, proxied by the unemployment rate, across the European Union using data from various sources. It first looks at the relationship between receipt of disability benefits and local unemployment rates, using unbalanced panels derived from the European Community Household Panel (ECHP), and the Survey of Income and Living Conditions (SILC). Later it uses various national surveys and examines the relationship between self-reported disability in general, and local economic conditions, using the 2002 Labour Force Survey Special module on disability.

Before moving on to the detailed analysis, Table 1 presents statistics that show the importance of the Disability Insurance (DB) programme in relation to expenditure on social protection (SPE) and other programmes (Old Age and Health Care) for the EU 27 countries. Social protection expenditure as a percentage of GDP varies from 32.0 in Sweden to 12.4 in Latvia. The fraction of SPE devoted to Disability Insurance also varies a great deal across EU countries: from 4.8% of the GDP in Sweden to 1.3% in the United States and 0.7% in Cyprus. These variations reflect a combination of variations in underlying programme generosity (such as replacement rates and maximum durations) and in how easy it is to access particular benefits.

2.1. Receipt of disability benefits and local unemployment conditions

We now examine the relationship between receipt of disability benefits and local unemployment conditions, starting with European cross-country household panels before moving on to examine specific economies. The general regression specification is of the following type:

Table 1. Expenditure on social protection (as a percentage of GDP), 2005

	Social protection	Old-age and survivor	Sickness/ health care	Disability benefit
EU 27	27.2	12.0	7.5	2.1
Belgium	29.7	12.7	7.7	2.0
Bulgaria	16.1	7.9	4.5	1.3
Czech Rep	19.1	7.9	6.5	1.4
Denmark	30.1	11.0	6.1	4.2
Germany	29.4	12.4	7.8	2.2
Estonia	12.5	5.4	3.9	1.2
Ireland	18.2	4.5	6.9	0.9
Greece	24.2	12.0	6.5	1.2
Spain	20.8	8.4	6.4	1.5
France	31.5	13.0	8.8	1.8
Italy	26.4	15.5	6.8	1.5
Cyprus	18.2	8.3	4.5	0.7
Latvia	12.4	5.7	3.1	1.1
Lithuania	13.2	6.0	3.9	1.3
Luxemburg	21.9	7.9	5.5	2.8
Hungary	21.9	9.1	6.4	2.1
Malta	18.3	9.5	4.8	1.2
Netherlands	28.2	11.1	8.1	2.6
Austria	28.8	13.5	7.1	2.2
Poland	19.6	11.5	3.8	2.0
Portugal	24.7[a]	10.9	7.0	2.4
Romania	14.2	5.7	5.0	1.0
Slovenia	23.4	10.2	7.4	2.0
Slovakia	16.9	7.0	4.8	1.5
Finland	26.7	9.6	6.7	3.4
Sweden	32.0	12.5	7.5	4.8
United Kingdom	26.8	11.8	8.1	2.4
United States	15.9	6.1	7.0	1.3

[a]Data corresponds to 2004.

Source: Eurostat 2008.

$$DB\ measure_{i,t} = \alpha + \beta * u\text{-}rate_{r,t} + \gamma * controls_{i,r,t} + \varepsilon_{it}$$

where, using the various disability benefit (DB) measures (DB inflow, DB outflow, DB stock), we estimate the probability that individual i at time t living in region r moves into/exits/remains in receipt of disability benefit. The primary interest is in β above, namely the impact of the local (or regional) unemployment rate (*u-rate*) on the observed individual disability benefit state or state transition. The basic controls (depending on the specification) are individual controls for age and gender, country dummies and time dummies.

The reasoning behind this specification is straightforward: it tests using disaggregated spatial data whether, controlling for personal characteristics, there is a relationship between the probability of DB receipt and the local unemployment rate. The hypothesis is that the stock of DB recipients will be higher, the higher the local unemployment rate, and that this will arise either because the inflow rate into DB

receipt is higher in such circumstances, or because the outflow rate is lower, or some combination thereof.

By using cross-country data sets such as the ECHP and the SILC in a common regression framework we impose the assumption that the response of DB receipt to economic conditions is common across countries. This is obviously a very strong assumption given the variety of institutional frameworks that are encountered. Indeed, these institutional conditions may also induce different trends in within-country DB rates over time. Therefore, we argue, that by including country dummies (and possibly time trends), we control for these differences in institutional factors, leaving the calculated βs to capture variations in local demand conditions – the primary purpose here is not to explain these idiosyncratic or country-specific differences themselves.

The implication of this methodology therefore is that if, for example, Bavaria is a better-than-average performing region in Germany whereas the north of England is a worse-than-performing region in the United Kingdom, we should observe a residual difference in DB claiming rates between these regions once we net out institutional factors that may influence the level of DB claims in Germany relative to the United Kingdom. However, to the extent that differential levels and trends in unemployment across countries also contain aggregate demand shocks specific to those countries, our method will not capture fully these demand effects.

Table 2 reports the coefficients (in bold where significant) of the impact on the probability of DB receipt/inflow/outflow of the regional u-rate (β in the above equation) for various econometric specifications. Results are illustrated for two cross-country panels; one is simply the ECHP panel from 1994 to 2001; the second set of results pools the ECHP with the subsequent SILC panel. Some descriptive statistics for the data sets are contained in the statistical appendix (in particular, of the individual countries comprising each data set), and results on the SILC panel on its own are available on request. This statistical appendix is available on the web at http://www.economic-policy.org/.

The table suggests that the results are sensitive to the controls that are included in the regression estimates. If we simply include controls for personal characteristics (gender and age), the ECHP results (not shown) suggest a significant and positive relationship between the probability of DB receipt and the local unemployment rate that is just significant at the 5% level. The relationship becomes highly robust if we include year and/or country dummies, as illustrated in the table. Once we pool the ECHP with the SILC, the result is 'incorrectly' signed (by our prior hypothesis) unless we include country and time dummies (the SILC contains a different set of countries – see the note to Table 2). Nevertheless, these results in broad terms confirm the anticipated positive relationship between DB claims and local unemployment rates across a wide range of countries. The average 'elasticity' of DB claims to the local unemployment rate is 0.16–0.17 across these countries – a doubling of

Table 2 Pooled panel estimates of disability benefit receipt (*DB*) and unemployment rates

	1. ECHP (1994–2001)		2. ECHP (1994–2001) + SILC (2004–2006)	
Dependent variable	Country dummies	Year and country	+ Country dummies	+ Year and country
DB Stock	**0.0018*** **	**0.0017*** **	**0.0020*** **	**0.0019*** **
t-stat	(4.05)	(3.92)	(4.41)	(4.03)
d(ln*y*)/d(ln*x*)	0.1688	0.1645	0.1695	0.1562
N	620,952	620,952	977,393	977,393
R^2	0.11	0.11	0.10	0.10
DB Inflow	−0.0001	0.0001	−0.0001	0.00001
t-stat	(1.30)	(1.35)	(−0.89)	(0.14)
d(ln*y*)/d(ln*x*)	–	–	–	–
N	419,939	419,939	578,387	578,387
R^2	0.03	0.03	0.03	0.03
DB Outflow (all)	−0.0014	**−0.0025** **	−0.0006	**−0.0032** **
t-stat	(−1.09)	(−2.55)	(−0.35)	(−2.00)
d(ln*y*)/d(ln*x*)		−0.0705		−0.0868
N	40,161	40,161	61,976	61,964
R^2	0.08	0.08	0.04	0.07
DB Outflow (restricted to age < 66)[a]	−0.0024	**−0.0039*** **	−0.0029	**−0.0060*** **
t-stat	(−1.60)	(−3.44)	(−1.54)	(−3.43)
d(ln*y*)/d(ln*x*)		−0.109		−0.165
N	33,636	33,641	54,162	54,162
R^2	0.13	0.14	0.08	0.09

Notes: All regressions control for age and gender of the respondent. Coefficients are OLS coefficients; similar results are obtained deriving marginal effects from probit maximum likelihood (available on request). Standard errors are clustered by region. Coefficients in bold are significant. Below significant coefficients, corresponding elasticities are reported.

Countries in the ECHP panel (see web appendix) are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

Countries in the SILC panel are (see web appendix): Austria, Belgium, Cyprus, Czech Republic, Estonia, France, Germany, Greece, Ireland, Italy, Latvia, Luxemburg, Poland, Spain, Sweden and the United Kingdom.

[a]The specification includes a dummy for labour force status retired.

* *p*-value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.01.

the unemployment rate is therefore associated with 16–17% more claimants to disability benefits.

Does this relationship arise because inflow rates into DB are higher when local unemployment rates are higher, or because outflow rates are lower? Subsequent rows of Table 2 test these propositions. Here there are mixed results, depending on the controls used. In specifications without country dummies (not shown here), inflow rates appear to be lower when local unemployment rates are higher whereas when we control for country effects, as in Table 2, the coefficient reverses and we get the 'correct' sign, albeit not statistically significant. In both panels we get the predicted negative sign for outflows although it is much stronger when we allow for time as well as country effects. In this particular case, the results are even stronger in the case where we further restrict the sample to ages below 66 (individuals above

that age are likely to become 'statistically' retired in many countries). We should reiterate that the pooled regressions are imposing the strong assumption that responses of DB claims to local economic conditions are constant across countries and time. Nevertheless the results suggest, especially when country dummies and a common time trend are incorporated, that inflow rates and, especially, outflow rates behave as might be expected.

The regressions in Table 2 impose the assumption that the relationship between DB benefit claimants and the unemployment rate is the same across all countries. This is of course unlikely. In the statistical appendix, available on the web, the relation is re-estimated allowing for variation in the estimated βs across countries. This also constitutes a test of robustness of the relationship while allowing for variations in institutional regimes across countries. Formally, write:

$$DB\ measure_{i,t} = \alpha + \sum\nolimits_{c=1-21} \left[\beta_c * \left(u\text{-}rate_{r,c,t} * country_c\right)\right] + \gamma * controls_{i,r,t} + \varepsilon_{it}$$

where *DB measure* is DB stock/DB inflow/DB outflow; subscripts *i*, *t*, *r* and *c* stand for individual, time, region and country (21 countries) respectively; and *controls* are age, gender and time dummies.

The results with unemployment rate–country dummy interactions, not surprisingly, give a variety of coefficient estimates across countries. For the relationship of the unemployment rate to the stock of claimants, the results are significant in all 21 countries, and correctly (i.e. positively) signed in 18 of them – in Cyprus, Greece and Germany we cannot find evidence in the data for the assumed positive relationship (but see the case study of Germany using German panel data in the next section of the paper). Coefficients vary but there are particularly strong relationships between stocks of claimants and unemployment rates in some transition economies, and also in Sweden.

Looking at inflow rates, the relationship (which is predicted to be positive) is less clear-cut; we observe the predicted relationship in 11 of the 21 countries, whereas 8 countries have a significant opposite sign between inflows and the unemployment rate. For outflow rates, where we predict a negative association with spatial unemployment rates, we get the 'correct' and the 'wrong' sign in 9 countries each. A caveat is that we are dealing with relatively small sample sizes in some countries (since the base is that the individual concerned was in receipt of DB benefits in a previous wave) and the underlying relationships are probably more robust than illustrated here. In fact in the regressions using just the ECHP on the original EU countries (as in the first panel of Table 2), we get a much clearer prediction on outflows, with 11 of the countries reporting a significant negative relationship between outflows and the unemployment rate, with three positive signs and one insignificant (these results are available on request).

In addition to the asymmetry of the impact of unemployment on inflow and outflow rates, there is also a potential asymmetry arising from the differential impacts

of rises and falls in the unemployment rates on inflow and outflow rates. The statement from the OECD quoted in Section 1.1 is consistent with the proposition that, while rising unemployment induces a rise in inflows and a fall in outflows, falling unemployment may have a lesser impact on flows (especially outflows), so that the number of claimants 'ratchets up' over time. Imposing symmetry on the relationship of claimants to unemployment, as in Table 2, may understate the 'true' relationships. We are limited in investigating this form of asymmetry by the relatively short time dimension of the panel, although this limitation is compensated in another respect by the substantial cross-sectional variation induced by using the region rather than the nation state as the basic unit of analysis.

3. RESULTS FOR INDIVIDUAL COUNTRIES

3.1. Germany

3.1.1. Descriptive evidence. As with the other countries to which we pay particular attention in this section, a brief description of the German disability insurance programme is contained in Appendix A, which is available on the web. As described there, until 2001, the presumption of the programme was that the majority of claimants who entered the disability insurance programme would remain there until retirement. Thus, for these data, we focus only on stocks and inflows. In addition, unification implies a change in the size of the measured aggregate stock of claimants and in the aggregated rates across the ex-West German and East German administrative regions. We can, however, differentiate the regions and provide separate data for 'West Germany' (1970–2007) and 'East Germany' (1993–2007) using data from the German Pension Fund (Deutsche Rentenversicherung).

Examination of the trends in the data show that unemployment in the ex-West German administrative regions rose slowly through much of the period with distinct cyclical peaks in the middle of each decade. The stock of disability benefit claimants also rose through the 1970s and most of the 1980s, thereafter declining, with a sharp fall in inflows in the mid-1980s. In the ex-East German administrative region, both unemployment rates and disability claims remained higher than those in the ex-West German regions from the early 1990s onwards. In what follows, we also see how, post-unification, unemployment in ex-West Germany also affected disability claims in the ex-East German regions.

In Table 3 we formally study these relationships using German administrative data. Including a trend, the unemployment rate in the ex-West German administrative regions greatly influences the stock but not the inflow. The East German unemployment rate influences positively the stock and negatively (but insignificantly) the inflow. As complementary evidence, we present in the last two columns evidence including the impact of the West German unemployment rate on

Table 3. Germany's official DB stock and DB inflow in ex-East and West Germany

Relation of unemployment rates to DB stocks and inflows

	West Germany regions		East Germany regions			
	Stock	Inflow	Stock	Inflow	Stock	Inflow
West u-rate	**0.51****	0.02			0.17	**0.07****
t-stat	(6.49)	(1.53)			(1.09)	(3.43)
East u-rate			**0.28***	−0.01	0.20	**−0.03***
t-stat			(2.61)	(−0.60)	(1.63)	(−2.40)
Trend	**−0.25****	**−0.03****	**−0.09***	**−0.03****	−0.08	**−0.02****
t-stat	(−11.7)	(−10.1)	(−2.03)	(−4.11)	(−1.84)	(−4.60)
Constant	**8.04****	**1.41****	**3.48***	**1.67****	**3.02***	**1.30****
t-stat	(23.8)	(28.3)	(2.68)	(6.99)	(2.22)	(6.38)
N	37	38	16	15	16	15
R^2	0.83	0.88	0.35	0.75	0.40	0.88
F	84.02	126.35	3.42	18.41	2.71	27.23

Notes: Coefficients in bold are significant.

* p-value < 0.05, ** p-value < 0.01.

