The Economic Burden of Disability in India: Estimates From the NSS Data[*]

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Abstract

The paper estimates the economic cost to family when a household member loses job due to onset of disability. The cost is measured in terms of loss in the 'conversion handicap' adjusted per capita household consumption and is estimated using the Indian National Sample Survey (NSS) data. Estimates of the loss are given by state, by rural-urban place of residence, and by the type of disability. The paper recommends a publicly provided actuarially fair social disability insurance program that taxes workers while working and provides disability benefits close to their pre-disability earnings to improve social welfare by preventing large consumption losses.

Keywords: Asia; India; Economic burden of disability; Disability in India; Cost of disability in India.

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To be incorporated in right context. Dessai, 2010 Doessel and Whiteford, 2013 Elwan, 1999 Government of India, 1995 Fujiura, 2001 Haber, 1973

Singal, 2008 Singal and Jeffery, 2009 Loyalka et al., 2012

Mitra, 2006 Mitra, Posarac, et al., 2013 Mitra and Sambamoorthi, 2008

National Sample Survey Organization, 1997 2002

Reddy and Chandrasekhar, 1998 Thomas, 2005 Walia, 2010 World Health Organization et al., 2011

1 Introduction

In this paper, we estimate the economic cost to family when a working family member loses job due to onset of disability. We use the special module on disability of the 2002 NSS (National Sample Survey) dataset to estimate the cost. We also review the policy debates on disability in developing countries, and to improve the welfare of workers who lose jobs due to disability, we propose a self-financed publicly provided social disability insurance program that taxes the workers while in good health and working and pay benefits when a worker becomes disabled and loses job. To put the policy debates in proper perspective, it is important to know how prevalent various types of disabilities are in less developed countries, what their causes and costs are. We can then evaluate the costs and benefits of public health policies that prevent or reduce the occurrence of disabilities, social disability insurance programs that provide disability benefits to those who lose jobs due to onset of disability, and public policies that improve educational attainment or employment of the disabled.

Disability is prevalent both in developed and developing countries, although the age distribution and the causes of disability in the two regions differ significantly. According to some estimates by the World Bank (see World Bank, 2007), about 600 million individuals in the world live with some disability, which means about one in every 10 of the world population, live with some disability. In developing countries, owing to their poor health care, poor nutrition, unsafe living conditions and inadequate prenatal care, children become more vulnerable to serious diseases, leading to higher rate of disability incidence for children and youth. Many other types of disabilities such as musculoskeletal, cardiovascular and neoplasm mostly occur at older ages, especially at most advanced ages. Since life expectancies are low in developing countries, most people do not survive to the advanced older ages to encounter those types of disabilities. Because the life expectancies are much higher in developed countries, they have higher rates of disability incidence of the latter types. The cross-country estimates of disability rates are not comparable, since each country uses different definition of disability. Still to get some ideas about some estimates, we refer to Mont, 2007, Table 2[1], who shows that the disability rates are as high as around 20 percent in New Zealand, Australia and the USA, and the rates are as low as 2.1 percent in India and even lower rates of 0.8 percent in Bangladesh and 0.7 percent in Kenya.

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[1] See Mitra, Posarac, et al., 2013 for better estimates of the disability incidence rates in 15 developing countries based on comparable household survey data.

While there are many studies that examine the causes of disability in developed countries, few studies are available for developing countries. Patel, 2009 uses the same NSS data that we also use, and he reports that in India roughly 50 percent of all disabilities are of locomotive type and they are more or less uniformly spread over all ages. A large proportion of the locomotive disabilities at young ages are caused by polio - about 62 percent are in the age-group less than 15 years, and about 32 percent are in the age group 15 to 59 years. These types of disabilities are totally preventable with proper public vaccination program. But India has a long way to achieve it. Mental disabilities are mostly concentrated among the working age population, and visual and hearing disabilities are concentrated among the aged population. Serious illness and head injury during childhood and prenatal complications before birth are the dominant causes of mental disabilities. Many of these could be prevented by proper medical care, adopting better workplace safety measures and by changing individual behavior towards accidents, burns, personal hygiene and malaria.

We can group public debates on disability policies into three categories: (i) preventive policies which include policies on public health, especially polio vaccination and prenatal and postnatal care, workplace safety, cleaning up of mine fields, and public awareness education, (ii) policies to reduce 'earnings handicap' (defined below) which include easier accessibility of the disabled person to schools and workplaces, and the prevention of discrimination against disabled persons in schools and in the labor market, (iii) policies to reduce 'conversion handicap' (defined below), which include providing resources for wheel chairs, prosthesis or other such special needs to the disabled.

Sen, 2004 in his address (???) states:

> "It is also, I would argue, useful to understand why the main schools of thought in theories of justice have tended to neglect this central issue, and how that neglect, in its turn, has tended to bias practical policies in the direction of inaction, and has even contributed to suppressing the sense of inadequacy that can reasonably accompany the failure to take a responsible view of the social obligation to the disabled."

He suggests extending the existing theories of justice for income distribution to incorporate the 'earnings handicap' and 'conversion handicap' of the disable people. He defines those two types of handicaps as follows: To achieve the same level of opulence a "disabled person may find it harder to get a job or to retain it, and may receive lower compensation for work."

This refers to 'earnings handicap'. On top of the earnings handicap, to "do the same things as an able-bodied person, a person with physical disability may need more income than the able-bodied person. To move easily or at all, a person who happens to be, say, crippled by an accident or by illness may need assistance, or prosthesis, or both. The conversion handicap refers to the disadvantage that a disabled person has in converting money into good living."

