I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 11101

Dynamics in Physical Functioning Limitations

Neha Agarwal
Hans-Peter Kohler
Subha Mani

OCTOBER 2017

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 11101

Dynamics in Physical Functioning Limitations

Neha Agarwal
University of California, Riverside

Hans-Peter Kohler
University of Pennsylvania

Subha Mani
Fordham University, University of Pennsylvania, IZA and CDEP, Columbia University

OCTOBER 2017

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Dynamics in Physical Functioning Limitations

The extent to which physical functioning limitations result in permanent job loss, lowered lifetime income and assets, in part, depends upon the extent to which onset of these limitations becomes permanent. This paper uses five rounds of data from Malawi to examine path dependence in physical functioning limitations. We do so using a dynamic linear panel data model where the coefficient on the one-period lagged health outcome captures path dependence in functional limitations. Our preferred estimates indicate – (a) partial recovery from onset of functional limitations for males, (b) there is less recovery in severe limitations than moderate limitations for males, (c) perfect recovery from both moderate and severe functional limitation for females.

JEL Classification: J14, I15, I10

Keywords: activity of daily living, functional limitation, panel data, Malawi

Corresponding author:
Subha Mani
Department of Economics
Fordham University
441 East Fordham Road
Dealy Hall, E 520
Bronx, New York 10458
USA

Email: smani@fordham.edu

1. Introduction

Global aging is transforming the age structure of the working population not only in high- and middle-income countries, but increasingly also in low-income countries where older individuals have very high rates of economic activities. Because intergenerational transfers within families are an important mechanism through which individuals and families insure against risk and smooth life-cycle consumption, any impact on the working age adult's ability to be economically active will have substantial welfare implications for not just the working adults, but for all dependents in their household.

Physical functioning limitations are one such deterrent that impedes adult's ability to be economically active, either in the labor market or own farm or similar self-employment. The relationship between the ability to be economically active and health becomes particularly important as individuals get older and poor health and functional limitations become more common. Physical functioning limitations are generally captured using difficulties in Activity of Daily Living that have found to be associated with reduced hours worked, loss in employment, and lower household earnings (Mani, Mitra and Sambamoorthi (2017), Payne et al. (2013), Mizunoya and Mitra (2013), Genoni (2012), Gertler and Gruber (2002)). The extent to which physical functioning limitations result in permanent job loss, lowered lifetime income, and reduced assets, in part, depends on the extent to which functional limitations remain permanent. If functional limitations were not permanent then some of the negative impact associated with functional limitations could be reversed.

This paper examines whether physical functioning limitations are transitory or permanent among mature and old individuals in Malawi using a dynamic linear panel data model allowing us to address the endogeneity concern in lagged health. Overall, we find that functioning limitations are largely transitory with greater persistence in severe than moderate limitations and for males more than females.

2. Empirical Specification

We estimate the following model:

$$H_{it} = \beta_0 + \beta_1 H_{it-1} + \sum_{j=2}^{R} \beta_j X_{jit} + \sum_{j=1}^{R} \delta_j Z_{ji} + \varepsilon_i + \varepsilon_{it} \quad (1)$$

where H_{it} is the functional limitation of individual *i* at time *t*. We use four measures of functional limitations: severe limitations, moderate limitations, number of severe limitations, and number of moderate limitations.[1] The X's and Z's capture all time-varying and time-invariant regressors respectively[2]. We include village-time fixed-effects to control for both time-varying observables and unobservables at the village level (ex: changes in local labor market conditions, access to health centers, and transportation). The regressions also include year dummies to capture time trends. There are two sources of unobservables: ε_i and ε_{it}. Adult's inherent healthiness is captured by ε_i, and ε_{it} includes individual specific time-varying unobservables. To account for any unobserved correlation among individuals living in a village, we cluster our standard errors at the village level.

The main coefficient of interest is β_1 that captures path dependence (over two survey rounds) in physical functioning limitations. A coefficient of *one* on β_1 indicates perfect path dependence, that is, no recovery from a functional limitation. Note that a coefficient of *zero* suggests perfect recovery from a functional limitation between survey rounds, and a coefficient between *zero* and *one* indicates partial recovery from a functional limitation. The OLS estimate on the lagged dependent variable does not result in an unbiased estimate for β_1 as the condition of zero

[1] We use the following two questions to construct our dependent variables. Severe limitations takes a value 1 if the individual responds saying "yes, limited a lot" to either of the following two questions: (1) "Do you have any health problems that limit you in carrying out moderate activities? (For example, cooking and cleaning, walking to meetings in the village, or tending to cattle and livestock. If so, how much?), and (2) "Do you have any health problems that limit you in carrying out strenuous activities? (For example carrying heavy loads, working on the farm, pounding maize, or digging a pit latrine. If so, how much?)", 0 otherwise. Similarly, moderate limitations takes a value 1 if the individual responds saying "yes, limited a little" to either of the above two questions, 0 otherwise. No. of severe and moderate limitations is the sum of times the respondent says "yes, limited a lot" and "yes, limited a little" respectively.