Source: Administrative data from German Pension Fund 1970–2000.

disability claims in the East German regressions. Although this evidence has to be taken with caution, it is interesting to observe the strong positive reaction of the East German disability benefit inflow rate to the West German unemployment rate. It may be that, as the expected jobs in ex-West Germany post-reunification failed to materialize, an increasing number of the labour force in the ex-East German administrative regions took refuge in the disability benefit programme.

3.1.2. Evidence from the German Socio-Economic Panel. For Germany, we also utilize the German Socio-Economic Panel (GSOEP) in the years for which disability questions are available. These years are 1984–89, 1991–92 and 1994–2007, with 16 regions identified. There are 376,581 person-observations available over the period of which just under 350,000 can be utilized in the analysis. (For the inflows and outflows, of course, the sample size is smaller because the initial observations are state dependent.) There is no variable directly indicating receipt of disability benefits in the GSOEP, but for the self-reported variable 'disabled', respondents are invited to indicate a disability degree/score of ≥30/100. In Germany people with a disability degree ≥30/100 can apply for disability benefit so we use the answer disabled = 1 as a proxy for DB = 1. Note that by excluding entrants to disability benefits who initially report spells of sickness or temporary incapacity, we may not be picking up short-term fluctuations in inflow rates arising from local labour market conditions.

Following the specification described in the previous section, we estimate regressions for self-reported disability score incidence in relation to unemployment and

Table 4. Panel estimates of disability and local unemployment rates in Germany using GSOEP, 1984–2007

Estimates of β coefficient on local unemployment rate

Dependent variable	+ Sex, age, east	+ Year dummies	+ Year and state dummies
DB Stock	**0.0018****	**0.0033*****	**0.0027***
t-stat	(2.88)	(4.53)	(1.82)
d(ln*y*)/d(ln*x*)	0.1386	0.2595	0.2108
N	239,340	239,340	239,340
R^2	0.25	0.25	0.25
DB Inflow	−0.0001	0.0001	−0.0002
t-stat	(−0.48)	(0.36)	(−0.62)
d(ln*y*)/d(ln*x*)	–	–	–
N	156,583	156,583	156,583
R^2	0.00	0.00	0.00
DB Outflow	**−0.0045*****	**−0.0040*****	**−0.0048****
t-stat	(7.45)	(−3.17)	(−2.62)
d(ln*y*)/d(ln*x*)	−0.4525	−0.3992	−0.4842
N	25,656	25,656	25,656
R^2	0.001	0.004	0.005

Notes: Standard errors are clustered by federal states. Elasticities are calculated for significant coefficients in the form of d(ln*y*)/d(ln*x*). Coefficients in bold are significant.

* *p*-value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.001.

basic controls for Germany using the GSOEP. The results are presented in Table 4.

The results indicate a positive relationship between the stock of individuals with the given level of disability and the local and time-specific unemployment rate. The coefficient almost doubles when time dummies are added and is now significantly higher than the average effect in Table 2 (with a correspondingly higher elasticity). The coefficients on inflow rates are generally insignificant. It is of interest to note, however, the robust negative relationship between the outflow rate and the unemployment rate, again with a considerably larger elasticity than in the cross-country analysis, and this despite the fact, described previously, that for much of the period, disability benefit claims were treated as an 'absorbing state'. The key caveat is to mention again that these results focus on self-reported disability that is eligible for a DB claim; we do not know whether the individual in the GSOEP receives the benefit or not. We return to the issue of self-reported disability in later sections of the paper.

3.2. Spain

For Spain, the analysis uses administrative data on eligibility for retirement pensions on the grounds of disability. As described more fully in the web appendix, permanent disability pensions have played an important role in allowing Spanish workers to retire at ages earlier than 60 (the early retirement age in Spain). In

particular, they were used extensively during the late 1970s and early 1980s as an early-retirement mechanism for workers in restructured industries (shipbuilding, steel, mining, etc.), or as substitutes for long-term unemployment subsidies in depressed regions, although eligibility was tightened in 1985. For contributory disability pensions (which are the focus here), eligibility and pension amounts depend on the level of disability. The 1985 reform distinguished four levels of permanent disability characterized by increasing severity. Since then, the legislation has formally reduced them to three, but has also created a special case at the first level to use the disability fund to subsidize the severance of older workers from specific sectors or regions.

Unemployment has been high in Spain by European standards, but was reduced after the mid-1980s with the exception of a sharp dip in growth in 1992. The ratio of new disability claims to GDP growth has therefore fallen since the mid-1980s; a fall heightened by a sharp reduction in new disability claims after the 1985 reform, which brought to an end a period of rising claims relative to GDP. The ratio of new disability claims to retirement pension claims, which is also an important indicator as described above, has tended to remain constant at around 40% since the late-1980s.

Table 5, Panels A and B, utilize regression analysis on administrative data disaggregated by Spanish region. The regressions relate the ratio of *new* disability pensions to the employment rate by region to per capita *regional* GDP and to the regional unemployment rate over the period 1992–2008.[5] We can therefore think of these as 'inflow' regressions. The panels differentiate between all claimants and those aged 45–64, although the results are in fact very similar.

As expected, the ratio of disability retirements relative to employment is positively related to the local unemployment rate and negatively related to the per capita regional GDP. The coefficient estimates in Panel A for 'all ages' are comparable to those from the cross-country estimates for the stock measures (though considerably more robust than earlier estimates on 'inflow effects'); however, the estimates for those 'aged 45 to 64' are considerably higher than those earlier estimates. All these results stem from the institutional regime described earlier whereby the Spanish disability programme has explicitly functioned as a form of early retirement programme.

3.3 The United Kingdom

The United Kingdom has experienced a rising trend in claimants for long-term contributory disability benefits since the early 1970s (known as Invalidity Benefits [IVB] and, after 1995, Incapacity Benefits [ICB]). The early 1980s in the United

[5] Results are very similar (but less significant) where we use regional GDP growth.

Table 5. New disability retirement pensions to employment, per capita regional GDP and regional unemployment rates, Spanish administrative data 1992–2008

Variable	(1)	(2)	(3)
Panel A: All ages			
Per capita regional GDP	**−0.067*** **	–	−0.024
t-stat	(−5.94)		(−1.26)
d(ln*y*)/d(ln*x*)	−0.7074		−0.2481
% regional unemp. rate	–	**0.027*** **	**0.020*** **
t-stat		(6.56)	(2.89)
d(ln*y*)/d(ln*x*)		0.3500	0.2594
Constant	**0.02*** **	**0.073*** **	**0.011*** **
	(16.78)	(11.38)	(3.59)
N	272	272	272
R^2	0.1220	0.1477	0.1501
F	35.28	43.00	22.34
Panel B: Ages 45 to 64			
Per capita regional GDP	**−0.002** **	–	**−0.084***
t-stat	(−6.83)		(−1.77)
d(ln*y*)/d(ln*x*)	−0.6697		−0.2880
% regional unemp. rate	–	**0.078*** **	**0.052*** **
t-stat		(7.28)	(2.92)
d(ln*y*)/d(ln*x*)		0.3207	0.2155
Constant	**0.06*** **	**0.024*** **	**0.038*** **
	(16.78)	(14.40)	(4.73)
N	272	272	272
R^2	0.1551	0.1725	0.1826
F	46.61	52.95	28.27

Notes: Regressions utilize data from administrative data from Spanish regions. *t*-stats in brackets. Coefficients in bold are significant.

* *p*-value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.1.

Kingdom were associated with several administrative reforms, described in more detail in the web appendix, designed to pass onto employers the costs of administering the 'gateways' into short-term sickness spells (IVB/ICB is only available after the claimant has been sick and out of work for at least 28 weeks). These changes, and growing unemployment in the early 1980s, may have contributed to the growth of claimants although the upward trend continued despite the rapid fall in unemployment in the late 1980s. The 1995 reform phased out all claims to disability benefits over state pension age and removed the exemption of disability benefits from income tax liability that had made retirement on IVB more attractive than retirement on the basic state retirement pension. This reform stabilized numbers, but growing eligibility among women, a shift towards older claimants of working age and lengthening durations have meant that later reforms have not reversed the earlier rise in claimant numbers.

Table 6. DB claims and regional unemployment rates, United Kingdom 1980–2008

Dependent variable: DB claims as percentage of regional workforce	Time trend		Fixed region effects
	No	Yes	
Coeff. on regional unemployment rate	**0.172****	**0.758*****	**−0.404*****
t-stat	(2.14)	(9.50)	(8.30)
N	319	319	319
R^2	0.014	0.3489	0.6075

Notes: From administrative data. *t*-statistics in brackets. Coefficients in bold are significant.
*** *p*-value < 0.01, ** *p*-value < 0.05.

The importance of the time trend in claimant numbers at the aggregate level in the United Kingdom can be illustrated by running regressions on regional data of the number of DB claims as a fraction of the regional workforce, relative to the regional unemployment rate. Table 6 shows the results of a simple panel regression of DB benefit claims in the 11 regions of Great Britain (excluding Northern Ireland) over time on the regional unemployment rate.

When an aggregate time trend is excluded, there is a significant but small positive relationship between DB claims and regional unemployment rates. Inclusion of an aggregate time trend strengthens the result considerably. However, inclusion of fixed effects for regions reverses the sign, suggesting that it is the inter-regional variation in unemployment rates across regions, rather than the aggregate trend in unemployment, that gives the positive relationship between the rate of disability benefit claims and the unemployment rate.

The analysis can be extended by using the British Household Panel Survey (BHPS) to analyse self-reported claimants of disability benefits, and transitions between waves on and off disability benefits. A transition into DB is defined as an individual who reported being in receipt of DB at time $t + 1$ having not so reported at time t, and an exit from DB is defined as not being in receipt at $t + 1$ having been so reported at t. Three-quarters of claimants enter from employment, one-quarter from unemployment. The stock of claimants and the transitions are then regressed on local unemployment rates for the 65 counties of England, Scotland and Wales in which respondents are located. A vector of control variables comprise personal characteristics including age of respondent, gender, marital status, age of children, occupation controls, education and spouse's labour market status. Table 7 contains the key coefficients, namely the βs on the county-level unemployment rates.

When the regressions are estimated without panel year dummies, the DB stock and inflow rates are positively related to the county-level unemployment rate, as expected, but the results are not significant. The outflow rate from disability benefits is negatively related to the local unemployment rate, and the coefficient is close to 5% significance without year dummies. However, when year dummies are also

Table 7. Disability benefit claims and county-level unemployment rates in the United Kingdom: BHPS 1992–2006

Dependent variable: Coefficient on county-level unemployment rate	Year dummies = no			Year dummies = yes		
	DB stock	DB inflow	DB outflow	DB stock	DB inflow	DB outflow
Coeff.	0.002	0.003	**−0.069*** **	**0.090*** **	**0.034*** **	−0.033
t-stat	(0.031)	(0.040)	(4.91)	(9.58)	(2.93)	(1.78)
d(ln*y*)/d(ln*x*)	–	–	0.15	0.24	0.05	0.15
N	61420	61420	3723	61420	61420	3723
Pseudo-R^2	0.3588	0.1114	0.0443	0.3688	0.1229	0.1483

Notes: Covariates are age of respondent, marital status, age of children, oocupational controls, education level of respondent and spouse's labour market status. Standard errors cluster-adjusted (county). Coefficients in bold are significant.

*** p-value < 0.01.

included, all three coefficients are highly significant as well as correctly signed. The results for Great Britain therefore provide strong support for the proposition that spatial variations in unemployment rates have the predicted signs on DB claim rates, as well as DB inflow and outflow rates but, as with the aggregate data for the United Kingdom, some of the trends in claimant rates over time in the panel data cannot be fully explained by business cycle fluctuations alone. Here, the most robust 'unemployment effect' is on outflow rates rather than inflow rates – higher unemployment, whether across locality or over time, is associated with falling outflow rates and lengthening durations (for further discussion, see Anyadike-Danes and McVicar, 2008).

3.4. The United States

The growth in both US disability programmes is well documented (see Appendix A, available on the web, for a description of the key US programmes, the SSDI and SSI). The financial challenges that this represents are discussed at length in every report published by the US Social Security Administration (SSA). On top of the increasing burden of the cash benefits paid to beneficiaries, the main concern is the growing health care costs attached to these programmes, with the growth of Medicare and Medicaid expected to represent more than 10% of GDP in the next decades (see Social Security Advisory Board, 2009 for a discussion of the rising health care costs in the United States).

While the increasing cost of a growing stock of beneficiaries should not come as a great surprise given the demographic trends, and in particular the growth in life expectancy in the United States, the inflow of applicants and awardees to the programmes is also on the rise, with each programme handling more than 2 million applications every year, when only a decade ago the number of applicants was around the 1 million mark. We show these trends in Figure 1. At the same time,

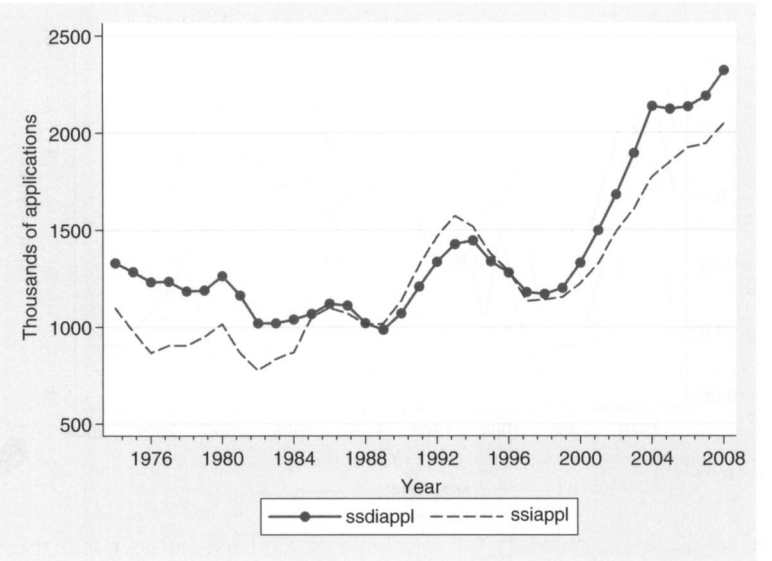

Figure 1. Number of applicants by year to the SSI and SSDI programmes in the United States

Source: http://www.ssa.gov

between 1997 and 2008, while the number of awardees increased by 35.87% and 51.5% in the SSI and SSDI programmes respectively, there was a decreasing award *rate* in both programmes as can be seen in Figure 2. Figure 2 also includes the national unemployment rate in each year, and we can see, at least in the late-1970s, mid-1980s and early-1990s, a fairly clear business cycle effect with award rates increasing with the unemployment rate. In other eras, the relationship is not apparent, such as the early-1980s, when the programme faced severe cutbacks from the Reagan administration, and from the mid-1990s onwards.