Being guided by the ethical and moral discussions on redistribution, as advocated, for instance, by or by the guidelines of the international health and development organizations such as the World Health Organization and the World Bank, or following some other principles of its own, India has introduced quite a few disability policies in all the above three areas. The achievements are, however, not satisfactory. A lot needs to be done to implement the existing policies or to introduce better policies. For instance, consider one important policy, the PWD (Person with Disability) Act of 1995 (see Trivedi, 2011 for excerpts of the main items of this policy). The policy reserves a certain percentage of public sector jobs for disabled persons, yet there has been a decline in the employment rate of the working age disabled population from 43 percent in 1991 to 38 percent in 2002. Furthermore, the policy encompasses only seven denominated types of disability and fails to include cerebral palsy, muscular dystrophy and autism (World Bank, 2007).

One most important earnings handicap for disabled persons is low or no education. For instance, reports a much lower educational attainment rate in India: about 52 percent illiteracy rate among the disabled population compared to a 35 percent illiteracy rate among the general population. The percentage of disabled children who are out of school is around five and a half times higher than that for the general population. The disabled children in India are more deprived of education than even generally known deprived SC &ST (Scheduled Castes and Scheduled Tribes) population whose percentage of out of schoolchildren population is about four times higher than that of the general population. In even the best performing major states, significant shares of out of school children are those with disabilities: in Kerala, 27 percent; in Tamil Nadu over 33 percent, see . Putting together estimates from survey data on 13 countries, Filmer, 2008 found that the poorest of the poor is the disabled population, because they had the lowest or no education, leading to lowest earnings in the labor market and thus to poverty. Controlling for other variables, his econometric estimates show that if disabled individuals attain the same level of education as the normal children, there will be no difference between the disabled and non-disabled persons as far as the opulence i.e. income is concerned. It is important to note however that policies to educate the disable is only a necessary step for equality of opulence between disabled and

non-disabled individuals, the labor market policies such as discrimination against disabled workers and making the workplace accessible to disabled workers must also be introduced and properly implemented. Note that this can only equalize the opulence between the two groups. The disabled population still faces the Sen's conversion handicap problem: equality of earnings of the able and disabled persons would not achieve equality of their living standards; more is to be done for the disabled population to achieve equity of living standard.

The disability policy discussions on India have focused on other areas such as provision of education for the disabled children, reservation of employment for the disabled persons, and provision of preventive cares such as universal coverage of polio vaccination and improvement of prenatal care. Those policies are useful but the implementation of those policies have been very unsatisfactory as can be seen by no improvement or even deterioration of disability incidence rates over time. For more meaningful policy discussions and recommendations, it is very important to know the magnitude of economic burdens to the family when a family member becomes disabled.

Disability imposes many types of economic burdens to the disabled individual, to the family of the disabled and more broadly to the employer, insurance companies and to the society. First, the family with a disabled member incurs extra expenses to meet the medical or equipment needs of a disable family member. Second, the individual with disability will end up contributing very little or nothing to the family resources due to presenteeism, i.e., lower productivity due to working while disabled, and due to absenteeism, i.e., total loss of job or reduction in the number of work hours due to disability. Third, the disability of the individuals can have many negative effects on their employers, insurance companies and society in terms of lost profits, higher medical expenses and maintenance of transportation and building infrastructures required to accommodate the disabled.

Not much is known about the magnitude of the medical costs of a disease or disability in developing countries. In developed countries, a few studies estimate medical costs and loss in earnings due to some diseases and disabilities, see for instance, Dall et al., 2010; Goetzel et al., 2004; Leibson et al., 2001; Mitchell and Bates, 2011; Swensen et al., 2003; Wild et al., 2004 and see Zhang et al., 2011 for a review of measurement issues in this area.

Disability of a family member affects the standard of living of the family. A disabled person has to incur extra expenses to convert a level of income to achieve the similar standard of living that a normal person can achieve. Amartya Sen (2004) names these extra

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expenses as *conversion handicap*. In addition to the conversion handicap expenses, the disabled person may lose days of work or may have lower productivity due to disability or may simply loses job. All these will lead to lower family income and lower consumption. Furthermore, other family members may have to cut down their work hours to take care of the disabled family member, reducing further the total family resources. Thus, on the one hand, the consumption will rise due to conversion handicap and on the other hand, the consumption will fall due to drop in the family resources. The net effect is to be empirically estimated, which we do in this paper using the NSS dataset.

Zaidi and Burchardt, 2005 introduced an empirical technique to estimate the magnitude of conversion handicap[2], i.e., to attain the same level of living standard, how much extra earnings a disabled person would need compared to a non-disabled person. This technique has been applied to a few studies on developed countries: Zaidi and Burchardt, 2005 provided estimates of these extra costs in the UK, Saunders, 2007 for Australia,Cullinan et al., 2011 for Ireland. Similar studies on developing countries are very limited due to paucity of appropriate date. See, however, M. Kandamuthan and S. Kandamuthan, 2004 for India, Braithwaite and Mont, 2009 for Bosnia and Vietnam, Mont and Cuong, 2011 for Vietnam, and Loyalka et al., 2014 for China. The estimation of the cost of disability is a very important policy research issue because it can gauge the costs and benefits of various disability preventive policies.

A disability insurance program, private or public, is required to reduce the welfare losses of families with disability. Private disability insurance programs are very rare even in developed countries where insurance markets are well developed. When they exist, they have limited coverage due to moral hazard and adverse selection problems associated with disability. To overcome these market failures, most developed countries have introduced publicly provided disability insurance programs, which are further justified ethically using the Rawlsian theory of redistributive justice. For instance, in the US, the disability insurance component of the OASDI (Old Age Security and Disability Insurance) program collects taxes from a worker while working and provides substantial percentage of his average pre-retirement earnings as disability benefits if he becomes disabled and applies for disability benefits. The program improves everybody's expected welfare under the Rawlsian veil of ignorance.[3] We will see that our estimates are useful to get an idea about the kind of

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[2] see also Berthoud et al., 1993 for an earlier estimate of this extra cost.