[2] We control for age, age squared, primary and secondary education, religion, ethnic group, gender, marital status, and indicator for metal roof.

correlation between the error term and H_{it-1} is never satisfied in dynamic models (Wooldridge 2002). We use the Arellano-Bover (1995) estimation strategy to deal with the endogeneity bias in H_{it-1}, wherein, change in H_{it-1} serves as an instrument for H_{it-1}.

3. Data

This study uses data from the 2006-2013 rounds of the Malawi Longitudinal Study of Families and Health (MLSFH). The survey covers three districts in rural Malawi: Rumphi, Mchinji, and Balaka (see Kohler et al. 2015 for more details).

Our sample includes individuals age 30+ in each round. The 2012-13 MLSFH rounds were administered to 45+ individuals as a result of limited project funding, and consequently, the last two waves have different age-composition than the first three waves.[3] We include an indicator variable to account for this changing age-composition. Descriptive statistics are presented in Table 1. Both the incidence and no. of moderate limitations is greater than severe limitations in all five waves.

4. Results

The persistence of gender-differential investments in human capital as well as gender-segregation in economic activities in developing countries suggest that males and females are likely to experience differential levels of path dependence in functioning limitations. Further, persistence in functioning limitations is also likely to vary by the type of limitation – moderate or severe. Hence, we present our results for males and females separately and by type of limitation – severe as well as moderate.

[3] The main results reported in the paper are robust to restricting all fives of the survey rounds to only 45+ years individuals.

The results for males and females are presented in Tables 2 and 3 respectively. The OLS estimate of β_1 are reported in Column 1 and preferred Arellano-Bover estimates are reported in Column 2 of Tables 2 and 3. OLS estimates suffer from endogeneity concerns that are likely to generate upward bias in β_1. A comparison of the coefficients reported in Columns 1 and 2 of Tables 2 and 3 indicate that this is indeed a concern. The preferred estimates in Column 2, Table 2 suggest that the presence of severe (moderate) functional limitation in one period increases the probability of reporting a severe (moderate) functional limitation again by 14 (9) percentage points. Both these coefficient estimates are significantly different from zero rejecting the null of perfect recovery indicating partial recovery in both moderate and severe functional limitations for males. We find similar partial recovery in the number of both severe and moderate functional limitations with less recovery for severe than moderate limitations. These results suggest that even though fewer people in the sample experience severe functional limitations, among those who do there is substantial path dependence in these limitations.

Our preferred estimates for females reported in Column 2, Table 3 suggest there is no evidence of path dependence in both moderate and severe limitations, as we cannot reject the null of perfect recovery at even the 10 percent significance level. A functional limitation among females is therefore transient, that is, there is no persistence. Payne et al. (2013) study transition between different states of disabilities using the 2006-2010 waves of the MLSFH. In line with our findings, the authors find high transition probability between different disability states. However, their analysis does not account for unobserved correlation between current and lagged disability states.

5. Conclusion

The long-term economic cost of physical functioning limitations can be projected based on the extent to which these functional limitations remain permanent; this is particularly relevant for an agricultural setting like rural Malawi. If functional limitations were transitory then some of the negative impact associated with a functional limitation could be reversed. This paper is the first

to examine persistence in physical functioning limitations using a dynamic linear panel data model that can account for endogeneity concerns in the lagged dependent variable. We find that for males, there exists partial recovery in severe and moderate functional limitations with greater persistence in severe than moderate limitations. We also find perfect recovery in both moderate and severe limitations among females, decreasing the projected long-term cost of functional limitations for females.

References

Arellano, B. and O. Bover. (1995). 'Another look at the instrumental variable estimation of error-components models', *Journal of Econometrics*, Vol. 68, pp. 29-51.

Genoni, M. (2012). Health Shocks and Consumption Smoothing: Evidence from Indonesia. *Economic Development and Cultural Change,* 60(3): 475-506.

Gertler, P. and Gruber, J. (2002). Insuring Consumption Against Illness. *American Economic Review*, 92: 51-70.

Kohler, H.-P., S.C. Watkins, J.R. Behrman, P. Anglewicz, I.V. Kohler, R.L. Thornton, J. Mkandawire, H. Honde, A. Hawara, B. Chilima, C. Bandawe, V. Mwapasa, P. Fleming, and L. Kalilani-Phiri. 2015. "Cohort Profile: The Malawi Longitudinal Study of Families and Health (MLSFH)." *International Journal of Epidemiology,* 44(2): 394-404.