At the same time as the rise in new awards, outflow rates from the programmes have been relatively small and decreasing as a function of the covered population and the number of individuals on the rolls, in spite of the efforts of the government to foster work among beneficiaries. In the last few years the SSA has considered a number of policy changes with the objective of fostering work among SSDI recipients. This has become an important priority in the government's agenda regarding disability policy. For example, Jo Anne B. Barnhart, former Commissioner of the SSA, stated in 2003 that expanding the employment opportunities for people with disabilities was one of the main objectives of her administration. Furthermore, in the Social Security 2003–2008 strategic plan, she also set as an objective to have an increase of 50% in the number of people with disabilities who achieve employment, by 2008 relative to the 2001 levels.

In Table 8, and in similar vein to our analysis of European countries, aggregate administrative data are used to analyse the business cycle effect on the stock, the inflow, and outflow to the US Disability Program. Data published by the SSA on

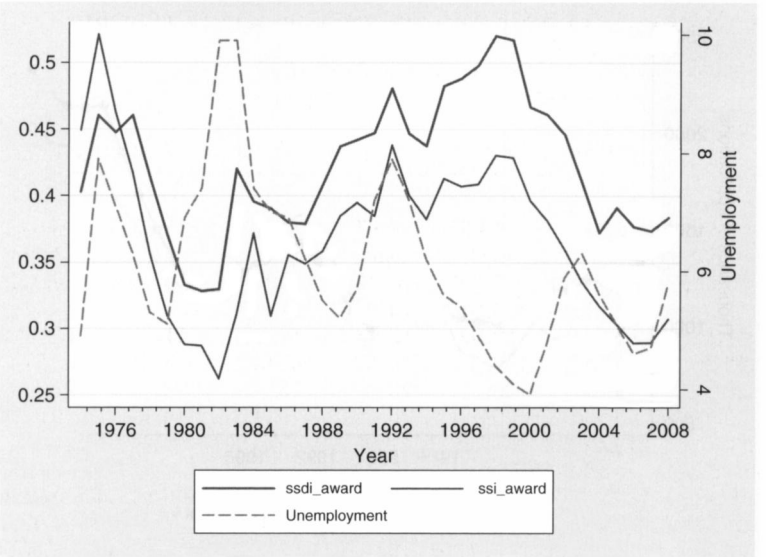

Figure 2. Award rates of the SSI and SSDI programmes and unemployment in the United States

Source: http://www.ssa.gov and http://www.bls.gov

the number of individuals receiving SSDI as workers, the number of awards in each year, and the terminations in each year are used, as well as the yearly data on the number of applications to the programme. Additionally, we also use the data on the stock, inflow, outflow, and applications to the SSI programme.

The upper panel of Table 8 shows the significant effect (and with the hypothesized sign) of unemployment rates on the stock of beneficiaries, the number of applications, the number of awards (inflow), and the number of terminations (outflow) to the SSDI programme, after controlling for a highly significant time trend.[6] The percentage of the variation explained is very high with R-squares around 0.9 or higher. Notice, however, that only 23 years of data are used (28 for the stock estimation) given that there was a distinct policy change during the Reagan administration which led to a severe period of retrenchment in the programme in the early 1980s at a time of high unemployment rates. If data from that period are included, the results in some cases even reverse in sign. We follow what many other researchers have argued and done (such as Autor and Duggan, 2006) and do not use the data from that period and focus on the data since the mid-1980s. For SSI the effect of unemployment rates on the inflow and number of applications is also significant and with the expected positive

[6] The terminations in the SSDI programme are mostly the result of death and reaching the full retirement age (FRA). At the FRA, benefits are converted to Old Age Benefits. In the last decade the percentage of terminations due to these two causes has fluctuated between 83% and 87%. Due to data limitations in the publicly released administrative data, we have only been able to isolate the non-death and non-conversion terminations back to the mid-1990s, so for the purposes of the estimations shown we are counting these two exogenous sources of terminations. The latter makes it even more remarkable that we see an effect of the business cycle on the outflow of the programme in the first panel in the table.

Table 8. SSDI and SSI indicators and national unemployment rate: US administrative data 1974–2008

	SSDI				SSI			
	Stock	Outflow	Inflow	Appl.	Stock	Outflow	Inflow	Appl.
Log of the series								
unemp	**0.0182**	**−0.0147**	**0.071**	**0.107**	−0.0005	0.0083	**0.095**	**0.1199**
	(2.17)	(−1.8)	(6.43)	(5.54)	(0.03)	(0.33)	(3.92)	(7.25)
time	**0.045**	**0.02**	**0.037**	**0.043**	**0.037**	**0.043**	**0.022**	**0.034**
	(19.39)	(13.73)	(20.11)	(15.56)	(11.07)	(12)	(6.57)	(13.05)
Cons	**14.13**	**12.54**	**12.04**	**12.53**	**14.41**	**11.49**	**12.07**	**12.64**
	(143.2)	(165.75)	(130.26)	(86.88)	(87.02)	(54.82)	(65.27)	(99.05)
N	28	23	23	23	23	23	23	23
R^2	0.975	0.938	0.954	0.913	0.88	0.866	0.672	0.872
F	296.1	219.48	211.33	121.53	79.31	95	22.28	86.77
Series relative to employment level								
unemp	**0.001**	0.000	**0.0004**	**0.00147**	0.00069	0.00006	**0.0005**	**0.0015**
	(4.57)	(0.70)	(11.22)	(5.43)	(1.41)	(1.32)	(4.68)	(7.4)
time	**0.0011**	**0.00002**	**0.0001**	**0.0004**	**0.00085**	**0.00006**	**0.00003**	**0.0002**
	(11.47)	(3.85)	(19.58)	(9.08)	(9.38)	(10.72)	(2.56)	(6.95)
Cons	0.0008	**0.0027**	−0.0004	**−0.005**	**0.013**	0.0004	0.0004	**−0.003**
	(0.21)	(8.89)	(−1.36)	(−2.5)	(2.92)	(1.17)	(0.52)	(−1.91)
N	28	23	23	23	23	23	23	23
R^2	0.916	0.54	0.93	0.799	0.79	0.78	0.582	0.74
F	73.35	10.53	194.8	44.37	51.24	70.59	11.15	35.46

Notes: t-stats in brackets. p-value < 0.1 or better if in bold.

sign, but is insignificant for the stock of individuals on SSI in each year, and the outflow from SSI.[7]

The lower panel estimates the same specifications but using the series relative to the employment level in the United States in the given year (using data for non-farm workers as of December of each year published by the Bureau of Labor Statistics). Although the magnitudes of the effects are different, the significance of the estimates is in most cases even higher, and the outflow from SSDI does not seem to be correlated with the unemployment rate once we control for the size of the employed population.

Two types of sensitivity analysis to the results shown in Table 8 were performed. First, instead of using the contemporaneous unemployment rate as our measure of the business cycle, we used the lagged unemployment rate, given that, especially for the inflows into the system, there are considerable delays between the time of application and the time that the individual is awarded benefits (see Benítez-Silva *et al.*, 1999). The key results do not change significantly if we include this measure, and for the inflows into SSDI and also for SSI the coefficient of the unemployment measure declines slightly, but it is still large and very significant. Second, and again mainly in relation to the inflow measures, we might worry that there was a mechanical relation-

[7] SSI terminations do not include those due to death.

ship between a transition into the disability system and an increase in unemployment since that person drops out of the labour force, so it would be useful to check whether another business cycle measure would give us similar results. One possible solution is the one used earlier, namely using the lagged measure of the unemployment rate. Another possibility would be to use GDP growth. The latter, however, does not perform very well for the inflow measures, giving us the wrong sign (but statistically insignificant), but it performs well for the stock measures. Given the small effect that disability inflows have on labour force participation we do not interpret these mixed results as evidence of possible reverse causality, especially because of the good performance of the lagged unemployment measure.[8]

Overall, the conclusion is that since the mid-1980s there is a significant business cycle effect measured by the unemployment rate on the size, number of applicants, inflow and outflow from the public disability insurance programmes in the United States, even after accounting for a time trend and the size of the working population. The main difference from the European results is that the inflow effects are large and significant while the outflow effect is not as clear, suggesting the high sensitivity of the US disability programmes to economic conditions, especially in the downturns, something that can be traced back to the very nature of these Federal programmes, which use a very strict definition of disability and provide the highly coveted health care coverage. We will see later whether these results are also present in the micro-level data using the PSID.

4. WORK DISABILITY AND HEALTH DISABILITY

4.1. Self-reported ill-health and disability

So far, the analysis has focused on what we defined as 'work disability'. We now focus on the relation of work disability to 'health disability'. As argued in the introduction, the two concepts are conceptually distinct. However, there is a natural link between the two concepts insofar as the latter will typically involve a clinical diagnosis, and part of the 'gateway' accessing disability benefits is some form of medical examination or evaluation. As suggested earlier, however, such evaluations may vary according to time and place, and individuals themselves differ not only in their attitude to given incapacity or disability but also in their willingness to utilize long-standing ill-health conditions as a reason for applying for disability benefits. Finally, as we also discussed earlier, general self-reported measures of 'health problems' or 'disabilities' are not clinical diagnoses, and contain high potential for various types of response bias.

Nevertheless, it is possible that the relationship that we observed in the previous two sections between work disability and unemployment is in part driven by under-

[8] We thank Luigi Pistaferri for suggesting this sensitivity analysis of our results.

lying fluctuations in health disability. In this section, the problem is investigated further. We first look at evidence on self-reported long-standing health problems or disability using the European Labour Force Survey (ELFS) for 2002. We investigate whether differences in positive responses to the question concerning health problems are associated with differences in unemployment across regional labour markets in a large number of European countries. The exact question asked is: 'do you have a long-standing health problem or disability?' The proportion answering in the affirmative in each regional labour market is regressed on that region's unemployment rate. If the relationship is positive, it is possible that the cross-sectional variation in work disability and unemployment is partly driven by an underlying relationship between health disability and unemployment (although 'response bias' also suggests that there may be a reverse causation). We also use a question from the Survey of Income and Living Conditions (SILC) which asks whether the individual is hampered or strongly hampered by health problems.

As a prelude to this analysis, Table 9 examines the proportions of people aged between 16 and 64 (and various sub-groups) that report that they have a long-standing health problem or disability in the ELFS. For comparison purposes we also construct two generosity indexes: generosity index 1 defined as DI expenditure to GDP / fraction having a long-standing health problem; and generosity index 2 defined as DI expenditure to GDP / fraction hampered by a health problem.

One striking feature of the table is the great variation across countries in these indices. This variation is much larger in the response to the question concerning the prevalence of long-standing health limitations than in the fraction reporting that they are hampered by health problems. Countries such as Denmark, Finland, the Netherlands and the United Kingdom consistently self-report much higher rates of long-standing health problems disability (or fraction hampered) in all age groups than, say, Germany, Italy or Spain. On the other hand, in the United States, using both the Current Population Survey (CPS), and the National Health Interview Survey (NHIS) we find levels of self-reported disability comparable to European countries at the low end of the distribution.[9] It is hard to believe that these differences across countries simply reflect 'objective' differences in the extent of long-term sickness or disability, or can simply be explained by differences in unemployment rates. There is a vast public health and epidemiological literature on whether self-reported experiences of ill-health are indeed directly comparable across countries (such as Salomon *et al.*, 2004) and an associated growing literature

[9] For the CPS we have compiled yearly data back to 1988 on self-reported disability, and in these two decades it has been stable, moving between 7% and 8% of the population. In the NHIS we have yearly data back to 1982, and due to definitional changes in the questions the proportion has fluctuated in a wider range, between 10% and 8%. In both data sets we also measure self-reported health status over time. The analysis of the historical data using these two data sources is available from the authors upon request. Notice the interesting contrast between the fairly stable figures on self-reported disability, and the highly variable award and application numbers to the US's disability programmes, suggesting a role for economic conditions that justifies the deeper analysis performed in this paper.

Table 9. Fraction reporting existence of a long-standing health problem or disability

Persons aged 16–64 in the ELFS 2002 supplement. Persons aged 18–64 in the CPS and NHIS 2002

Country	16–44	45–54	55–64	All	% hampered (SILC)	Generosity Index 1	Generosity Index 2
Austria	0.077	0.168	0.249	0.129	27.4	0.170	0.080
Belgium	0.129	0.256	0.331	0.195	23.2	0.103	0.086
Cyprus	0.060	0.168	0.310	0.124	26.0	0.056	0.027
Czech Rep.	0.110	0.278	0.426	0.207	28.6	0.068	0.049
Germany	0.060	0.141	0.238	0.114	35.3	0.368	0.119
Denmark	0.142	0.227	0.294	0.190	13.3	0.116	0.165
Estonia	0.137	0.319	0.497	0.246	37.9	0.049	0.032
Spain	0.051	0.120	0.224	0.093	23.6	0.214	0.085
Finland	0.214	0.385	0.586	0.322	37.5	0.106	0.091
France	0.174	0.311	0.408	0.240	21.3	0.075	0.085
Greece	0.045	0.129	0.263	0.105	20.1	0.114	0.060
Hungary	0.045	0.227	0.278	0.131	35.0	0.161	0.060
Ireland	0.071	0.151	0.259	0.113	24.6	0.079	0.037
Italy	0.030	0.090	0.152	0.070	19.7	0.215	0.076
Latvia	0.040	0.117	0.209	0.082	34.3	0.134	0.032
Luxemburg	0.061	0.142	0.244	0.106	21.5	0.264	0.130
Netherlands	0.186	0.301	0.403	0.248	20.9	0.105	0.124
Norway	0.102	0.195	0.333	0.161	18.9	0.280	0.238
Portugal	0.127	0.274	0.448	0.220	31.5	0.109	0.076
Slovenia	0.160	0.234	0.294	0.199	27.7	0.100	0.072
Slovakia	0.096	0.292	0.392	0.193	26.8	0.078	0.056
Sweden	0.041	0.147	0.200	0.093	22.0	0.517	0.218
UK	0.194	0.334	0.492	0.276	21.0	0.091	0.119
All countries	**0.087**	**0.189**	**0.287**	**0.145**	–	–	–
US (CPS 2002)	0.047	0.102	0.167	0.077	–	0.142	–
US (NHIS 2002)	0.0512	0.1155	0.182	0.085	–	0.156	–

Notes: Generosity index 1: DI expenditure to GDP / fraction having a long-standing health problem; Generosity index 2: DI expenditure to GDP / fraction hampered.

in health economics on variations in self-reported disability (such as Lindeboom and van Doorslaer, 2004; Kapteyn *et al.*, 2007, 2009), all of which cast doubt on direct comparisons across countries in self-reported health.

Despite these problems with self-reported disability, we believe that our generosity indexes are still informative. Despite some inconsistencies between the indices (the correlation between the indices is 0.69), they reveal that DI generosity is much greater in Nordic European countries than in either Central or Southern countries. Most likely, the large variation has to do with the internalization of the legal requirements for disability in each country's individual self-reported classifications.