[3] See, Social Security Administration, 2007 for an overview of the program and Haveman and Wolfe, 2000 for a description of the program, its benefits and its incentive effects. See also Raut, 2007 for some estimates.

expected welfare gains that an Indian family can expect if such a program is introduced.

The rest of the paper is organized as follows. Section 2 discusses the patterns of disability in India that are found by other studies using the census data and the NSS data. This section also describes the variables we use in our econometric analysis. In section 3, we describe the patterns of job loss due to onset of disability. In section 4, we estimate the effect of losing job due to onset of disability on the household 'conversion handicap' adjusted per capita consumption and discuss the policy implications. Section 5 concludes the paper.

2   The disability patterns in India

In India, two institutions are involved in the collection of national level data on the nature and magnitude of disability. These are National Sample Survey Organization (NSSO) and Census of India. Census of India collects data at regular ten years interval. It is a complete enumeration or census, aiming at collection of basic necessary data, which include information on disability among other things. Last census was taken in 2011 and the detailed results are yet to be out. The previous census was taken in 2001. The following table gives at a glance the disability situation of India.

Table 1: Disability in India by Gender and Type of Disability: 2001

Type of disability	Person	Male		Female	
		Number	Percent	Number	Percent
Seeing	10,634,881	5,732,338	45.5	4,902,543	52.7
Speech	1,640,868	942,095	7.5	698,773	7.5
Hearing	1,261,722	673,797	5.3	587,925	6.3
Movement	6,105,477	3,902,752	31	2,202,725	23.7
Mental	2,263,821	1,354,653	10.7	909,168	9.8
Total	**21,906,769**	**12,605,635**	**100**	**9,301,134**	**100**

Source: Census of India, 2001

Table 1 iXXX.

The above table shows that there are more female members with seeing disability than male members, whereas in case of movement disability it is just the opposite. It is expected, because the male members usually work outside their home and they are more likely to be victim of accidents leading to movement disability.

NSSO collects data on household consumption every year by taking representative samples of households from all regions of the country. These are called rounds. In approximately every fifth year, the size of the sample is enhanced in order to get more efficient

estimates of the population parameters. These rounds are called quinquennial rounds. Data on employment are also collected every year. Besides, special surveys are conducted from time to time to collect information on other aspects like disability, slum dwellers, child workers etc. Last disability survey was conducted in 2002 (58th Round). Since the year 2002 is close to 2001 when the census was taken, we have the opportunity to compare the two figures. This is given in the following table:

Table 2: Percentage of Disabled People in India by Type of Disability

Type of Disability	Census 2001 (%)	NSSO 2002 (%)
Seeing	49	14
Speech	7	10
Hearing	6	15
Movement	28	51
Mental	10	10
Total	100	100

Source: National Sample Survey Organization, 2002.

It is clear from Table 2 that the two definitions of disability, rather types of disability, do not match. Census 2001 arrives at the figure of seeing disabled person as 49% which is much higher than 14% found by NSSO. There are vast differences in the figures of movement disability also. Absolute figures also differ much. Total number of disabled persons in Census of India, 2001 is about 4 times larger than that of NNSO (National Sample Survey Organization, 2002) estimate.

Census of India admits that there are difficulties in defining and measuring disability and therefore used its own definitions of disabilities. According to NSSO, restrictions or lack of abilities to perform a normal activity assumed to be of permanent nature is termed as disability. The reasons for differences will be clearer if we explore the definitions type by type. The Census of India defined disability as (i) being completely blind or having blurred vision even with the help of spectacles. Impaired vision in only one eye is also treated as visual disability. Even a person, who has not tested his/her eyes and is having blurred vision without spectacles, is treated as visually disabled. NSSO, however, defines a person to be visually disabled if he/she does not have any light perception in both eyes even with spectacles/contact lances. Night blindness is not considered by NSSO as visual disability. The above discussion makes it clear why NSSO visual disability estimate is so low compared to census figure.

Let us now come to the point why there are large discrepancies between the census and

NSSO estimates of the locomotive disability. According to Census of India, 2001, a person is considered as disable if he/she (i) is unable to use the limbs normally, or (ii) lacks a thumb or all the fingers or all the toes, or (iii) has any part of the body deformed, or (iv) is unable to move around with his/own effort without the aid of another person or without the aid of a stick, or (v) is unable to move or lift or pick up any small article placed near her/him. Problems of joints like arthritis are kept out of this purview. According to NSSO, over and above the criteria as stated above, a person who lacks normal ability associated with his/her own movement or movement of objects from place to place is treated as disabled. Thus it encompasses a broader sphere. It is not mentioned clearly whether a person with dysfunction of joints due to arthritis is also included.[4] So it is possible that such persons are also included in the list. Moreover, any physical deformity, regardless of the possibility of movement of the body and limbs, is regarded as a criterion for a person to be disabled. Thus it is not surprising that the percentage of persons with movement disability from the NSSO sample will be so much different from the percentage in the Census data.

The reasons for differences in figures in other types of disability can similarly be traced in the respective definitions. We shall not go into the details of it, since we shall deal with only NSSO data and have no intention of comparing our estimates with those of census estimates.

Disability is closely related to poverty and backwardness. It has been found that there are comparatively more disabled persons in rural areas and in underdeveloped states ().

It should be mentioned here that there may be overlapping, i.e., with more than one disability. The figures in Table 1 and Table 2 take only the primary disability as reported by the respondent. The following table will make the idea clear.

Table 3: Disability in India by Type of Disability and Place of Residence

Regions	Sex	Number of PWD	At Least One Disability	Visually Impaired	Hearing Impaired	Speech Disability	Locomotors Disability	Overlapping
	Male	4,950	2078	308	339	298	1370	557
	Female	3,473	1424	362	330	169	762	426
Urban	Total	8,423	41.58%	7.94%	7.94%	5.50%	25.30%	11.67
	Male	17,737	7442	1539	1409	942	4396	2009
	Female	12,628	5210	1796	1164	557	2411	1490
Rural	Total	30,365	41.67%	10.98%	8.47%	4.90%	22.42%	11.52%

Source: National Sample Survey Organization, 1997.

