Operationalizing Amartya Sen's Capability Approach through Capability-Equivalent Income

Yuan Cheng, PhD[1]; John K. Dagsvik, PhD[2]; Xuehui Han, PhD[3]
[1]Fudan University, [2]Statistics Norway, [3]Asian Development Bank

Abstract

Economic conditions that have strong impact on individual well-being and freedom are sometimes not reflected in income. To capture the welfare impact of such non-income-related economic condition, Amartya Sen proposed the Capability Approach. However, empirical applications of the capability approach are typically expressed in reduced form which is not fit for conducting welfare analysis. Using the random utility theory, we incorporate capability into the job market choice set as well as the utility through disposable income and leisure, so that we can translate it to the traditional concept of income. We showed that capability disadvantages can be converted to capability-equivalent income through the compensation variation. We simulate a transfer program where the disabled individuals are compensated with capability-equivalent income through an income tax to the top 20% earners. We find that inequality would be mitigated and the overall welfare of whole society would improve by 4%.

Methods and Materials

The utility of agent i is assumed to have the form:

$$(1) \quad U^{D_i}(C_i, h_i, j, z) = v^{D_i}(C_i, h_i)\varepsilon_i(j, z),$$

where (C_i, h_i) denotes disposable income and monthly hours of work of i, respectively. The term $\{\varepsilon_i(j,z)\}$ is i.i.d. across jobs z and agent i with the extreme value distribution of c.d.f. $exp(-1/x)$, $x > 0$.

The probability $\varphi(h_i, j)$ of choosing hours of work h_i in sector j when working in either one of the three sectors—agriculture, manufacturing, and the other industries—such that $h_i > 0$ can be expressed as:

$$(2) \quad \varphi(h_i, j) = P\left(\max_{z \in B_j(h)} U(h_i w_j + I_i, h_i, j, z)\right) =$$

$$\frac{\theta(j)g_j(h_i)v^{D_i}(h_i w(j) + I_i, h_i)}{v(I_i, 0) + \sum_r \theta(r) \sum_{x \in D_i} g_r(x)v^{D_i}(xw(r) + I_i x)}$$

where $w(j)$ is the average wage of sector j and I_i is the non-labor income. $D_i = 1$, if agent i is disabled, and zero if otherwise.

The probability $\varphi(i, 0,0)$ of not working with $h = 0$ can be presented as:

$$(3) \quad \varphi(i, 0,0) = \frac{v^{D_i}(I_i, 0)}{(v(I_i, 0) + \alpha_0 D_i + \sum_r \theta(r) \sum_{x \in D_i} g_r(x)v^{D_i}(xw(r) + I_i x)}.$$

The empirical specification of utility of consumption and leisure is:

$$(4) \quad log v(C_i, h_i) = \alpha_0 D_i + (\alpha_1 + \alpha_1 * D_i)C_i + (\alpha_2 + \alpha_2 * D_i)h_i.$$

The opportunity sets of jobs faced by agent i if he chooses to work is:

$$(5) \quad log\left(\theta(j)g_j(h_i)\right) = log\theta(j) + log g_j(h_i) = \gamma_{0j} + \gamma_j X_i.$$

The job opportunity measure $(\gamma_{0j} + \gamma_j X_i)$ can be explicitly linked to the number of jobs faced by agent i in sector j as: $\tilde{m}_{ij} = \theta(j)g_j(h_i) = exp(\gamma_{0j} + \gamma_j X_i)$.

The likelihood function for the maximization is:

$$(6) \quad \log L = \sum_i \sum_{j=1}^3 Y_{ij} log(\varphi(h_i, j)) + \sum_i Y_{i0} log(\varphi(i, 0,0)).$$

Capability-Equivalent Income can be expressed as:

$$CV(X_i, X_i^0) = I_i - \tilde{I}_i,$$

so that $V(\theta, g_i, w, I_i, X_i) = V(\theta, g_i^0, w, \tilde{I}_i, X_i^0),$

where the status of disability in X_i is artificially assumed gone (equal to zero) to get X_i^0, and the expected utility takes the form:

$$V(\theta, g_i, w, I_i, X_i) = v(I_i, 0, X_i) + \sum_{j=1}^3 \theta(j)v(\overline{w}_j h_i + I_i, h_i)g_j(h_i).$$

The impact of the transfer program can be assessed as:
Pre-Transfer Welfare:

$$W^B = \sum_{i \in I_D} V(\theta, g_i, w, I_i, X_i) + \sum_{i \in I_{ND}} V(\theta, g_i, w, I_i, X_i),$$