We again exploit within-country regional variations in self-reported health to examine whether there are associations between self-reported 'health disability' and unemployment rates. We pool all the regions in the various countries in the ELFS 2002 supplement on disability and run a simple regression of the proportion reporting long-standing illness or disability on the regional unemployment rate. The

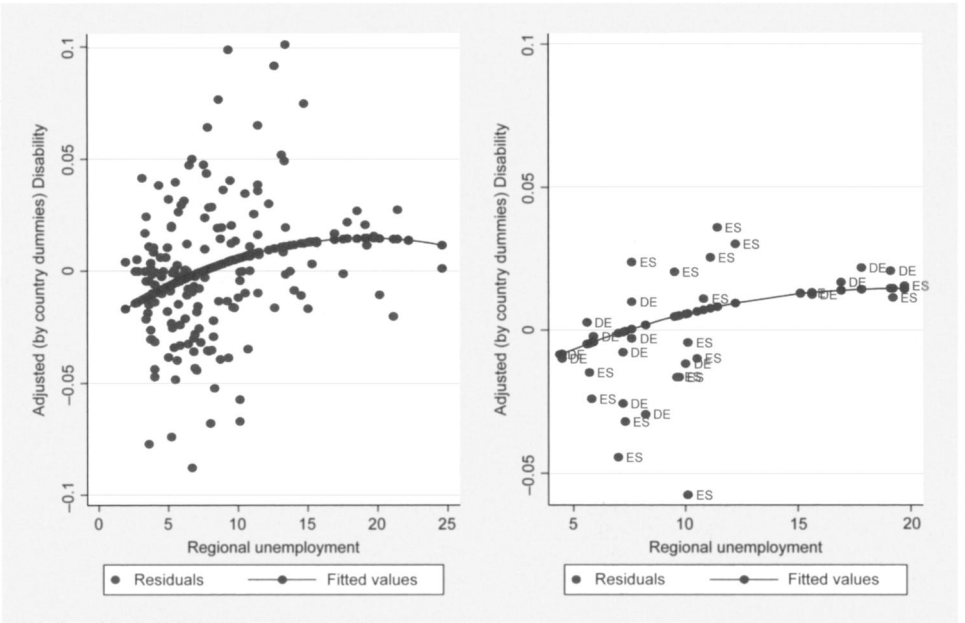

Figure 3. Existence of a long-standing health problem or disability and regional unemployment rates

Source: ELFS supplement 2002.

results are graphed in Figure 3, which also (by way of comparison with some of the earlier evidence) specifically identifies the relationship for regions in Spain and Germany because these countries, from Table 9, have comparable overall rates of self-reported long-term ill-health and disability. Figure 3 shows that there is in general a relationship between local unemployment rates and self-reported disability and that it is non-linear, levelling out at higher levels of regional unemployment. Variations in regional unemployment 'explain' about 9% of the variation in self-reported health proportions across regions in a linear model, and about 12% in a model specified as quadratic.

4.2. Self-reported disability, disability benefit claims and unemployment

If there is a correlation between self-reported long-standing ill-health and disability on the one hand, and spatial variations in unemployment rates on the other, then this may 'explain' the relationship between disability benefit claims and unemployment rates described in Section 2 of this paper. The implicit hypothesis in that section, derived from the discussion in Section 1, was that the disability benefit regime has been used as a direct way of cushioning variations in labour demand across economies both spatially and over time, and that variation in claim rates did not simply reflect variations in health disability. An alternative hypothesis, if we rule

out pure 'reporting bias' in self-reported health, is that the variations in work disability in fact largely reflect variations in health disability – so that inclusion of a proxy for the latter in the disability benefit claim regressions would weaken the direct effect of unemployment rates on disability benefit claims. This is tested in this subsection.

We undertake the test by repeating the earlier regressions on the relationship between disability benefit receipt and the local unemployment rate (as in Table 2) including self-reported health (SRH) as an additional regressor. This tests whether inclusion of this variable weakens the βs of long-term unemployment identified in those regressions. In Table 10, therefore we run the regression:

$$DB\ measure_{i,t} = \alpha + \beta * u\text{-}rate_{r,t} + \gamma * country_{i,r,t} + \delta * HEALTH_{i,t} + \varepsilon_{it}$$

where various health measures are used. They include:

Col. 2: Self-reported Health (SRH) = 1 very good, 2 good, 3 fair, 4 bad, 5 very bad

Col. 3: Bad health = 1 if SRH is bad or very bad (4 or 5), 0 if SRH < 4

Col. 4: Hampered = 1 if individual reports being hampered or strongly hampered by health problems

Other controls and variable definitions are as before.

Table 10. Pooled panel estimates of unemployment rates on disability benefit receipt (DB) allowing for self-reported health

ECHP (1994–2001) and SILC (2004–2006)

	(1) as Table 2	(2) + Self-reported health	(3) + Bad health	(4) + Hampered by health
Dependent variable:				
DB Stock	**0.0019*** **	**0.0017*** **	**0.0013*** **	**0.0012*** **
t-stat	(4.03)	(3.82)	(3.55)	(3.28)
d(ln*y*)/d(ln*x*)	0. 1562	0.1560	0.1196	0.1125
N	977,393	907,616	907,616	907,616
(Pseudo) R^2	0.10	0.19	0.20	0.22
DB Inflow	0.00001	0.0001	0.0001	0.0000
t-stat	(0.14)	(1.10)	(0.71)	(0.32)
d(ln*y*)/d(ln*x*)	–	–	–	–
N	578,387	548,407	548,407	548,407
(Pseudo) R^2	0.03	0.04	0.04	0.04
DB Outflow	**−0.0032****	−0.0015	−0.0020	−0.0021
t-stat	(−2.00)	(−0.95)	(−1.26)	(−1.35)
d(ln*y*)/d(ln*x*)	−0.0868		–	–
N	61,964	55,577	55,577	55,577
(Pseudo) R^2	0.07	0.09	0.09	0.11

Notes: All regressions include year and country dummies and control for age and gender of the respondent. Coefficients are OLS coefficients; very similar results are obtained deriving marginal effects from probit maximum likelihood. Probit results are available on request from the authors. Standard errors are clustered by region. Below significant coefficients (in bold), corresponding elasticities are reported.

** *p*-value < 0.05, *** *p*-value < 0.01.

In the web appendix, in Table B3, we allow the βs to vary across countries as in Table B2, so consequently:

$$DB\ measure_{i,t} = \alpha + \sum\nolimits_{c=1-21} \left[\beta_c * \left(u\text{-}rate_{r,t} * country\right)\right] + \gamma * controls_{i,r,t} + \delta * HEALTH_{i,t} + \varepsilon_{it}$$

Finally, in Table 11 we allow the effect of the unemployment rate to vary with health:

$$DB\ measure_{i,t} = \alpha + \beta * HEALTH_{i,t} + \gamma * HEALTH_{i,t} * u\text{-}rate_{r,t} + \delta * controls_{i,r,t} + \varepsilon_{it}$$

The most striking aspect of Table 10 is that the inclusion of self-reported health measures leaves the significant signs on the DB stock and outflow coefficients unchanged (when using the SRH index) or slightly reduced (when using either of the two other indicators). The inclusion of the SRH index also changes the insignificant

Table 11. Pooled panel estimates of disability benefit receipt (DB) and unemployment rates interacted with health measures ('bad health', 'hampered')

ECHP (1994–2001) and SILC (2004–2006)

Dependent variable:	DB Stock	DB Inflow	DB Outflow
	+ Year and Country	+ Year and Country	+ Year and Country
Unemployment rate	**0.0009****	0.0001	**−0.0040****
t-stat	(2.40)	(0.75)	(−2.08)
d(ln*y*)/d(ln*x*)	0.0833	–	−0.1133
Good health	ref.	ref.	ref.
Bad health	**0.3368*****	**0.0754*****	**−0.1972*****
t-stat	(10.6)	(6.84)	(−10.4)
*urate*goodhealth*	ref.	ref.	ref.
*urate*badhealth*	**0.0052****	−0.0002	**0.0041*****
t-stat	(2.04)	(−0.22)	(2.61)
N	907,616	548,407	55,570
R^2	0.20	0.04	0.06
Unemployment rate	0.0004	0.0001	**−0.0045****
t-stat	(0.99)	(0.56)	(−2.29)
d(ln*y*)/d(ln*x*)	–	–	−0.1262
Not hampered	ref.	ref.	ref.
Hampered	**0.2551*****	**0.0592*****	**−0.2803*****
t-stat	(9.80)	(8.19)	(−14.4)
*urate*not hampered*	ref.	ref.	ref.
*urate*hampered*	**0.0058***	−0.0002	**0.0038****
t-stat	(1.84)	(−0.36)	(2.17)
N	907,616	548,407	55,577
R^2	0.22	0.04	0.09

Notes: Below significant unemployment rate coefficients (in bold), elasticities are reported.

* *p*-value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.01.

Source: ECHP 1994–2001 and SILC 2004–2006.

and negative coefficient on the inflow rate to the 'correct' sign (albeit the coefficient is small in value). Self-reported health is a significant explanatory variable in terms of disability benefit claims – this should not be too surprising as such a finding is consistent with both a relation between work and health disability *and* with a 'story' of reporting bias – but it does not eliminate the underlying relationship between unemployment rates and disability claims; indeed in certain respects it slightly strengthens it.

When we augment the unemployment rate country interactions both with health measures (SRH, bad health and hampered) and self-reported health measures interacted with countries, simply including self-reported health measures on balance somewhat strengthens the relationship between unemployment rates and disability claims (see Table B2 in the web appendix). For example, when using SRH, 14 instead of 11 countries report positive and significant inflow effects of higher unemployment and many of the stock coefficients are strengthened. In contrast, the strength of the negative outflow effects in some countries is slightly weakened. Including *both* unemployment rate and self-reported health interactions does tend to increase the volatility of coefficient signs and values, suggesting that we are asking too much of the data.

Finally, Table 11 explores the interaction between health and the business cycle using two health measures: bad health and hampered. Results in this table are comparable to those reported in Table 2. As expected, for the stock of claimants, introducing these interactions reduces the effect of the business cycle when we control for those in good health condition (good health or not hampered) and increases it for those in bad health conditions. These results are suggestive that the effect of the business cycle is somewhat stronger for those in bad health than for the rest of the population. However, and even more important, the effect of the unemployment rate remains significant for those in fair or good health.

4.2.1. Evidence for the United States. For comparable estimates for the United States we use the Panel Survey of Income Dynamics (PSID), which has been collected since 1968. Starting from 1968, the PSID interviewed and re-interviewed the individuals from families in the core sample every year, whether or not they were living in the same dwelling or with the same people. Adults have been followed as they have grown older, and children have been observed as they advance through childhood and into adulthood, forming family units of their own. The PSID data files provide a wide variety of information about both the families and individuals collected over the span of the study. The central focus of the data is economic and demographic, with substantial detail on income sources and amounts, employment, family composition changes, and residential location. Information gathered in the survey applies to the circumstances of the family unit as a whole (e.g., type of housing) or to particular persons in the family unit (e.g., age, earnings). While some information is collected about all individuals in the family unit, the greatest level of detail is ascertained for the

Table 12. Pooled panel estimates of disability benefit receipt (DB) and unemployment rates allowing for self-reported health. PSID 1985–1993

	Benchmark	+ 'in Good Health'
Dependent variable:		
DB Stock	**0.00059*** **	**0.00040*** **
t-stat	(3.85)	(2.62)
N	87,629	87,508
(Pseudo) R^2	0.027	0.034
DB Inflow	**0.00028*** **	**0.00019***
t-stat	(2.34)	(1.61)
N	70,633	70,545
(Pseudo) R^2	0.0112	0.0148
DB Outflow	0.00015	0.00009
t-stat	(1.53)	(0.92)
N	70,633	70,545
(Pseudo) R^2	0.0106	0.0122

Notes: All US regressions include year controls and control for age, age-squared, gender, marital status, race (black and white dummies), education, and occupation of the respondent. Coefficients are OLS coefficients; very similar results are obtained deriving marginal effects from probit maximum likelihood. Coefficients in bold are significant. Probit results are available on request from the authors. Notice that the reported R-squared can be misleading in a Linear Probability Model, the Pseudo-R-squares in the probit estimations move between 0.12 and 0.3.

*** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1.

primary adults heading the family unit. The estimates below use information for the 1985 to 2005 period for which there is information on disability, as well as on health status and most of the controls discussed previously for the European data sets, like occupation, demographic characteristics, health status, and of course the local unemployment rate. Up to 1993 the unemployment rate is at the county level, but starting then it is only at the state level. However, we only have data on disability benefits receipt in the 1985 to 1992 period.

Table 12 reports estimates using a specification very similar to that reported in Table 10. In this case given data limitations we can only use the PSID data for the 1985 to 1992 period, but we are able to control for an array of variables including occupation, time effects, and demographic characteristics. In this period the PSID records the county level unemployment rate, and Table 12 shows that there is a positive and strongly significant effect of local unemployment on the DB stock (those reporting receiving disability benefits in a given year), and the DB inflow (those receiving disability in a given year after not receiving it in the previous year), whereas there is an insignificant effect on the DB outflow (those dropping from the rolls). These results are broadly in line with those we find with the other data sets and are strengthened once we control for self-reported good health in the last column (which has a significant negative effect, not shown in the table). However, the effect of the business cycle is somewhat smaller in the United States than in Europe, which should not come as a great surprise given the Federal nature of the

Table 13. Pooled panel estimates of disability benefit receipt (DB) and self-reported disability (DIS) and unemployment rates interacted with health measure (good health)

	DB Stock	DB Inflow	DB Outflow
	+ Year and	+ Year and	+ Year and
Dependent variable	Occupation	Occupation	Occupation
Disability benefit receipt: PSID 1985–1992			
Unemployment rate	**0.00068*** **	**0.00042***	0.00025
t-stat	(2.27)	(1.8)	(1.31)
Good health	**−0.014*** **	**−0.0045** **	**−0.0033*** **
t-stat	(−7.61)	(−3.19)	(−1.59)
*U-rate * goodhealth*	**−0.0005***	**−0.00043***	−0.00031
t-stat	(−1.78)	(−1.89)	(−1.59)
N	87,508	70,5451	70,5451
R^2	0.034	0.0136	0.0123
	DIS Stock	DIS Inflow	DIS Outflow
Self-reported disability: PSID 1985–2005			
Unemployment rate	**0.0027*** **	**0.0016*** **	**0.00082*** **
t-stat	(6.36)	(4.95)	(3.02)
Good health	**−0.037*** **	**−0.014*** **	**−0.0096*** **
t-stat	(−14.22)	(−7.45)	(−5.58)
*U-rate * goodhealth*	**−0.0023*** **	**−0.0013*** **	**−0.00056** **
t-stat	(−5.46)	(−4.14)	(−1.96)
N	181,707	156,409	143,127
R^2	0.0681	0.0233	0.017

Notes: All US regressions include year controls and control for age, age-squared, gender, marital status, race (black and white dummies), education, and occupation of the respondent. Coefficients are OLS coefficients; very similar results are obtained deriving marginal effects from probit maximum likelihood. Coefficients in bold are significant. Probit results are available on request from the authors. Notice that the reported R-squared can be misleading in a Linear Probability Model, the Pseudo-R-squares in the probit estimations move between 0.12 and 0.3.

*** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1.

programme, and the very strict definition of disability implemented in the United States.[10]

And, by way of comparison with Table 11 for the combination of ECHP + SILC, in Table 13 we control for the interaction between a measure of self-reported health and the unemployment rate to check for the residual business cycle effect once we control for the underlying health condition of the respondents. The results regarding the effect of the business cycle are surprisingly stable, and become in some cases even stronger than in the previous specifications, providing clear

[10] As a sensitivity analysis, and also following a suggestion by a referee, we have controlled for disability status (having a health limitation that severely limits the work of the individual) in the regressions shown, to recognize the possible omitted variable bias problem given a likely correlation between unemployment and health disability. For the DB stock measure the inclusion of disability status reduced the size of the coefficient by around 50% but it remained statistically significant, while for the other measures the coefficients and their significance were essentially unaffected. We also use here the lagged unemployment rate with similar results.

evidence of the support for our hypothesis. In addition, in the second panel of Table 13, information is provided on the relation of self-reported disability status (as reported in the employment section) to unemployment rates, which can be utilized for a longer period given data limitations on the measure of disability benefit receipt.[11] Although self-reported status may suffer from justification bias, the relationship to unemployment rates is also strong, including a correctly signed coefficient on the unemployment rate for the stock and inflow measures. Overall, therefore, we confirm the findings of the European panels for the United States that inclusion of self-reported 'good' and 'bad' health among our explanatory variables does not dampen the effect of the business cycle on receipt of disability benefits.[12]

5. SELF-REPORTED HEALTH AND HEALTH DISABILITY

The analysis in Section 1 suggested that there is a strong relationship between work disability and unemployment rates. The inclusion of self-reported measures of health disability in the previous section did not alter this conclusion to any great degree, although that section suggested that there was also a relationship between self-reported disability and claims for disability benefit. This should not be too surprising, both because independent evaluations of health disability are at least one of the 'gateways' to receipt of disability benefits, but also because 'response bias' would lead us to believe that individuals who are in receipt of, or applying for, disability benefits, have an obvious incentive to report that they are in poor health. It is revealing, however, when examining the ECHP-SILC panel, to note that 25,000 out of 86,000 claimants of disability insurance (29% of the total) self-report that they are in 'good' or 'very good' health, and indeed 127,000 of 1.432 million non-claimants report that they are in 'bad' or 'very bad' health. This, at the very

[11] We have also used the self-reported disability measure from the health section with very similar results.

[12] It is important to mention that the number of outflows in the data is rather small, considering that we do not count the possible outflows due to death. In the 1985 to 1992 period, using the more stringent benefits receipt measure we only observe 266 cases of individuals exiting the rolls, and most of them claim they are leaving to retirement or to be homemakers, with less than 5% of them saying they are now working. Using the self-reported disability measure in the full 1985–2005 period we observe around 1,560 outflow cases. With this softer measure, we observe that 21% of those who left the disability state are now working, but still around 60% of them either say that they are retired or that they are homemakers. It is also interesting to analyse the source in terms of their previous employment status, of the inflows in our data sample. In the 1985–1992 period there are only 339 inflows, and a large proportion of them, almost 35%, were declaring in the previous period that they were disabled already, but not receiving benefits. Additionally, around 26% considered themselves retired in the previous period, and 21% homemakers. Only 16% reported being in the labour force, either working, unemployed, or temporarily laid off. If we analyse the inflows in the 1985–2005 period using the employment section measure, we observe around 2,100 inflows, and the picture is quite different in terms of the previous employment status of the newly disabled: around 32% of them were working, and another 19% either unemployed or temporarily laid off. On the other hand, around 18% said they were working, and 26% that they were homemakers in the previous period. These differences should not be very surprising, given the very strict definition of disability from the point of view of receiving benefits, which essentially requires individuals to be out of the labour force for a period of nearly half a year in order to qualify for benefits.

least, suggests that the link between work disability and health disability is not exact.[13]

In this last section, therefore, we utilize data from two country studies (the United Kingdom and the United States) to air some preliminary speculations on the relationship between health disability and economic conditions. This is a topic on which a certain amount has been written, and is part of a much larger topic of how disability and ill-health has evolved over time and across countries (e.g. what health conditions have increased or decreased in prevalence, especially among disability benefit claimants) which cannot be discussed in extensive detail here. Nevertheless it forms a natural sequel to the earlier discussion by posing the question along the following lines: if work disability is related to economic conditions and health disability is (partially) related to work disability, then is health disability also related to economic conditions? Consideration of this last topic has been hampered so far by the use of rather general self-reported questions on health status which are, unfortunately, the only form of health questions available in many of the large socio-economic panels such as those used here.

5.1. Health disability, work disability and unemployment in the United Kingdom

Some panel data, such as the British Household Panel Survey (BHPS) and the English Longitudinal Survey of Ageing (ELSA) in the United Kingdom, the new Surveys of Health and Ageing in Europe (SHARE) and, in the United States, the Panel Survey of Income Dynamics (PSID) and the Health and Retirement Survey (HRS), ask much more detailed questions on personal health and disability than those so far utilized here. Indeed some of these surveys, such as the Health Survey of England, which underpins ELSA, also provide independent medical evaluations (primarily nurses' visits) in some of the waves. Some of these panels (ELSA, SHARE and the HRS) only look at subsets of older people, and in most cases, most of the detailed questions on health conditions and disability are still primarily self-assessed and subject to various kinds of response or justification bias. Nevertheless it seems plausible to argue that some of these detailed questions elicit more accurate response to particular health conditions. Consequently, a natural question to ask is whether we can find any evidence that responses to very detailed questions on health can be used to find evidence of business cycle-type fluctuations in 'objective' measures of health. If we found that specific, objectively measured health conditions and disabilities tended to be more prevalent where there was higher unemploy-

[13] Benítez-Silva *et al.* (2006) analyse in detail the differences between self-reported disability and SSA award information, finding that there is a considerable number of individuals who do not report a disability although they are receiving benefits, and vice versa. They construct a three index model through which they can estimate the classification errors in the SSA disability determination process. The latter is also the objective of Nagi (1969), and Smith and Lilienfeld (1971).

ment, then this would suggest that part of the observed correlation between unemployment rates and disability claims arose from this source; if no such prevalence of health disability in high unemployment areas or periods was observed, then the correlation of health and work disability cannot be the explanation.

We investigate two issues using appropriate panel data. First, are some disabilities pro- or counter-cyclical as measured by prevailing unemployment? Second, does the incidence or threat of unemployment induce changes in reporting behaviour and take-up of disability insurance benefits given reported medical conditions?

Past evidence on the first point is mixed but, if anything, suggests that the incidence of disabilities is *pro-cyclical*: that is, higher incidence is likely when economic activity is booming and unemployment is lower. In early work, Kossoris (1938, 1943) pointed to the pro-cyclicality of accident and injury-related disabilities; a result confirmed later by Robinson and Shor's (1989) analysis of accidents at Californian construction sites. However, other work which confirms some evidence of pro-cyclicality points rather to the 'fear factor' induced by a threatened loss of job in eras or regions of high unemployment. Brooker *et al.* (1997) argue that back pain and acute claim rates in Canada are pro-cyclical; and Ruhm (2000) has argued using aggregate data that various dimensions of ill-health and mortality are commonly associated with 'good times' rather than recession. There is, however, countervailing evidence: for example, findings such as those of Beale and Nethercott (1988) and Jenkins *et al.* (1982) that the stress of threatened redundancy increases spells of certificated sickness and Bridges and Disney (2010), who find that stress-related illness is associated with family economic problems such as indebtedness and the threat of unemployment.

5.1.1. Health disability, work disability and unemployment in the BHPS. For the United Kingdom, the British Household Panel Survey (BHPS) asks respondents for details on 12 specific reported health conditions among a range of self-assessed questions concerning capacity for work. We pool the available waves of the BHPS and examine the correlation of these specific health conditions with unemployment rates (calculated from administrative data) for the 65 counties of England, Scotland and Wales. A positive sign indicates that the condition is *counter-cyclical*: that is, that higher unemployment induces greater self-reported incidence of the condition; a negative sign the reverse.

Table 14 shows clearly that the relation between self-reported specific health conditions and unemployment is either significantly negative or insignificant in all cases bar one (problems with sight). There is no evidence that health disability is directly and positively affected by unemployment; indeed the reverse is more likely, especially among some of the most prevalent conditions underlying the growth in receipt of disability benefits (such as back pain, chest and breathing problems, other internal organs such as the stomach, and depression).

Table 14. Incidence of specific self-reported health conditions in relation to county-level unemployment rates, BHPS 1992–2006

Probability of reporting given health condition:	Coefficient on unemployment rate	*t*-stat.
A) Arms, legs, hands, feet, back	−0.019*	(−1.79)
B) Sight	0.032*	(1.86)
C) Hearing	0.020	(0.96)
D) Skin condition	−0.023*	(−1.65)
E) Chest/breathing problems	−0.038**	(−2.15)
F) Heart/blood pressure	−0.002	(0.13)
G) Stomach/liver/kidneys	−0.037**	(−2.39)
H) Diabetes	0.012	(0.20)
I) Anxiety, depression, bad nerves	−0.006	(−0.38)
J) Alcohol or drug related	−0.034	(0.57)
K) Epilepsy	0.017	(0.27)
L) Migraine	−0.035**	(−2.24)
M) Other	0.010	(0.79)

Notes: Estimation method: Random effects probit, BHPS data. Demographic controls are identical to those used in Table 7.

** p-value < 0.10, ** p-value < 0.05.

If this is the case, then it must be true (or at least consistent with the analysis of previous sections) that the probability of claiming disability benefits, conditional on having a specific health condition, is higher in areas and periods of higher unemployment. This can also be tested, and the results are contained in Table 15. In this table, we first test (column 1) whether receipt of disability benefits is associated with the *incidence* of given health conditions, with the local unemployment rate and with an interaction between each health condition and the unemployment rate as additional regressors. The interaction is intended to test whether a higher unemployment rate increases the likelihood that a person with a given health condition claims disability benefit, independently of the direct effect of unemployment on the claiming rate. Columns (2) and (3) then apply the more stringent test of whether *changes* in health conditions affect the probability of entering or leaving disability benefit respectively by the next period, along with the unemployment rate and an interaction term of the change in the health condition and the unemployment rate.

The first column of Table 15 shows a strong positive relationship between most health conditions and receipt of disability benefits in the United Kingdom. Two important drivers of disability claims in the United Kingdom in recent years have been problems with limbs and, especially, back pain, and psychological problems, especially depression. These indeed show up strongly in the results, along with alcohol and drug-related problems. The influence of the unemployment rate remains as strong as in Table 7 despite the inclusion of these new variables. Interestingly, notwithstanding the Canadian epidemiological study cited earlier, claims for 'problems with limbs and back pain' increase in areas and periods of high unemployment; three other interactions are also positively signed and significant

Table 15. Probability of claiming disability benefits conditional on reporting certain specific health conditions and local unemployment rate. BHPS 1992–2006

Coefficient on:	(1) DB stock *Coeff.* (*t-stat*)	(2) DB inflow *Coeff.* (*t-stat*)	(3) DB outflow *Coeff.* (*t-stat*)
Self-reported health			
Limbs and back pain	0.74** (18.11)	0.30*** (3.88)	0.14 (1.30)
Sight	0.17* (2.06)	0.35** (2.29)	−0.38** (−2.27)
Hearing	−0.13 (−1.14)	0.10 (0.42)	0.40* (1.71)
Skin condition	−0.17* (−2.37)	−0.03 (−0.24)	0.02 (0.09)
Lungs	0.35** (6.02)	0.26** (2.13)	−0.10 (−0.58)
Heart/blood pressure	0.37*** (6.61)	0.27** (2.41)	−0.20* (−1.86)
Stomach/liver/kidneys	0.30*** (4.60)	0.24* (1.70)	−0.14 (−0.81)
Diabetes	0.09 (1.08)	0.24 (0.85)	0.31 (1.07)
Anxiety, depression, nerves	1.05** (19.05)	0.67*** (7.08)	0.27** (2.31)
Alcohol or drug related	0.68** (3.89)	0.07 (0.30)	−0.36 (−0.99)
Epilepsy	0.54** (2.86)	0.63* (1.68)	0.17 (0.30)
Migraine	0.16* (2.08)	0.06 (0.53)	0.09 (0.65)
Other health problem	0.51** (8.00)	0.43*** (3.80)	−0.08 (−0.42)
Unemployment (U) rate	0.09** (9.21)	0.05*** (4.06)	−0.03* (−1.79)
Self-reported health × U rate			
Limbs and back pain	0.02* (2.26)	0.004 (0.34)	−0.01 (−0.58)
Sight	0.01 (0.58)	−0.03 (−1.00)	0.06* (1.72)
Hearing	0.04* (2.50)	−0.01 (−0.13)	−0.03 (−0.64)
Skin condition	0.02* (1.81)	0.001 (0.07)	−0.03 (−0.99)
Lungs	−0.01 (−1.16)	−0.03 (−1.38)	0.02 (0.69)
Heart/blood pressure	0.004 (0.41)	−0.03 (−1.42)	0.05** (2.03)
Stomach/liver/kidneys	−0.004 (−0.36)	−0.01 (−0.27)	0.03 (0.81)
Diabetes	0.04* (2.40)	0.02 (0.33)	−0.04 (−0.66)
Anxiety, depression, nerves	−0.02* (−1.94)	−0.02 −0.98)	−0.04 (−1.56)
Alcohol or drug related	−0.01 (−0.28)	0.06 (1.27)	0.06 (0.88)
Epilepsy	0.01 (0.28)	−0.02*** (−3.46)	−0.05 (−0.41)
Migraine	−0.02 (−1.49)	0.001 (0.03)	−0.02 (−0.55)
Other health problem	−0.02 (−1.28)	−0.04 (−1.60)	0.01 (0.21)
N	60784	65799	3725
Log likelihood	−8386.05	−3055.22	−1725.93
Pseudo R^2	0.32	0.12	0.13

Notes: Demographic controls as in Table 7. *T*-stats in parentheses. Standard errors cluster-adjusted (county).

*** *p*-value < 0.01, ** *p*-value < 0.05, * *p*-value < 0.1

Source: Column (1) estimated by maximum likelihood probit; Columns (2) and (3), health shocks specified as changes. Analysis of BHPS 1992–2007.

although psychological problems are negatively signed, that is, more likely to appear where the unemployment rate is lower.