[4] It is written that "A persons having locomotors disability will include those with loss or absence or inactivity of whole or part of hand or leg or both due to amputation, paralysis, deformity or dysfunction of joints which affects his/her *normal ability to move self or object*" is termed as disable.

Table 3 shows that there is not much rural-urban difference so far as disability is concerned. Rather male-female differences are bigger.

Causes of disability are specific to the type of disability. E.g., visual disability may be because of old age, cataract, eye discharge, glaucoma, injury, diarrhea (for under age 6 children), etc. It is surprising to note that about 3% of visual disability in India is due to small pox.

The earnings of a person may have a link with the disability. But the earnings data are very difficult to collect in India. So NSSO does not collect earnings data. Instead it collects data on consumer expenditure at the household level. Consumer expenditure is taken as a proxy for the income of the household. Consumer expenditure is also found to be more stable than income because over time people develop stable habits of consuming particular types of commodities and their quantities. Income data have more fluctuations. Changes in income do not immediately influence significant changes in the types and the quantities of consumption. Thus, we use the per capita household consumer expenditures data collected by NSSO to measure the cost of disability when a person loses job due to onset of disability. Our data is on households with a disabled member. So the consumption expenditures for all households already include the extra 'conversion handicap' amount. Thus, our estimate of consumption loss due to job loss will be for the 'conversion' handicap adjusted consumption.

Our main variable, the household per capita consumption is defined as follows in the NSSO report. "Household consumer expenditure is measured as the expenditure incurred by a household on domestic account during a specified period, called reference period. It also includes the imputed values of goods and services, which are not purchased but procured for consumption. In other words, it is the sum total of monetary values of all the items (i.e. goods and services) consumed by the household on domestic account during the reference period. The imputed rent of owner-occupied houses is excluded from consumption expenditure. Any expenditure incurred towards the productive enterprises of the households is also excluded from the household consumer expenditure. Monthly per capita expenditure (MPCE) is the household consumer expenditure over a period of 30 days divided by household size. A person's MPCE is understood as that of the household to which he/she belongs."

We define the Work Loss variable as taking value 1 if a family member was working before the onset of his disability and lost work after the onset of disability, and taking value

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0 otherwise.

NSSO collected data on general education attained by disabled family members under the categories: not literate, literate without formal schooling, literate but below primary, primary, middle, secondary, higher secondary, diploma/certificate course, graduate, post graduate and above. We created our binary variable Higher Education to take value 1 if the education level is Higher Secondary or above and 0 otherwise.

We summarize our variables in the following table.

Work Loss	= 1 if lost work due to disability, else = 0
Higher Education	= 1 if Higher Sec. or above, else =0
Household Size	Household size
Age at Disability Onset	Age at the onset of disability
Number of Disabilities	The number of disabilities
Caste	= 1 if backward class, else = 0
Place of Residence	= 1 if Rural, else = 0

We dropped observations that have missing information on any of the variables in the above table. We ended up with a sample size of 50,464 households with a disabled member.

3   Patterns of job loss due to onset of disability

NSSO collected data on whether the disabled person was working before the onset of disability. According to their estimates (see, 2003b, Statement 16), about 37 per cent of the age 5 and above disabled population were working before the onset of disability. For our sample, we report in Table 4 the percentage of disabled individuals who lost work due to onset of disability and the average monthly per capita consumption expenditures of households with disabled members who lost job and with disabled members who did not lose job. We report these statistics for the overall sample, and its various subgroups.

In our overall sample, about 49 percent lost work after onset of disability. The percentage of disabled individuals who lost job is higher among the disabled members with lower education, lower caste, lower income states and living in rural areas. Among the types of disability, the visual disability led to highest rate of job loss, about 62 percent, and the speech disability led to the lowest rate of job loss, about 31 percent. The loss of jobs led to about 8.5 percent lower average per capita household monthly consumption expenditures for the overall sample, and for most its subgroups, the losses are close to the

loss of the overall sample, with the striking differences for the higher education group, for whom the loss of job increased per capita consumption by about 4 percent, and for the rural households, for whom the drop in consumption is very small, about 1 percent. There are large variations in the loss of consumption for various types of disability: the drop in per capita consumption expenditure is the highest, about 16 percent, for mental disability, and the lowest, about 1.49 percent for the speech disability.

Table 4: Characteristics of work loss in the sample

Group	Number of disabled people in the sample	Percent lost work	Average monthly consumption of those who did not lose job	Average monthly consumption of those who lost job	Percent change in average monthly consumption
Overall	50,464	48.99	596.64	545.94	8.5
Lower Education	47,513	49.52	566.55	520.35	8.15
Higher Education	2,951	40.6	1008.34	1048.44	-3.98
Upper Class	16,423	47.22	739.59	677.66	8.37
Lower Class	34,041	49.85	524.06	485.74	7.31
Urban	18,545	41.75	769.07	720.48	6.32
Rural	31,919	53.2	471.95	466.35	1.19
High Income States	8,661	48.79	715.17	638.82	10.68
Middle Income States	14,759	46.44	625.53	548.58	12.3
Low Income States	19,963	49.48	492.28	467.1	5.11
By Disability Type					
Mental	5,175	51.11	612.23	514.13	16.02
Visual	8,452	62.25	557.29	488.39	12.36
Hearing	6,892	54.3	644	562.18	12.7
Speech	1,278	31.22	602.93	593.93	1.49
Locomotors	28,667	44.22	592.35	570.16	3.75