Mizunoya, S. and Mitra, S. (2013). Is there a Disability Gap in Employment Rates in Developing Countries? *World Development* Vol. 42; pp.28-43.

Mani, S., Mitra, S. and Sambamoorthi, S. (2016), "Dynamics in Health and Employment: Evidence from Indonesia." IZA Discussion Paper No. 10256.

Payne CF, Mkandawire J, Kohler H-P (2013) Disability Transitions and Health Expectancies among Adults 45 Years and Older in Malawi: A Cohort-Based Model. PLoS Med 10(5): e1001435.

Wooldridge, J. (2002). Econometric Analysis of Cross Section and Panel Data, MIT Press, Cambridge, MA.

Table 1: Descriptive Statistics

	Mean (sd)				
	2006	**2008**	**2010**	**2012**	**2013**
% Severe limitation	0.040	0.048	0.096	0.114	0.108
	(0.20)	(0.21)	(0.29)	(0.32)	(0.31)
% Moderate limitation	0.201	0.199	0.303	0.350	0.366
	(0.40)	(0.40)	(0.46)	(0.48)	(0.48)
No. of severe limitations	0.041	0.055	0.160	0.172	0.161
	(0.27)	(0.31)	(0.52)	(0.54)	(0.53)
No. of moderate limitations	0.278	0.316	0.511	0.517	0.535
	(0.62)	(0.62)	(0.81)	(0.78)	(0.78)
% Male	0.476	0.418	0.418	0.428	0.424
	(0.50)	(0.49)	(0.49)	(0.49)	(0.49)
% Primary education	0.587	0.575	0.615	0.575	0.551
	(0.49)	(0.49)	(0.49)	(0.49)	(0.50)
% Secondary education	0.087	0.076	0.097	0.063	0.062
	(0.28)	(0.27)	(0.30)	(0.24)	(0.24)
% Muslim	0.245	0.238	0.241	0.268	0.261
	(0.43)	(0.43)	(0.43)	(0.44)	(0.44)
% Christian	0.695	0.641	0.674	0.653	0.659
	(0.46)	(0.48)	(0.47)	(0.48)	(0.47)
% Married	0.914	0.828	0.795	0.768	0.755
	(0.28)	(0.38)	(0.40)	(0.42)	(0.43)
% with metal roof	0.154	0.206	0.252	0.307	0.333
	(0.36)	(0.40)	(0.43)	(0.46)	(0.47)
Age in years	43.898	49.570	49.643	58.926	59.762
	(10.47)	(14.22)	(14.42)	(11.62)	(11.64)
Observations	1913	2731	2686	1264	1254

Table 2: Dynamics in Functional Limitations for Males

	OLS (1)	Arellano-Bover (2)
Panel A: Severe		
Lagged severe	0.219***	0.140**
	(0.04)	(0.06)
Observations	2332	1429
R-squared	0.36	0.38
F-statistic from first-stage regression		345.80
Panel B: No. of severe		
Lagged no. of severe	0.483***	0.456**
	(0.12)	(0.22)
Observations	1344	641
R-squared	0.57	0.56
F-statistic from first-stage regression		11.34
Panel C: Moderate		
Lagged moderate	0.153***	0.091*
	(0.03)	(0.05)
Observations	2332	1429
R-squared	0.31	0.32
F-statistic from first-stage regression		1678.14
Panel D: No. of moderate		
Lagged no. of moderate	0.176***	0.057
	(0.04)	(0.06)
Observations	1866	1058
R-squared	0.37	0.37
F-statistic from first-stage regression		512.97

Notes: Robust standard errors adjusted for clustering at the village level in parentheses. Other controls include full set of socioeconomic characteristics described in Table 1 and dummy for 2012/13 rounds. P<0.01***, P<0.05**, P<0.10*.

Table 3: Dynamics in Functional Limitations for Females

	OLS (1)	Arellano-Bover (2)
Panel A: Severe		
Lagged severe	0.225***	0.050
	(0.04)	(0.05)
Observations	3079	1849
R-squared	0.31	0.31
F-statistic from first-stage regression		1039.84
Panel B: No. of severe		
Lagged no. of severe	0.480***	0.083
	(0.09)	(0.15)
Observations	1227	468
R-squared	0.64	0.65
F-statistic from first-stage regression		12.39
Panel C: Moderate		
Lagged moderate	0.100***	0.006
	(0.02)	(0.04)
Observations	3079	1849
R-squared	0.24	0.24
F-statistic from first-stage regression		6130.01
Panel D: No. of moderate		
Lagged no. of moderate	0.121***	0.010
	(0.03)	(0.04)
Observations	2363	1281
R-squared	0.30	0.31
F-statistic from first-stage regression		1810.91

Notes: See Table 1.