Examining the inflow data, unemployment remains a significant predictor of entering disability benefit receipt, as in Table 7. There is evidence that the onset of particular health conditions is also associated with inflow into disability benefit, with 'arms and back pain' and psychological problems again highly significant. There is no strong evidence for additional interactions between particular health conditions and unemployment rate in either direction; a result confirmed in column (3) for

outflows. Note that inflows are much more sensitive to the onset of health conditions than are outflows to changes in health conditions, and that unemployment remains an explanatory variable in outflows, albeit the statistical significance is somewhat weakened relative to Table 7.

Taken together, Tables 14 and 15 show that it is not the cyclical correlation of health disability and work disability that underlies the observed correlation between unemployment and work disability. Indeed, if anything, self-reported health disability (once we move away from rather general questions concerning 'good' and 'bad' health) is often *negatively* associated with unemployment rates. The fact that the association here between health and work disability is mostly pro-cyclical not counter-cyclical, confirms previous studies and suggests that changes in health disability cannot be used to explain the counter-cyclical relationship between disability claims and unemployment; indeed for some conditions higher unemployment increases the probability that a person with a given health condition will enter the disability benefit regime. Moreover, the difference between these results and those depicted in Figure 5 suggest that answers to rather general questions on self-reported health, of the type illustrated there, are indeed likely to suffer from various forms of response and justification bias and should be used with caution when 'explaining' differences in disability claim rates.

5.2. Health disability, work disability and unemployment in the PSID

In similar vein to the analysis for the United Kingdom, the US Panel Study of Income Dynamics (PSID) can be examined to see whether specific disabilities are pro- or counter-cyclical as measured by prevailing unemployment, and also whether the incidence of unemployment induces changes in reporting behaviour of disability insurance benefits given reported medical conditions.

The PSID has a different set of health conditions from those in the UK data, and unfortunately they are only available from the 1999 wave onwards (we utilize data here until 2005). However, this period at least captures the ending of a boom cycle, a short recession, and the beginning of another boom cycle. Additionally, in this time period we only have access to the state-level unemployment rate, and we cannot measure disability benefit receipt, only the self-reported disability measure.

In Table 16 we show the relationship between self-reported health conditions and unemployment rate, which in this case is at the state level for this period of analysis. We can see that in the PSID the evidence is a bit more mixed than in the United Kingdom, mainly because the type of conditions measured are different and in some cases more consistent with a positive link between unemployment rates and stressful situations that can lead to health problems. However, in most cases the coefficients are not significant and very small, suggesting a weak relationship, and only in the case of stroke, heart disease, diabetes, and high blood pressure are the positive coefficients statistically significant. For a number of conditions the effect

Table 16. Incidence of specific self-reported health conditions in relation to state-level unemployment rates, PSID 1999–2005

Probability of reporting given health condition:	Coefficient on unemployment rate	*t*-stat
A) Stroke	0.0016*	(1.84)
B) Heart attack	0.0005	(0.51)
C) Heart disease	0.0020*	(1.68)
D) Asthma	−0.0001	(−0.07)
E) Lung disease	−0.0016	(−1.61)
F) Diabetes	0.0040***	(2.99)
G) Arthritis	−0.0018	(−1.02)
H) Cancer	−0.0017*	(−1.66)
I) Mental problems	−0.0006	(−0.88)
J) High blood pressure	0.0074***	(3.52)
K) Emotional problems	−0.0041***	(−3.28)
L) Learning disability	−0.0021***	(−3.08)

Note: PSID data 1999–2005. We include demographic controls as in Table 12 and 13 above and also a measure of yearly salary and hours worked. We report coefficients, and *t*-statistics in parentheses, after running LPM for each condition separately. All regressions have 45,462 observations.

*** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1.

is negative, and in some cases such as cancer, emotional problems, and learning disabilities, even statistically significantly so. We conclude from this that in the United States during this time period the evidence of a link between the business cycle and health disability is very weak, indeed if anything weaker than in the United Kingdom.

Table 17 then links disability reports with reports on health conditions and the unemployment rate and, in similar vein to Table 15, we test whether the *onset* of a given condition is associated with disability reports. We then test whether the probability of reporting being disabled *given* the onset of a particular health condition is higher in states where the unemployment rate is higher. The results are broadly in line to what we obtained in the BHPS, in fact showing a stronger and significant association between self-reported incidence of conditions and disability reports. The effects are quite large in magnitude compared with the predicted probability. We interpret this as showing that disability in the United States is more clearly related to underlying health conditions, even after controlling for the unemployment rate in the state of residence of the individual.

In the last column and row of the table we can observe the positive association of the unemployment rate with self-reported disability even after controlling for the incidence of health conditions, and the interaction of the conditions with the unemployment rate, suggesting a significant direct business cycle effect. Additionally, through the coefficient on the interaction terms we find that the association between health and work disability is mostly pro-cyclical albeit weaker than in the United Kingdom. But, as in the United Kingdom, we can conclude that the association cannot be used to explain the counter-cyclical relationship between disability

Table 17. Probability of reporting disability conditional on reporting certain specific health conditions and unemployment rate, PSID 1999–2005

Probability of condition at t given not at $t-1$	Reporting disability (DIS)		DIS with interaction (health × U rate)	
A) Stroke	0.002***	(3.22)	0.0016	(0.73)
B) Hearth attack	0.0001	(0.75)	0.0018	(0.72)
C) Heart disease	0.00033**	(1.98)	−0.00006	(−0.16)
D) Asthma	0.00025*	(1.66)	−0.00009	(−0.26)
E) Lung disease	0.00051**	(2.13)	0.00036	(0.4)
F) Diabetes	0.00092***	(3.33)	0.0019	(1.04)
G) Arthritis	0.00125***	(4.58)	0.0014	(1.4)
H) Cancer	0.00058**	(2.22)	−0.0003	(−1.47)
I) Mental problems	0.0047***	(3.45)	0.0240	(1.13)
J) High blood pressure	0.00064***	(3.99)	0.00025	(0.6)
K) Emotional problems	0.0030***	(4.57)	0.0023	(1.12)
L) Learning disability	0.0026***	(2.76)	0.026	(0.95)
Unemployment rate	0.00010***	(2.67)	0.000009*	(1.94)

Note: We include the demographic controls as in Table 12 and 13. We report in the table marginal effects and t-statistics after estimating Random Effects Probit Models. The number of observations is 48,088. The predicted probabilities are 0.04% and 0.04%, respectively for the two columns.

* p-value < 0.1, ** p-value < 0.05, *** p-value < 0.01.

reports and unemployment. Notice that the disability system in the United States is a Federal programme, and in principle not geared towards responding to variation in economic conditions so the business cycle effect is weaker as could be expected. The fact that the results are in line with the British case is remarkable, and shows that our methodology has uncovered underlying relationships between these variables that illuminate the policy discussion.

6. ASSESSMENT AND POLICY DISCUSSION

At the heart of the discussion in this paper has been the distinction between 'work disability' and 'health disability'. We have shown that the stocks and flows of disability benefit claimants are highly sensitive to the business cycle, as measured by local variations in unemployment rates and, in the case of Spain, by regional variations in per capita GDP or GDP growth. This illustrates the importance of the concept of 'work disability' in understanding the trend and fluctuation in claimant numbers, since there is little evidence that 'health disability' is related to the business cycle in a comparable manner. This is not the first study to show a relationship between disability benefit claims and unemployment rates but other studies have not considered the issue over a variety of cross-country data sets as here, and nor have these studies considered the relationship between work and health disability over the business cycle in an integrated manner.

Why are disability benefit claims so closely related to the business cycle? In principle, disability insurance systems are based on a notion of health disability, with

'gateways' and assessments designed to identify and discriminate among applicants on grounds of underlying capacity to work. In some cases such as Spain and Germany, however, such programmes have been national gateways into early retirement in the face of adverse demand shocks – whether as an explicit national policy or as an implicit indirect route which is well known and tolerated.[14] More generally, since individuals are more likely to wish to claim disability benefits when job opportunities are fewer and/or real wages are lower, the business cycle 'effect' presumably arises because 'work capacity' assessments are applied in a more discretionary manner at a local level according to economic conditions – anecdotal evidence suggests that 'capacity to work' is assessed less stringently in regions where employment opportunities are scarce and where particular individuals are 'hard to place'. Moreover where local managers of re-employment centres are under strong pressure from central government to keep unemployment figures down or to raise outflow rates from the unemployment register in times of recession, assigning individuals to the disability register is one mechanism for achieving these goals.

Of course, 'work disability' and 'health disability' are related because all disability insurance programmes impose some form of work capacity test. Indeed, in the data we observe a relationship between an individual's general self-reported health and the probability of receiving disability benefits. Crucially, however, this relationship does not affect the coefficients on the business cycle variables. Moreover, the incidence of given medical conditions is, if anything, pro-cyclical not counter-cyclical – strongly so in the United Kingdom, less so in the United States. And finally, in the European Labour Force Survey, while we observe a link between self-reported health and disability benefit receipt, a significant minority of disability benefit claimants report that they are in good or very good health, and a substantial proportion of non-claimants report that they are in poor health.

Disability insurance programmes are built on the premise that many health disabilities are of long duration or even permanent after the onset of the condition, as in programmes where disability is essentially seen as a 'route' into early retirement. Consequently such programmes place great emphasis on initial evaluations of disability and in determining what constitutes capacity for work at the first screening of the applicant. Indeed many countries have tightened these conditions significantly in recent years, while adopting broader criteria for what constitutes 'capacity for work' (that is, a broader range of occupations than that in which the applicant has been employed in the recent past). However, the analysis here shows, not just that some health disability is of potentially short duration, but that 'work disability' is related to specific economic and social circumstances which are time-varying.[15]

[14] Cremer *et al.* (2009) refer to the comparable use of the unemployment insurance programme in Belgium as an indirect early retirement route as a 'Canada Dry' pension – for an explanation of this nomenclature, see their footnote 5.

[15] See Benítez-Silva and Ni (2009) for a discussion of the dynamic nature of some health measures such as some activities of daily living.

Tightening initial eligibility conditions, especially in recession, may not just be politically unpopular but also genuinely impose hardship on individuals who, for one reason or another, find it hard to find a job. It should be recognized that, *de facto*, disability insurance programmes do operate like somewhat more generous unemployment insurance (UI) programmes, but perhaps the major difference is that, whereas UI programmes operate on the premise that claimants are, in essence, temporary, disability insurance programmes often work on the basis that disabilities are long-standing. A consequence is that disability programmes can easily ratchet up in size over time – with sharp inflows during 'bad times' but low levels of outflow in 'good times' so that, at the onset of each downturn, the residual number of long duration claimants is higher. Interestingly, our results for the European countries suggest a relatively small effect on inflows and a larger effect of outflows, while in the United States the inflow effect is significant and fairly large, while the outflow effect is less clear. However, the likely asymmetry of these effects during recessions and booms will result in a lower number of outflows when unemployment is high, but not necessarily more outflows when the economy improves, so even moderate inflow effects will result in ever-expanding programmes.

This phenomenon is noted by OECD (2006), as in the earlier long quotation from that document. But arguably, it is the differentiation between health and work disability that lies at the heart of this observation and which should lie at the heart of their analysis. If 'work disability' is the key issue, attempts to tighten up the disability insurance regimes in recession look politically heartless, whereas it is always easier to achieve employment targets in 'good times' by absorbing other groups into the workforce (such as married women and late retirees) rather than the more hard-to-place long duration disability benefit claimants. New thinking may be required to address the work disability-business cycle relationship.

One possible approach is to reconsider the nature of disability insurance programmes. Disability benefit payments are generally *state contingent*, in terms of labour market state: that is, applicants will obtain benefits if they can demonstrate that they are unable to work. Benefits are not paid because an individual is assessed as 'disabled' as such but because he or she is assessed as incapable of work (defined with varying degrees of specificity). So disability insurance is not a compensatory payment for long-standing illness or medical condition but, akin, to unemployment insurance, a subsidy for worklessness. Consequently, disability benefit payments are only available so long as the individual does not have a job and, like unemployment insurance, on the margin give an incentive to an individual not to find a job once the individual has passed the various eligibility criteria for disability benefits.

Analyses of incentives attached to disability insurance programmes often understate the costs of finding a job that face individuals who are in receipt of disability benefits. First, disability insurance programmes often offer higher replacement rates than unemployment insurance programmes. Second, an individual with a health disability is more costly to an employer than an individual with the same labour

cost (i.e. wage and social insurance contributions) who does not have a health disability. The individual with a health disability is more likely to take time off to visit doctors or hospitals, to have to buy medicine and health treatments (which are more likely to be free if the individual is in receipt of disability benefits) and to take regular periods off work. Certain kinds of health disability (notably medical illness and psychological problems) may be stigmatizing in the workplace. Finally, different criteria may be applied by benefit and re-employment offices to disability benefit claimants relative to, say, unemployment insurance claimants, in particular in relation to training and other active labour market policies. Tightly budgeted labour market programmes may focus on 'easy to place' applicants and policies to re-employment disability benefit claimants may thereby appear less cost effective than those applied to other types of re-entrants.

This suggests policies not just to broaden criteria for 'work capacity' but also to pay greater attention to how 'work capacity' varies over the spell of disability benefit receipt and not simply at the initial application. For example, thought could be given to detaching receipt of disability benefits (either in full or in part) from labour market state (i.e. activity or inactivity). For example, a policy could be implemented whereby a disability benefit recipient continues to receive all or part of their benefits even if they find a job – whether for a finite or an unlimited period.[16] Of course, it is likely to be more expensive to pay disability insurance benefits as a form of compensation for health disability rather than in relation to a lack of work capacity (work disability) given the number of people with some form of disability who continue to work. But this might deal with the incentive problems that arise from paying full benefit if the individual is inactive versus 'no benefit' if the person with a health disability continues to work. Such thinking might constitute an effective response to what has become an increasing budgetary problem for many OECD countries.

It is natural to finish with a discussion of the likely effect of the current global economic crisis on disability programmes. We have seen in 2008–2009 a large increase in unemployment rates across the developed world, and given that is our main explanatory variable it is logical to speculate about the effects that we might expect to see. The cross-country results for Europe do not point in the direction of a large growth in the inflow to the disability programmes (although inflow effects are observable for specific countries). However, the results certainly suggest that outflows from disability registers will decline during this period. In contrast, the results for the United States imply a considerable inflow effect from the recession,

[16] See the report by the Social Security Advisory Board (2006) about the importance of combining work with benefits receipt to reach the goals of the disability system in this century. See also Hoynes and Moffitt (1996), Tuma (2001), Benítez-Silva *et al.* (2008), Benítez-Silva (2009, 2010), and Yin (2008) for a discussion of these possibilities within the US disability system. Very recent UK reforms are designed so that those exiting the disability benefit regime may, under certain conditions (such as low income or participation in a specific programme) receive some additional disability-related income. But it is too early to evaluate the scale and outcomes of such programmes.

and this effect is already apparent. The SSA provides monthly statistics on the number of recipients in the SSI and SSDI programme, and of new awardees to the SSI programme. Up to November 2009, the number of awardees in the SSI programme had grown by 11% with respect to the same period in 2008, while up to December 2009 the number of total awards as disabled workers into the SSDI programme had grown by 10.1% compared with 2008, while the number of total recipients as disabled workers and dependents in the SSDI programme had grown by about 4.5%. Given that in this period the unemployment rate in the United States has gone from just below 6% to around 10%, these effects seem quantitatively consistent with the econometric evidence presented here.