4 The effect of job loss on per capita household consumption

Disability of a family member involves extra expenditures to cover medical cares and equipment requirements for the disability member to manage his daily living - known as 'conversion handicap' in Sen's terminology. On top of the conversion handicap, if the disabled member loses job at the onset of his disability, the total resources available for the family

to spend becomes smaller. This would further reduce the wellbeing of the family. The burden of disability will be the sum of the two. We cannot get an estimate of the extent of 'conversion handicap' in India from our dataset since it does not have a nationally representative sample of households without disability to match with the households with disability. However, we can estimate the latter cost, since our dataset consists of households with a disabled member, and contains information on if a member lost job due to onset of disability. To that end, we estimate the percentage loss in household per capita consumption of households with a disabled member when the disabled member loses job due to onset of disability. We use a fixed effect regression model as follows:

$$\ln(c_{ij}) = \alpha_i + \beta' X_{ij} + \epsilon_{ij},$$

where X_{ij} is a k dimensional vector of characteristics[5] of the individual j in state i, β is a k dimensional vector of parameters, and α_i is the fixed effect of state i. One of the right hand side variables is the binary variable Work Loss, and the interpretation of the corresponding β is that controlling for other variables, if a disabled member loses job due to the onset of his disability, the percentage change in per capita consumption is β.

If we had the earnings data on individuals, we could estimate the loss in earnings due to disability but no earnings data are available in India. So we use consumption data to estimate the cost.

Table 5 shows the estimates for β for the overall, and separately for the rural and the urban population. The parameter estimate for the dummy variable 'Loss of Work' gives the estimate of the percentage change in per capita household consumption of a household with a disability member if the disabled member loses job due to disability. It shows that for the overall population, about 7 percent loss in consumption occurs if there is job loss. The loss in consumption is higher for an urban household 11 percent as compared to a much lower loss of 4 percent for a rural household.

Furthermore, the number of disabilities of a disabled member, measuring the severity of disability, can further lower the loss in per capita household consumption by 2 percent for each extra disability. This effect is lower for a rural household, 2 percent and higher for an urban household, 3 percent.

We also see that a household of lower caste has 20 percent lower per capita consumption, and from rural background has 32 percent lower consumption. An extra household member

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[5]See column 1 in Table 5 for the variables that we use.

in a household reduces the per capita consumption of the household by 4 percent. A household with a higher educated member increases the household's per capita consumption by 41 percent, which is a huge premium for education.

These effects for rural and urban population are shown in the last two columns. We find that percentage loss in consumption is much higher for the urban sector (11 percent) compared to the rural sector (4 percent). There are no significant differences in the effects of other variables between the rural and the urban sectors.

Table 5: The Effect of Work Loss on Per Capita Consumption of the Overall, Rural and Urban Households with Disabled Members

Population	Overall		Rural		Urban	
Parameters	b	t-stat	b	t-stat	b	t-stat
Intercept	7.1607	190.98	6.855	152.34	7.1262	110.44
Work Loss	-0.0713	-16.58	-0.0421	-8.12	-0.1068	-14.36
Higher Education	0.4058	49.04	0.3079	24.19	0.457	40.49
Household Size	-0.0356	-52.39	-0.0329	-42.01	-0.0413	-32.52
Age of Disability Onset	0.0015	17.43	0.001	9.49	0.0019	13.56
Number of Disabilities	-0.0218	-4.36	-0.0168	-2.86	-0.0305	-3.41
Caste	-0.2006	-45.42	-0.1667	-31	-0.239	-31.66
Place of Residence	-0.3216	-76.83				
R2	0.36		0.26		0.28	
Number of Households with Disability	50,464		31,919		18,545	

Note: All coefficients are significant at 1% level.

In Table 6, we report the estimated fixed effects. Statistically significant (with absolute value of t-statistics greater than or equal to 1.69) estimates are marked by asterisk. It means that in those states if a disabled worker loses work, the per capita consumption is lost significantly and the remaining states do not have any significant effects other than through the effects of the included variables. From our estimates we find that the percentage loss in consumption is as high as 16 percent in Sikkim and in some of the bigger states the effect is also as big as 14 percent in Maharashtra, 12 percent in Delhi, and around 9 percent in Tripura, Assam and West Bengal.

Zaidi and Burchardt, 2005 postulated that the living standard *LS* of an individual depends on his earnings *E*, disability status *D* and other factors as follows:

$$LS = \alpha + \beta \ln E + \gamma D + ...,$$

where α, β and γ are parameters. Holding other factors constant, we have $\Delta LS = \beta \Delta E/E + \gamma \Delta D$. To have the same level of LS, i.e., $\Delta LS = 0$, if $\Delta D > 0$, i.e., if D changes from 0 to 1, the associated percentage change in E is given by $\Delta E/E = -\gamma/\beta$.

Loyalka et al., 2014 found the estimates of this extra cost for China to be in the range of 8 to 43 percent, depending on the number of adults in the households and the place of residence: the higher the number adults in the household or if the disabled person lives in the rural area, the lower is the cost of disability. Braithwaite and Mont, 2009 estimated the extra cost of disability to be 9 percent for Vietnam and 14 percent for Bosnia. Mont and Cuong, 2011) refined the Braithwaite and Mont analysis and estimated the cost of disability by the degree of disability and by the age of disability onset. After controlling for other factors, they estimated the cost to be around 13 percent if the onset is before age 18. Our estimates of the cost of disability arising from losing job due to onset of disability are lower than these estimates from other countries. This is expected because we are estimating the cost arising from the loss of job for the households with a disabled member, for whom the average consumption is already lower than the households without any disabled member.

We also estimated the above Probit model for each type of disability. These are reported in Table 7. We find that the consumption loss is the highest for the Speech disability (14 percent), followed by Mental (11 percent). The remaining types of disabilities have much lower estimates of around 6 percent. Other coefficients have estimates similar to the estimates in the overall sample.

According to our estimates, the living standards as measured by per capita household expenditure of the households falls by 7 percent if the disabled member loses job due to onset of disability. A social insurance program can tax the working population and provide the disabled members who lose jobs a cash benefits to restore consumption close to what they were enjoying before losing job. This will reduce very little the consumption and hence the living standards of those who are working, but will reduce the huge loss in consumption and hence improve the living standards of the households whose members lose job due to onset of disabilities.