Post-Transfer Welfare:

$$W^T = \sum_{i \in I_D} V(\theta, g_i, w, (I_i + CV_i), X_i) + \sum_{i \in I_{ND}} V(\theta, g_i, w, (I_i - t), X_i).$$

Cambodia Civil War and Genocide in 1970s

The Cambodia Civil War from 1970 to 1975 provides a specific case to render the exogeneity of disability. After gaining independence from the French empire in 1953, Cambodia started as a new and independent country. However, along with the economic difficulties faced by Cambodia as a new country, especially the lack of food for peasants, and its involvement in the neighbouring Viet Nam's civil war, conflicts between pro- and anti-communist forces heated. The civil war was ignited at the end of 1960s. Just after the Civil War came, the so-called Pol Pot's Regime (1975-79), during which a genocide was carried out, induced massive deaths and injuries. Heuveline (2015) estimated that the genocide induced a median value of 1.9 million excess deaths. This unique history strongly implies that disability in Cambodia is more likely caused by external shocks rather than reckless individual behaviours.

	Agri. (γ_1)	Manuf. (γ_2)	OtherInd. (γ_3)
Intercept	1.185**	-0.661**	0.218
	(0.127)	(0.181)	(0.141)
Gender (0=male; 1=female)	0.014	0.109	0.056
	(0.046)	(0.068)	(0.052)
Language (=1, if speaking more than 1 language)	0.041	0.21	0.008
	(0.126)	(0.177)	(0.144)
Length of schooling	-0.156**	-0.139	0.065
	(0.069)	(0.104)	(0.077)
Living in the current location since birth (0=yes; 1=no)	-0.096**	-0.111	-0.013
	(0.047)	(0.07)	(0.053)
Urban/Rural (Urban=1; Rural=0)	-0.252**	-0.078	0.075
	(0.054)	(0.081)	(0.06)
Experience	-0.129*	-0.178*	-0.173**
	(0.071)	(0.104)	(0.079)
Experience squared	0.03**	0.04*	0.037**
	(0.014)	(0.021)	(0.016)
Disability (=1, if disability is indicated in the survey)	-1.746**	-1.581**	-1.817**
	(0.426)	(0.444)	(0.439)
Disposible income (1,000,000 KHR)		1.642**	
		(0.275)	
Disposible income *D_i		1.458**	
		(0.513)	
Working hours (5,040 hours)		-0.663	
		(1.548)	
Working hours *D_i		-2.076	
		(5.79)	
$\alpha_0 D_i$		-0.881**	
		(0.061)	
Likelihood at maximum		-17,241	
Likelihood at benchmark		- 37,958	
McFadden's ρ^2		**0.55**	
Total No. of Observations (no. of disabled)		14,103(982)	

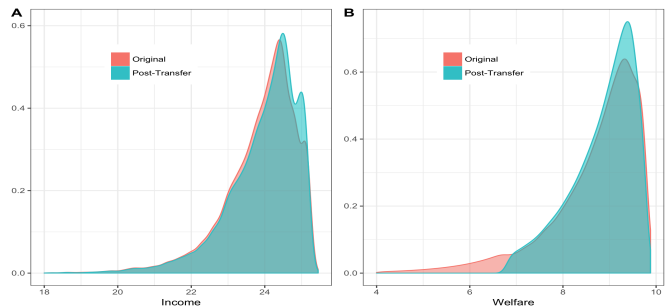Table 1. Coefficient Estimates of the Deterministic Utility Function and Opportunity Sets

Figure 1. Distribution of Income and Welfare Pre- and Post- Transfer Program

Conclusions

We found that: (1) Having a disability reduces job opportunities significantly and individuals with disability have higher utility towards consumption and values leisure more. (2) The reduced job opportunities can be measured with a money metric measure, Capability-Equivalent-Income, which generates the same utility level as if the disabled were free of disability. (3) A transfer program, where individuals with disabilities are fully compensated for their capability-induced loss of job opportunities and this is financed by taxing the top 20% earners, can reduce inequality in income and welfare and increase the overall welfare.

Contact

Xuehui Han
Asian Development Bank
Email: xuehuihan@adb.org
Website: https://sites.google.com/site/xuehuihan2016/
Phone: +63 2 632 6641

References

1. Blundell, R., Costa Dias, M., Meghir, C. and Shaw, J. (2016) Female Labor Supply, Human Capital, and Welfare Reform. Econometrica, 84: 1705–1753.
2. Dagsvik, J. K. (2013) Making Sen's Capability Approach Operational: A Random Scale Framework. Theory and Decision, 74: 75-105.
3. Heuveline, P. (2015) The boundaries of genocide: Quantifying the uncertainty of the death toll during the Poll Pot regime in Cambodia (1975-79). Population Studies, 69: 201-218.