Discussion

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This paper addresses the following question: Do worse economic conditions lead to more people applying and being awarded disability benefits (DB)? This is an important question. Many countries (like the United States) have experienced a massive increase in the proportion of people receiving DB. This rise, unjustified in the face of general improvement of health due to technology and so on, has prompted many researchers to investigate the disincentive effects created by DB, that is, the 'moral hazard' aspect of disability insurance (see Autor and Duggan, 2006, for a recent review).[17]

The novelty of this paper is that it looks at the moral hazard issue from two new angles. First, it provides international evidence on DB and the related moral hazard issue. Second, it examines micro data evidence with micro data from four countries, while at the same time controlling for the confounding effect of health.

The DB programme, as most social insurance programmes, has the usual trade-off between insurance and incentives. On the one hand DB (is supposed to) provide insurance against rare but catastrophic events. The insurance provided by a DB programme is valuable because the risk of a disability is typically small, and hence precautionary saving against it would be inefficient. However, the paper is not concerned about measuring the insurance value of the DB programme. The paper is mostly concerned about measuring the distortions induced by DB, such as people exaggerating their disability, or the labour supply disincentives (i.e., people quitting into unemployment in the anticipation of applying for DB).

[17] Technically, the term 'moral hazard' is inappropriate because there is no hidden action. However, there is still private information – the government observes the true disability status of an individual with error.

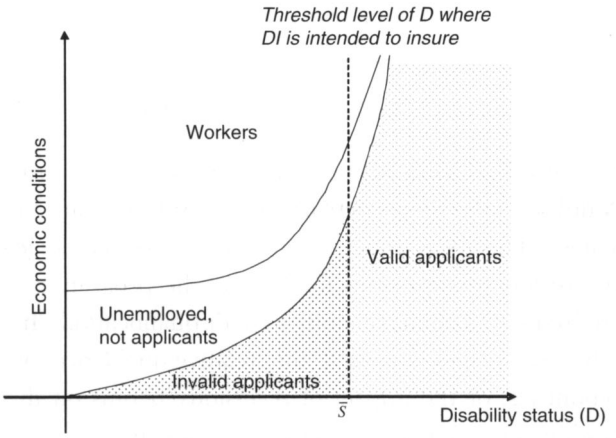

Figure 4. The trade-off between incentives and insurance

Source: Low and Pistaferri (2009).

Figure 4 (taken from Low and Pistaferri, 2009) shows the trade-off between economic conditions and disability status graphically. On the y-axis we have an index of economic conditions faced by the worker – it could be the state of the local economy, for example. On the x-axis we have the disability status of an individual. The vertical line $\bar{S}$ is the level of disability above which the government determines that the individual is disabled and deserves DB. Unfortunately, the government only observes the disability status with error – hence an applicant with a low level of disability can be admitted into the programme (type II error) or a truly disabled applicant can be rejected (type I error). The figure shows that there are four areas of interest for policy. Certain individuals work, others are unemployed but do not apply for DB, others apply for DB – some are truly disabled, some are not. The area labelled 'Invalid applicants' identifies the size of the moral hazard problem. For a given level of local economic conditions, the worse is the disability status the higher the probability to apply. More importantly, for a given disability status (say, below $\bar{S}$) the probability to apply increases when economic conditions worsen. The paper tries to quantify this link.

The main contribution is empirical and hence I will devote the rest of my comments to the empirical specifications and results. The objective of the empirical analysis is to understand whether worsening of economic conditions induces an increase in the moral hazard problem of DB. The paper starts with the simple specification:

$$DB_t = \alpha + \beta U_t + controls + e_t$$

in which DB is a measure of the 'size' of the DB programme, measured with the stock of people on DB, the inflow into DB, the outflow off DB, and the number of applications to the programme. U is the local unemployment rate. Empirically, the paper finds that an increase in U: (a) increases the 'stock' of people on DB;

(b) has basically no effect on the 'inflows'; and (c) it reduces the 'outflows'. Since definitionally

$$Stock_t = Stock_{t-1} + Inflow_t - Outflows_t$$

a possible inference is that most of the action on the 'stock' must be coming from a reduction in 'outflows' (this is particularly true for European countries, less so for the United States). This begs the question: Why do people leave DB? In most countries there are four main causes for leaving the programme: death, transitions into 'official' retirement, voluntary quit, and disqualification. It would have been interesting if the paper had analysed the relative incidence of the four outflow causes across countries, or the impact of recessions/booms on these four causes. In particular, recessions may slow down voluntary quits, make governments more lenient, or even to an extreme slow down death (as argued by Ruhm, 2000).

One may argue that there are other variables that may capture the decline in the opportunity cost of applying for DB besides local unemployment rates (and may perhaps be even more informative). In Low and Pistaferri (2009) we argue that there are at least three types of shocks that may lead an individual to apply for DB: genuine health shocks, lack of job offers, and permanent productivity shocks (i.e., shocks unrelated to health such as obsolescence of skills or changes in the prices thereof). The latter mechanism is unexplored here, but future research could check whether this is important by exploiting the fact that, say, skill-biased technical change has operated differentially across countries. For example, one could use indexes of 'permanent' wage inequality (trying to distinguish between cycle and trend effects).

While I believe that economic conditions do matter in determining DB outcomes, and hence I take this paper's findings as credible, I will list here four issues that may affect the *quantitative* interpretation of the findings. Some of these issues are discussed in the paper and here I just restate them with some qualifications. The first issue is the timing of the unemployment variable. It takes time for an application to be approved. If applications respond to unemployment, then we should see a response to lagged, not contemporaneous unemployment rate. The second issue is reverse causality. People who transition into DB reduce labour force participation rates (mechanically), and hence reduce the unemployment rate. Third, some of the paper's regressions are run with aggregate data, using regional variability in unemployment rates within a country (e.g., East Anglia versus West Midlands). However, there may be some sample selection bias induced by migration. For instance, high unemployment rate in region A pushes some workers to migrate towards region B with lower unemployment rate. Since migrants tend to be more productive and healthier, it is not surprising that regions with a high unemployment rate have more people on DB. The last possible bias concerns an omitted variable issue. Measures of 'strictness of test for admission into program' affects DB rates and may be correlated with unemployment. In bad

times, government becomes more permissive.[18] Of course, it is very difficult to obtain measures of strictness.

In the last part of the paper, the authors deal with perhaps the most important source of omitted variable bias of their regression. Disability status affects DB rates (effectively fulfilling the programme's goal), but disability status may also be correlated with unemployment (because of 'response bias' or because 'recessions are bad for health'). The solution proposed here is a control function approach, consisting of: (a) checking first whether disability status is actually correlated with unemployment, and (b) augmenting the basic specification with measures of disability status.

The problem becomes one of measurement. How should we measure disability status? The paper proposes a distinction between work and health disability, which I find a bit elusive. A work disability seems to be equated with 'subjectively reported disability', and a health disability seems to be equated with 'objectively measureable disability'. However, this distinction is not always informative. Take back pain as an example. Some people have herniated disks, that is, an objective and measurable condition (via an MRI scan); but not all people with a herniated disk have back pain. In contrast, some people complaining of excruciating back pain (a subjective condition) have no medical pathology (i.e., medically obtainable 'proof' of their ailment). Things get even less clear with, for example, mental disorders: 'experts' must assess them. It is precisely this elusiveness that makes the DB screening problem so potentially fraught with errors.

In practice, is disability status (positively) correlated with unemployment? Using subjective measures, the answer is yes, but with two caveats. First, there is a response bias: People who are out-of-work may exaggerate the extent of their disability as a form of self-rationalization of their state. Second, the relationship is positive but flats out at high levels of unemployment. Using objective measures, disability status appears (negatively) correlated with unemployment in the United Kingdom while the results are mixed for the United States. Hence if anything, recessions appear to be *good* for health. One issue is whether this can really be true for *all* conditions, short and long term. The mechanism behind it is unclear.

Nevertheless, the authors find that high unemployment rates increase stocks on DB and reduce outflows even controlling for disability status. Hence the main finding of the paper appears robust to these checks, which is reassuring.

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This paper analyses the empirical relationship between the regional unemployment rate and the number of disability benefit recipients, using a large number of data

[18] It is somewhat interesting that the results for the United States reverse sign when the authors include the DB 'retrenchment' of the Reagan era.

sets for various OECD countries. Data sources include harmonized cross-section data at the individual level for 23 countries from the European Labour Force Survey 2002, the European Community Household Panel cross-country data (ECHP) and the Survey of Income and Living Conditions (SILC), country-specific micro panel data such as the British BHPS, the German GSOEP and the PSID for the United States, as well as time series and panel data aggregated to the regional or national level. While previous studies have focused on similar empirical relationships between the business cycle and inflow, outflow, or stock of disability benefits recipients, the current study looks at the issue from many different angles and challenges the robustness of the finding that the size of disability programmes is anti-cyclical.

The main conclusion is that there is a robust positive relation between unemployment and disability claimants, implying that claiming disability benefits is anti-cyclical. In European countries the main reason is pro-cyclical outflow from disability programmes, while in the United States anti-cyclical inflow plays a larger role. Regressions based upon micro-data with different types of information on health show that the positive relation between unemployment and claiming disability benefits remains when health is kept constant. The relation between the health indicators and unemployment varies across health domains. Physical health problems are more often pro-cyclical, while mental health problems tend to be anti-cyclical. These relations are much weaker than the relation between unemployment and claiming disability.

The paper is interesting and important for public policy, and particularly topical given the recent economic crisis. The authors use an impressive variety of data sets and regressions and the power of the paper is the robustness of the main conclusion: the point that disability claiming is positively affected by unemployment, and that this cannot be explained by movements in genuine health. A major policy implication is the need to stimulate outflow out of disability programmes rather than treating disability as an absorbing state. My comments do not challenge these findings but discuss their implications and the need for further research aimed at more specific policy recommendations.

To understand the paper's policy implications it seems useful to say more about the underlying conceptual framework. Health is a multidimensional concept, and some aspects of (both physical and mental) health will affect productivity and employment while others will not. Disability programmes are meant for workers with a health problem that limits the amount or type of work they can do. The main results in the paper confirm that claiming disability benefits is not just a medical issue: the relation between unemployment and disability claiming is much stronger than what can possibly be predicted from the weak and ambiguous relation between the business cycle and physical and mental health. In the heterogeneous institutional settings in OECD countries, with varying generosity, access criteria, and application procedures, claiming of disability benefits also depends on eco-

nomic factors driving the decisions of employers and the alternative opportunities for the workers. Moreover, non-economic factors such as employer attitudes and negative stereotypes of workers with a health problem can play a role. It is quite plausible that the trade-offs made by employers and workers often lead to different outcomes during economic booms or recessions.

The authors emphasize the difference between 'work disability' and 'health disability', where they identify work disability with claiming disability benefits. In other studies, however, work disability is given the different meaning of work-related health, and socio-economic surveys often measure it with a question that explicitly asks about health problems related to work, like 'Do you have a health problem that limits the amount or type of work you can do?'. Using such a question could be a welcome addition to the empirical analysis since it accounts for the fact that some aspects of health are related to work capacity while others are not. The edited volume of Stapleton and Burkhauser (2003) focuses on the question why the fraction of workers among those who report they have a work-related health problem has fallen in the 1990s, and Kapteyn *et al.* (2008) analyse a dynamic model where work-related health defined with this question is one of the factors determining employment status.

The question on work-related health is a rather general self-assessment that may suffer from a similar type of justification bias as other measures of self-assessed health, as explained by the authors. This, however, does not mean such measures should be discarded. Recent research of Kapteyn *et al.* (2009) using vignettes, short stories of hypothetical people with a specific work-related health problem, indeed suggest that US respondents with and without paid work evaluate the work-related health problems of the same vignette persons systematically differently (while European respondents do not), but the differences are not large enough to have a substantial effect on the estimated relationship between health and employment status. More work on the dynamic relationships between indexes of general health, work-related health, and disability status therefore seems a useful direction of future research.

It is interesting to see the large variation in health status and its relation to disability inflow and outflow across countries. It would be useful to make more of this when it comes to specific policy recommendations. An example is the difference in the business cycle effect on disability outflow between the United States and the United Kingdom, which may relate to the different ways in which workers are treated once they have entered the programme. In general, there is huge variation, also within Europe, in the generosity of disability benefits, the access criteria, the application procedures, and the measures to stimulate programme outflow. While studies like Bound and Burkhauser (1999) discuss the relation between these programme features and the size of disability programmes, how these institutional differences affect the relation with the business cycle has not been systematically studied. The recommendation to pay attention to policies that

can stimulate disability outflow is very useful but more research is needed to see which policies can be effective.

Policy-oriented future research would benefit from a clearer distinction between supply and demand factors. Supply factors such as the generosity of the disability insurance programme and the temporary or permanent nature of disability benefits are widely recognized, also in the current study. The demand side, however, essentially enters through the business cycle variables only. There seems to be an analogy with studies of early retirement and employability of older workers: now that in most countries financial incentives have changed and policies that stimulate labour supply at an older age are starting to be successful, policy focus is changing slowly to the question whether employers are willing to keep or recruit the older workers, to productivity and cost benefit trade-offs on the side of the firm, and to non-economic demand factors like negative perceptions and attitudes towards older workers (see, e.g., Sigg, 2007). In the same spirit, economic and non-economic demand factors may hamper the employment opportunities of workers with a health problem, and employability of these workers may require measures such as accommodation of the workplace or adjustment of job tasks, as well as a change in employer attitudes. This suggests economic policy measures such as subsidies for adjustments or a system with penalties and rewards for firms with relatively high or low numbers of disability entries (see Koning, 2009), as well as new legislation or public campaigns to improve the image of workers with a handicap. The effectiveness of packages of such policies has not yet been analysed systematically.

The relation between retirement policy and disability policy goes beyond the demand and supply parallels sketched above. The two are strongly intertwined. Work-related health problems and disability benefit claiming are more prevalent among older workers than among the younger age groups, and disability claiming is often seen as an alternative exit route when generous early retirement arrangements are no longer available. The results of the current study confirm that policies aiming at increasing the standard retirement age bear the risk of increasing the number of disability applications, particularly during times of recession when older workers are at higher risk to lose their job and are even less likely to find new jobs. This suggests that future research focused on the disability of older workers in relation to other labour market exit routes would be particularly worthwhile.