Using our estimates, we can get an idea about the tax rate that an working adult has to bear. Let γ be the proportion of the population that get disabled, which according to the National Sample Survey Organization, 2003a report is 0.017, i.e. 1.7 percent. Let α_n be the

Table 6: Work Loss and Per Capita Consumption of Households with Disabilities in Various States

State Code	State	Number of households	Percent lost work	Consumption Loss - Fixed Effect	t-stat
1	JAMMU & KASHMIR	1393	41.28	-9.41*	-3.72
2	HIMACHAL PRADESH	1093	57	-1.36	-0.42
3	PUNJAB	2063	36.5	-2.09	-0.89
4	CHANDIGARH	128	25	1.42	0.1
5	UTTARANCHAL	605	33.55	-3.63	-0.72
6	HARYANA	1494	31.06	-0.08	-0.03
7	DELHI	497	19.72	-12.16*	-2.09
8	RAJASTHAN	3179	31.71	-1.6	-0.78
9	UTTAR PRADESH	9803	33.75	-5.89*	-4.84
10	BIHAR	4959	36.48	-1.02	-0.59
11	SIKKIM	534	26.78	-15.96*	-3.45
12	ARUNACHAL PRADESH	275	42.91	-8.31	-0.42
13	NAGALAND	403	34.49	2.28	0.66
14	MANIPUR	931	46.19	2.94	0.75
15	MIZORAM	462	41.13	-1.92	-0.32
16	TRIPURA	960	26.67	-9.92*	-2.32
17	MEGHALAYA	605	38.51	-0.45	-0.09
18	ASSAM	1831	41.45	-9.32*	-3.91
19	WEST BENGAL	6598	31.89	-9.47*	-6.63
20	JHARKHAND	1541	33.29	-8.14*	-2.09
21	ORISSA	2845	49.21	-5.11*	-2.42
22	CHHATISGARH	1240	40	1.87	0.54
23	MADHYA PRADESH	3952	33.73	-7.80*	-3.75
24	GUJARAT	2579	26.29	-5.02*	-2.32
25	DAMAN & DIU	197	29.95	-10.91*	-1.69
26	DADRA & NAGAR HAVELI	168	32.14	-6.35	-0.57
27	MAHARASHTRA	6741	36.21	-14.43*	-9.15
28	ANDHRA PRADESH	5578	35.77	-7.24*	-4.68
29	KARNATAKA	3116	31.03	-3.05	-1.54
30	GOA	128	29.69	5.85	0.46
31	LAKSHADWEEP	206	13.59	0.47	0.06
32	KERALA	3024	27.58	-8.50*	-4.12
33	TAMILNADU	6122	30.56	-10.38*	-7.06
34	PONDICHERRY	495	24.85	-9.68*	-1.98
35	ANDAMAN & NICOBAR ISLAND	234	26.92	-17.17*	-2.42
	Overall	75,979	34.4	-8.75*	-19.29

Note: * denotes significant at 5% level.

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fraction of the non-disabled population who work, and α_d be the fraction of disabled population who work. Let θ_d be the fraction of disabled population who lose job due to onset of disability. Assume that non-disabled workers do not lose job. Let the per capita consumption of the households with non-disabled members be w_n and with a working disabled member be w_d and with a disabled members who loses job due to onset of disability be w_0. Let τ be the per capita consumption tax rate on the households with working members. A simple calculation will show that

$$\tau = \frac{\theta_d \left(1 - \frac{w_0}{w_d} \right)}{1 + \frac{(1-\gamma)}{\gamma} \cdot \frac{\alpha_n}{\alpha_d} \cdot \frac{w_n}{w_d}}.$$

From our estimates we have $\theta_d = 0.49$, and the estimated percentage loss in per capita consumption of the households with a disabled member losing job due to onset of disability is $1 - w_0/w_d = 0.07$. From National Sample Survey (2003b) we get an estimate of $w_n = 675$ which we obtain by assuming 70 percent of the population lives in rural area, and then taking the weighted average of the rural per capita household consumption 531 and the urban per capita household consumption 1012. Our estimate of $w_d = 597$ (see Table 4). Even under the assumption that $\alpha_d = \alpha_n$, the tax rate comes out to be $\tau = 0.0005$, i.e., 0.05 percent. This is very small. It is important to note that unlike the disability programs in the US and other developed countries, the benefits do not cover medical expenses. In that case, the tax rate will be higher.

The benefits structure can be designed to take care of moral hazard and adverse selection problems, i.e., to avoid individuals to give up jobs at the onset of disability to get onto the disability program, and also to prevent workers from malingering disability to obtain benefits.

5 Conclusion

This paper estimates the loss in 'conversion handicap' adjusted per capita household consumption when a family member loses job due to onset of disability. It uses the disability module of the 2002 Indian National Sample Survey (NSS) data. The paper finds that the economic cost of losing job due to onset of disability is around 7 percent of 'conversion handicap' adjusted per capita household consumption. The loss in consumption is lower (4 percent) if the place of residence is rural as compared to a much higher loss (11 percent)

Table 7: Work Loss and Per Capita Consumption of Households with Various Types of Disabilities

Disability Type	Mental		Visual		Hearing		Speech		Locomotors	
Parameters	B	t-stat	β	t-stat	β	t-stat	β	t-stat	β	t-stat
Intercept	7.2721	70.03	7.1116	62.37	7.1371	87.34	6.9824	46.34	7.1576	134.16
Work Loss	-0.1055	-7.59	-0.0626	-6.29	-0.0723	-6.81	-0.1415	-4.75	-0.0667	-10.98
Higher Education	0.2958	11.19	0.4331	14.2	0.4729	16.76	0.5593	9.91	0.404	41.05
Household Size	-0.034	-15.57	-0.0307	-19.13	-0.0363	-19.67	-0.0409	-9.48	-0.0369	-40.87
Age of Disability Onset	0.0002	0.54	0.0012	5.58	0.002	9.18	0.0026	4.51	0.002	15.8
Number of Disabilities	-0.0539	-3.5	-0.0312	-2.71	-0.0232	-1.78	-0.0225	-0.78	-0.0122	-1.78
Caste	-0.1891	-14.07	-0.1753	-16.15	-0.2124	-18.11	-0.1801	-6.73	-0.2032	-34.4
Place of Residence	-0.3048	-22.76	-0.283	-27.04	-0.3409	-30.09	-0.2857	-11.37	-0.3239	-58.59
R2	0.33		0.32		0.4		0.4		0.37	
No. of Households with Disability in the sample	5,175		8,452		6,892		1,278		28,667	

for the urban place of residence. The consumption loss is significantly higher for speech disabilities (14 percent) and mental disabilities (11 percent). After controlling for other factors, the paper estimates high losses in consumption in the states of Sikkim (16 percent), Maharashtra (14 percent) and Delhi (12 percent), followed by the states of Assam, Tripura and West Bengal (around 9 percent).

The entire exercise is carried out with the NSS data. As already noted, the definitions adopted by NSSO and Census differ widely, leading to much discrepancies in the percentages of disabled persons in different categories. Thus if the census data are used, the results may change substantially. We believe, however, that the conclusions will be similar even if census data are used.

A publicly provided actuarially fair social disability program that taxes workers while working and provides disability benefits close to their pre disability earnings when disable, can improve social welfare by preventing large consumption losses that result from loss of job due to onset of disability.

References

Berthoud, R., J. Lakey, and S. McKay (1993). The economic problems of disabled people. Vol. 759. Policy Studies Institute (cit. on p. 7).

Braithwaite, J. and D. Mont (2009). Disability and poverty: A survey of World Bank Poverty Assessments and implications, *{ALTER} - European Journal of Disability Research*, **3**, no. 3, 219–232. DOI: 10.1016/j.alter.2008.10.002 (cit. on pp. 7, 16).

Census of India (2001). *Census of India 2001*. Disability India. Registrar General and Census Commissioner, New Delhi: Government of India (cit. on pp. 8–10).

Cullinan, J., B. Gannon, and S. Lyons (May 2011). Estimating the extra cost of living for people with disabilities, *Health Economics*, **20**, no. 5, 582–599. DOI: 10.1002/hec.1619 (cit. on p. 7).

Dall, T. M., Y. Zhang, Y. J. Chen, W. W. Quick, W. G. Yang, and J. Fogli (2010). The Economic Burden Of Diabetes, *Health Affairs*, **29**, no. 2, 297–303. DOI: 10.1377/hlthaff.2009.0155 (cit. on p. 6).

Dessai, K. (2010). Amartya Sen's Idea of Justice: A Just Idea but an Unjust Application to Persons with Disabilities, *Indian Journal of Constitutional Law*, 132–137 (cit. on p. 2).

Doessel, D. and H. Whiteford (2013). Applying Concepts from Mill and Sen to the Standard of Living for Disabled People, *Queensland Centre for Mental Health Research, School of Population Health, The University of Queensland, Locked Bag 500, Richlands Qld 4077* (cit. on p. 2).

Elwan, A. (1999). Poverty and Disability A Survey of the Literature, *Social Protection Discussion Paper Series* (cit. on p. 2).

Filmer, D. (2008). Disability, Poverty, and Schooling in Developing Countries: Results from 14 Household Surveys, *The World Bank Economic Review*, **22**, no. 1, 141–163. DOI: 10.1093/wber/lhm021 (cit. on p. 5).

Fujiura, G. T. (2001). *Emerging Trends in Disability*. Disability India. Population Reference Bureau (cit. on p. 2).

Goetzel, R. Z., S. R. Long, R. J. Ozminkowski, K. Hawkins, S. Wang, and W. Lynch (Apr. 2004). Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health Conditions Affecting U.S. Employers, *Journal of Occupational and Environmental Medicine*, **46**, no. 4, 398–412. DOI: 10.1097/01.jom.0000121151.40413.bd (cit. on p. 6).

Government of India (1995). *The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995*. Disability India. Parliament of India, New Delhi: Parliament of India, New Delhi (cit. on p. 2).

Haber, L. D. (1973). Some Parameters for Social Policy in Disability: A Cross-National Comparison, *The Milbank Memorial Fund Quarterly. Health and Society*, **51**, no. 3, 319–340 (cit. on p. 2).

Haveman, R. and B. Wolfe (2000). "Chapter 18 The economics of disability and disability policy", ed. by A. J. Culyer and J. P. Newhouse. Vol. 1, Part B. Handbook of Health Economics. Elsevier, 995–1051. DOI: 10.1016/S1574-0064(00)80031-1 (cit. on p. 7).

Kandamuthan, M. and S. Kandamuthan (2004). The Economic Burden of Disabled Children on Families in Kerala in South India, *Centre for Development Studies Discussion Paper No. 91* (cit. on p. 7).

Leibson, C. L., S. K. Katusic, W. J. Barbaresi, J. Ransom, and P. C. O'Brien (2001). Use and costs of medical care for children and adolescents with and without attention-deficit/hyperactivity disorder, *JAMA*, **285**, no. 1, 60–66. DOI: 10.1001/jama.285.1.60 (cit. on p. 6).

Loyalka, P., L. Liu, G. Chen, and X. Zheng (2012). The Economics of Disability in China, *Working Paper 244, Stanford University* (cit. on p. 2).

Loyalka, P., L. Liu, G. Chen, and X. Zheng (2014). The Cost of Disability in China. English, *Demography*, **51**, no. 1, 97–118. DOI: 10.1007/s13524-013-0272-7 (cit. on pp. 7, 16).