Panel discussion

Etienne Wasmer suggested that one of the reasons why more people apply for disability benefits during bad times may be due to changes in working conditions and stress in the workplace. He pointed out that data at the individual level, which measures various aspects of stress in the workplace are correlated with country level

unemployment. Richard Disney noted that it is difficult to pin down how stress in the workplace influences disability claims. For example, when there is much more pressure of unemployment people could be much more stressed but may not necessarily take more time off work for fear of losing their job. He referred to a Canadian study which shows that back pain was one of the main disability claims in recent years when unemployment was falling but there is evidence that people are less likely to make back pain claims in periods or areas where unemployment is higher. He noted that it would be interesting to see whether there is a reversal in the types of claims if unemployment rates were to rise sharply. Morten Ravn focused on the importance of understanding the difference in outflow rates into employment between people claiming unemployment benefit and those who were on disability benefit. He wondered how less likely disability claimants were to find employment. He pointed out that it is important to differentiate between how changes in disability regulation and job search impact on outflow rates. Stefan Gerlach believed there should be greater emphasis and discussion on the main policy questions the paper seeks to address. Referring to the large differences across countries in the proportion reporting the existence of a long-standing health problem or disability, he wondered if a relevant policy to ask was how does one make Finland (32%) more like Italy (7%)? Richard Disney responded that the primary focus of the paper was on the relationship between disability benefit and unemployment and to show that disability was not simply related to measurable health conditions. He believed that the optimal policy should support health disabilities in the population but also deal with shocks to employability. He did not believe that it was necessarily a bad thing that DB increases when unemployment is higher as it provides a form of augmented disability insurance for long-term unemployed people.

Web appendixes

Available at http://www.economic-policy.org

REFERENCES

Anayadike-Danes, M. and D. McVicar (2008). 'Has the boom in incapacity benefit claimant numbers passed its peak?' *Fiscal Studies*, 29, December, 415–34.

Autor, D. and M. Duggan (2003). 'The rise in the disability rolls and the decline in unemployment', *Quarterly Journal of Economics*, February, 157–205.

—— (2006). 'The growth in the Social Security disability rolls: a fiscal crisis unfolding', *Journal of Economic Perspectives*, 20(3), 71–96.

Baker, M., M. Stabile and C. Deri (2004). 'What do self-reported objective measures of health measure?' *Journal of Human Resources*, 39(4), 1067–93.

Beale, N. and S. Nethercott (1988). 'Certificated sickness absence in industrial employees threatened with redundancy', *British Medical Journal*, 28, May, 1508–10.

Beatty, C. and S. Fothergill (1996). 'Labour market adjustment in areas of chronic industrial decline: the case of the UK coalfields', *Regional Studies*, 30, November, 627–40.

Benítez-Silva, H. (2009). 'Disability, social insurance, and labor force attachment', in *Essays on Economics, Disability, and Employment (Ensayos sobre Economía, Discapacidad, y Empleo)* Delta Publicaciones (ch. 9, pp. 179–201), http://www.deltapublicaciones.com/catalogo.php?ids=11&pub=151

—— (2010). 'Disability and labor force attachment: a policy challenge', manuscript, SUNY-Stony Brook.

Benítez-Silva, H., M. Buchinsky and J. Rust (2006). 'How large are the classification errors in the social security disability award process?' manuscript, SUNY-Stony Brook, UCLA, and University of Maryland.

—— (2008). 'Induced entry effects of a $1 for $2 offset in SSDI benefits', manuscript, SUNY-Stony Brook, UCLA, and University of Maryland.

Benítez-Silva, H., M. Buchinsky, H. Chan, S. Cheidvasser and J. Rust (1999). 'An empirical analysis of the social security disability application, appeal and award process', *Labour Economics*, 6, 147–78.

—— (2004). 'How large is the bias in self-reported disability?' *Journal of Applied Econometrics*, 19(6), 649–70.

Benítez-Silva, H. and H. Ni (2009). 'Recovery and mobility limitations among older Americans', manuscript, SUNY-Stony Brook and Kennesaw State University.

Berkowitz, M. (1996). 'Improving the return to work of social security beneficiaries', in J.L. Mashaw, V. Reno, R.V. Burkhauser and M. Berkowitz (eds), *Disability, Work and Cash Benefits*, W.E. Upjohn Institute for Employment Research, Kalamazoo, MI.

Black, D., K. Daniel and S. Sanders (2002). 'The impact of economic conditions on participation in disability programmes: evidence from the coal boom and bust', *American Economic Review*, 92, March, 27–50.

Blöndal, S. and S. Scarpetta (1999). 'The retirement decision in OECD countries', OECD Economics Department Working Papers No. 202, Paris.

Bound, J. (1991) 'Self-reported versus objective measures of health in retirement models', *Journal of Human Resources*, 26, 106–38.

Bound, J. and R. Burkhauser (1999). 'Economic analysis of transfer programs targeted on people with disabilities', in O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 3C. Elsevier Science, North Holland, Amsterdam.

Bound, J., M. Schoenbaum, T.R. Stinebrickner and T. Waidmann (1999). 'The dynamic effects of health on the labor force transitions of older workers', *Labour Economics*, 6, 179–202.

Bridges, S. and R. Disney (2010). 'Debt and depression', *Journal of Health Economics*, 29, 388–403.

Brooker, A.-S., J. Frank and V. Tarasuk (1997). 'Back pain claim rates and the business cycle', *Social Science and Medicine*, 45(3), August, 429–39.

Burkhauser, R. and M. Daly (2001). 'United States disability policy in a changing environment', Working Papers in Applied Economic Theory 2002-21, Federal Reserve Bank of San Francisco.

Burkhauser, R., A. Houtenville and D. Wittenburg (2003). 'A user's guide to current statistics on the employment of people with disabilities', in D.C. Stapleton and R.V. Burkhauser (eds), *The Decline in Employment of People with Disabilities: A Policy Puzzle*, W.E. Upjohn Institute for Employment Research, Kalamazoo, MI.

Capella-McDonnall, M. (2007). 'Effectiveness of the ticket to work program for beneficiaries who are blind or have low vision: comparisons with other beneficiaries', *Journal of Visual Impairment & Blindness*, V101(5), 296–301.

Cremer, H., J.-M. Lozachmeur and P. Pestieau (2009). 'Use and misuse of unemployment benefits for early retirement', *European Journal of Political Economy*, 25, June, 174–85.

Diamond, P.A. (2007). 'Top-heavy load: trouble ahead for social security systems', *CES ifo Forum*, 8(3), 28–36.

Disney, R. and S. Smith (2002). 'The labour supply effect of the abolition of the earnings rule for older workers in the United Kingdom', *Economic Journal*, 112, March, C136–52.

Disney, R. and S. Webb (1991). 'Why are there so many long-term sick in Britain?' *Economic Journal*, 101, 252–62.

Disney, R., C. Emmerson and M. Wakefield (2006). 'Ill-health and retirement in Britain: A panel data-based analysis', *Journal of Health Economics*, 25, (July), 621–49.

Dwyer, D.S. and O.S. Mitchell (1999). 'Health problems as determinants of retirement: are self-rated measures endogenous?' *Journal of Health Economics*, 18, 173–93.
Gruber, J. and J. Kubik (1997). 'Disability insurance rejection rates and the labour supply of older workers', *Journal of Public Economics*, 64, April, 1–23.
Gruber, J. and Wise, D.A. (1999). *Social Security and Retirement around the World*, University of Chicago Press, Chicago.
—— (2004). *Social Security and Retirement around the World: Micro-Estimation*, University of Chicago Press, Chicago.
Hassink, W.H.J., J.C. van Ours and G. Ridder (1997). 'Dismissal through disability', *De Economist*, 145(1), 29–46.
Haveman, R. and B. Wolfe (1984). 'Disability transfers and early retirement: a causal relationship?' *Journal of Public Economics*, 24, June, 47–66.
Haveman, R., P. de Jong and B. Wolfe (1991). 'Disability transfers and the work decision of older men', *Quarterly Journal of Economics*, 106, August, 1419–26.
Hoynes, H.W. and R. Moffitt (1996). 'The effectiveness of financial work incentives in social security disability insurance and supplemental security income: lessons from other transfer programs', in J.L. Mashaw, V. Reno, R.V. Burkhauser and M. Berkowitz (eds), *Disability, Work and Cash Benefits*, W.E. Upjohn Institute for Employment Research, Kalamazoo, MI.
Jenkins, R., A. Macdonald, J. Murray and G. Strathdee (1982). 'Minor psychiatric morbidity and the threat of redundancy in a professional group', *Psychological Medicine*, 12(4), 799–807.
Jiménez-Martín, S. and J. Vall-Castelló (2009). 'Business cycle effects on labor force transitions for older people in Spain', FEDEA, WP 2009-25.
Jiménez-Martín, S., J.M. Labeaga and C. Vilaplana (2006). 'A sequential model for older workers' labor transitions after a health shock', *Health Economics*, 15(9), 1033–59.
Kapteyn, A., J.P. Smith and A. van Soest (2007). 'Vignettes and self-reporting on work disability in the United States and the Netherlands', *American Economic Review*, 97, March.
—— (2008). 'Dynamics of work disability and pain', *Journal of Health Economics*, 27(2), 496–509.
—— (2009). 'Work disability, work, and justification bias in Europe and the United States', NBER Working Paper No. 15245.
Koning, P. (2009). 'Experience rating and the inflow into disability insurance', *De Economist*, 157, 315–35.
Koning, P. and D.J. van Vuuren (2007). 'Hidden unemployment in disability insurance', *Labour*, 21(4), 611–36.
—— (2008). 'Disability insurance and unemployment insurance as substitute pathways', forthcoming in *Applied Economics*.
Kossoris, M. (1938). 'Industrial injuries and the business cycle', *Monthly Labor Review*, 46, 579–94.
—— (1943). 'Changes in injury frequency rates and employment in manufacturing, 1936–1941', *Monthly Labor Review*, 56(5), 949–54.
Lahiri, K., D.R. Vaughan and B. Wixon (1995). 'Modeling SSAs sequential disability determination process using matched SIPP data', *Social Security Bulletin*, 58(4), 3–42.
Lindeboom, M. and E. van Doorslaer (2004). 'Cut point shift and index shift in self-reported health', *Journal of Health Economics*, 23, November, 1083–99.
Low, H. and L. Pistaferri (2009). 'Disability risk, disability insurance and life-cycle behaviour', NBER Working Paper 15962.
Lutz, W., W. Sanderson and S. Scherbov (2008). 'The coming acceleration of global population ageing, *Nature*, 451(7), 716–19.
McVicar, D. (2006). 'Why do disability benefit rolls vary across regions? A review of the evidence from the USA and the UK', *Regional Studies*, 40, July, 519–33.
—— (2008). 'Why have UK disability benefit rolls grown so much?' *Journal of Economic Surveys*, 22(1), 114–39.
Muller, L.S. (1992). 'Disability beneficiaries who work and their experience under program work incentives', *Social Security Bulletin*, 55(2), 2–19.
—— (2000). 'The search for evidence of a labor supply response to a benefit offset', Office of Research, Evaluation and Statistics, Social Security Administration.

Nagi, S.Z. (1964). 'A study in the evaluation of disability and rehabilitation potential', *American Journal of Public Health*, 54(9), 1568–79.
—— (1969). *Disability and Rehabilitation: Legal, Clinical, and Self-Concepts and Measurement*, Ohio State University Press, Columbus, OH.
—— (1991). 'Disability concepts revisited: implications for prevention', in *Disability in America: Toward a National Agenda for Prevention*, National Academy Press, Washington, DC.
OECD (2006). *Sickness, Disability and Work: Breaking the Barriers, Volume 1: Norway, Poland and Switzerland*, OECD, Paris.
—— (2007). *Sickness, Disability and Work: Breaking the Barriers, Volume 2: Australia, Luxembourg, Spain and the United Kingdom*, OECD, Paris.
—— (2009). *Employment Outlook 2009: Tackling the Jobs Crisis*, OECD, Paris.
Riphahn, R. (1997). 'Disability retirement and unemployment: substitute pathways for labour force exit? An empirical test for Germany', *Applied Economics*, 29(5), 551–61.
Robinson, J. and G. Shor (1989). 'Business-cycle influences on work-related disability in construction and manufacturing', *Milbank Quarterly*, 67(2), 92–111.
Ruhm, C. (2000). 'Are recessions good for your health?' *Quarterly Journal of Economics*, 115, May, 617–50.
Salomon, J., A. Tandon and C. Murray (2004). 'Comparability of self-reported health: cross-country multicounty surveys using anchoring vignettes', *British Medical Journal*, 328, January, 258.
Sigg, R. (2007). 'Extending working life: evidences, policy challenges and successful responses', in B. Marin and A. Zaidi (eds), *Mainstreaming Ageing: Indicators to Monitor Sustainable Progress and Policies*, Ashgate, Farnham, pp. 447–89.
Smith, R.T. and A.M. Lilienfeld (1971). 'The Social Security Disability Program: an evaluation study', Research Report 39, Social Security Office of Research and Statistics.
Social Security Advisory Board (2003). *The Social Security Definition of Disability*, Washington, DC.
—— (2006). *A Disability System for the 21st Century*, Washington, DC.
—— (2009). *The Unsustainable Cost of Health Care*, Washington DC.
Stapleton, D.C., B. Barnow, K. Coleman, K. Dietrich and G. Lo (1994). *Labor Markets Conditions, Socioeconomic Factors and the Growth of Applications and Awards for SSDI and SSDI Disability Benefits: Final Report.* Lewin-VHI, Inc. and the Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation.
Stapleton, D.C. and R.V. Burkhauser (2003). *The Decline in Employment of People with Disabilities: A Policy Puzzle*, W.E. Upjohn Institute for Employment Research, Kalamazoo, MI.
Thornton, C. (Project Director) (2007). *Evaluation of the Ticket to Work Program: Assessment of Post-Rollout Implementation and Early Impacts.* Mathematica Policy Research Inc., under contract from the Social Security Administration.
Tuma, N. (2001). 'Approaches to evaluating induced entry into a new SSDI program with a $1 reduction in benefits for each $2 in earnings', manuscript, Stanford University.
Westerhout, E. (2001). 'Disability risk, disability benefits, and equilibrium unemployment', *International Tax and Public Finance*, 8(3), 219–43.
WHO (1980). *The International Classification of Impairments, Disabilities, and Handicaps: A Manual Relating to the Consequences of Disease*, World Health Organization, Geneva.
Wunderlich, G.S., D.P. Rice and N.L. Amado (eds) (2002). *The Dynamics of Disability: Measuring and Monitoring Disability for Social Security Programs*, National Academy Press, Washington DC.
Yin, N. (2008). 'Partial benefits in the Social Security Disability Insurance: a policy alternative to foster work among the disabled', manuscript, Baruch College-CUNY.