Mitchell, R. J. and P. Bates (2011). Measuring Health-Related Productivity Loss, *Population Health Management*, **14**, no. 2, 93–98. DOI: 10.1089/pop.2010.0014 (cit. on p. 6).

Mitra, S. (2006). The Capability Approach and Disability, *Journal of Disability Policy Studies*, **16**, no. 4, 236–247. DOI: 10.1177/10442073060160040501 (cit. on p. 2).

Mitra, S., A. Posarac, and B. Vick (2013). Disability and Poverty in Developing Countries: A Multidimensional Study, *World Development*, **41**, no. 0, 1–18. DOI: 10.1016/j.worlddev.2012.05.024 (cit. on pp. 2, 3).

Mitra, S. and U. Sambamoorthi (May 2008). Disability and the Rural Labor Market in India: Evidence for Males in Tamil Nadu, *World Development*, **36**, no. 5, 934–952. DOI: 10.1016/j.worlddev.2007.04.022 (cit. on p. 2).

Mont, D. and N. V. Cuong (July 2011). Disability and Poverty in Vietnam, *The World Bank Economic Review*, **25**, no. 2, 323–359. DOI: 10.1093/wber/lhr019 (cit. on pp. 7, 16).

Mont, D. (2007). Measuring disability prevalence, *World Bank Social Protection Discussion Paper*, no. 0706 (cit. on p. 3).

National Sample Survey Organization (1997). *SARVEKSHANA, 47th rounds*. Disability India. Department of Statistics, Ministry of Planning, Government of India (cit. on pp. 2, 10).

National Sample Survey Organization (2002). *NSS 58th Round*. Disability India. Government of India (cit. on pp. 2, 9).

National Sample Survey Organization (2003a). *Disabled Persons in India - NSS 58th Round, (July — December 2002)*. Disability India Report No. 485 (58/26/1). Government of India (cit. on p. 16).

National Sample Survey Organization (2003b). *Household Consumer Expenditure and Employment - Unemployment Situation in India*. Disability India Report No. 485 (58/26/1). Government of India (cit. on p. 12).

Patel, S. K. (2009). An Empirical Study of Causes of Disability in India, *The Internet Journal of Epidemiology*, no. 6, 2 (cit. on p. 4).

Raut, L. K. (2007). "Mortality and Disability Risk Sharing under the OASDI Program in a Stochastic Overlapping Generations Framework", *Paper presented at the Western Economic Association Meeting, June 29-July 3, 2007, Seattle.* (Cit. on p. 7).

Reddy, M. V. and C. Chandrasekhar (1998). Prevalence of Mental and Behavioural Disorders in India: A meta-Analysis, *Indian J. Psychiat*, 149–157 (cit. on p. 2).

Saunders, P. (2007). The Costs of Disability and the Incidence of Poverty, *Australian Journal of Social Issues*, **42**, no. 4, 461–480. DOI: 10.1002/j.1839-4655.2007.tb00072.x (cit. on p. 7).

Sen, A. (2004). Disability and justice, *Address to the Disability and Inclusive Development: Sharing, Learning and Building Alliances Conference, 30 November-1 December 2004, Washington, DC.* (cit. on pp. 4, 5).

Singal, N. (2008). Forgotten Youth: Disability and Development in India, *Working Paper No. 14, Research Consortium on Educational Outcomes and Poverty, University of Cambridge* (cit. on p. 2).

Singal, N. and R. Jeffery (2009). Transitions to adulthood for young people with disabilities in India: Current status and Emerging Prospects, *Asia Pacific Disability Rehabilitation Journal*, **20**, no. 1, 15–40 (cit. on p. 2).

Social Security Administration (2007). Social Security Programs in the United States - OASDI, *Office of Policy, Social Security Adminsitration, Washington, DC, USA* (cit. on p. 7).

Swensen, A. R., H. G. Birnbaum, K. Secnik, M. Marynchenko, P. Greenberg, and A. Claxton (Dec. 2003). Attention-Deficit/Hyperactivity Disorder: Increased Costs for Patients and Their Families, *Journal of the American Academy of Child & Adolescent Psychiatry*, **42**, no. 12, 1415–1423. DOI: 10.1097/00004583-200312000-00008 (cit. on p. 6).

Thomas, P. (2005). Mainstreaming disability in development: India country report, (cit. on p. 2).

Trivedi, M. (2011). Interpretation of Persons with Disability (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, *SSRN Journal*. DOI: 10.2139/ssrn.1738769 (cit. on p. 5).

Walia, G. K. (2010). *Factsheet on Disability in India*. Disability India. South Asia Network for Chronic Disease (cit. on p. 2).

Wild, S., G. Roglic, A. Green, R. Sicree, and H. King (Apr. 2004). Global Prevalence of Diabetes: Estimates for the year 2000 and projections for 2030, *Diabetes Care*, **27**, no. 5, 1047–1053. DOI: 10.2337/diacare.27.5.1047 (cit. on p. 6).

World Bank, T. (2007). People with Disabilities in India: From Commitments to Outcomes, *Report,Human Development Unit, South Asia Region* (cit. on pp. 3, 5).

World Health Organization et al. (2011). World report on disability 2011, (cit. on p. 2).

Zaidi, A. and T. Burchardt (Mar. 2005). Comparing Incomes when needs differ: equivalization for the extra costs of disability in the UK, *Review of Income and Wealth*, **51**, no. 1, 89–114. DOI: 10.1111/j.1475-4991.2005.00146.x (cit. on pp. 7, 15).

Zhang, W., N. Bansback, and A. H. Anis (2011). Measuring and valuing productivity loss due to poor health: A critical review, *Social Science & Medicine*, **72**, no. 2, 185–192. DOI: https://doi.org/10.1016/j.socscimed.2010.10.026 (cit. on p. 6).