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Intrahousehold Wealth Inequality and Welfare: Evidence from Karnataka, India

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Inequality within the household is neglected in wealth inequality re-search due to paucity of data and established theoretical frames for accounting for intrahousehold distribution. We develop a framework for welfare theoretic interpretation of intrahousehold wealth inequality. Illustrative data from India shows that 32% of total wealth inequality is attributable to intrahousehold inequality that results in a median welfare loss of as much as 80% for plausible values of inequality aversion.

Keywords: Atkinson Inequality Measure, Household Asset Matrix, Gender Asset Gap, Intrahousehold Wealth Inequality

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Abstract

Inequality within the household is neglected in wealth inequality research due to paucity of data and established theoretical frames for accounting for intrahousehold distribution. We develop a framework for welfare theoretic interpretation of intrahousehold wealth inequality. Illustrative data from India shows that 32% of total wealth inequality is attributable to intrahousehold inequality that results in a median welfare loss of as much as 80% for plausible values of inequality aversion.

1 Introduction

Wealth inequality has attracted the attention of both researchers and policy makers following the global financial crisis of 2007 [Piketty, 2014, Shorrocks et al., 2014]. However, a crucial missing piece in wealth inequality research is inequality *within* the household. Gender is a particularly important axis of intrahousehold wealth inequality [Deere and Doss, 2006]. This gendered

inequality is of concern as evidence shows assets owned by women are disproportionately associated with welfare outcomes such as child nutrition and education, women's empowerment, and reduced experience of domestic violence [Oduro et al., 2015, Bhattacharyya et al., 2011, Allendorf, 2007, Park, 2007].

The neglect of intrahousehold wealth inequality is aggravated by lack of individually disaggregated data [Deere and Doss, 2006]. Even when such data is available, extant inequality metrics suffer from the problem of incommensurability. In this paper, we show that an extension of the Atkinson and Foster frameworks for normative measures of income inequality to intrahousehold wealth inequality resolves the incommensurability problem [Atkinson, 1970, Sen and Foster, 1997]. Using primary data from India as an illustrative example, we find intrahousehold inequality accounts for 32% of overall wealth inequality.

2 The Incommensurability Problem

The public goods nature of certain household assets renders direct comparison between households based on intrahousehold asset distribution incommensurable. Consider three households, A, B, and C, each consisting of exactly one heterosexual couple, and owning the same aggregate assets but

distributed differently between the man and woman. Assume that the woman in household A owns 70% of all household assets; woman in B owns 50%; and the woman in C owns 30%. This information about gendered inequality sheds no light on the actual wellbeing of women or aggregate welfare in any of the households. We cannot automatically conclude that the woman in C is the most disadvantaged, or that woman in A the most advantaged. If the assets owned by household C are dominated by pure public goods, and the that of A by private assets, it is plausible that the woman in C experiences better welfare outcomes. We develop a simple welfare theoretic framework to surmount this incommensurability.

Consider household i with average assets of $\bar{Y}^i$ and an intrahousehold distribution Φ^i:

$$W_j^i = U_j^i\left(\bar{Y}^i, \Phi^i\right) \tag{1}$$

W_i^j is the household welfare evaluated by individual j in household i. This formulation allows for each individual in the household to evaluate aggregate household welfare using welfare function, $U_j^i(\cdot)$. Let $\tilde{W}_j^i$ be the maximum welfare this household can achieve with perfect equality ($\tilde{\Phi}$) in asset ownership:

$$\tilde{W}_j^i = U_j^i\left(\bar{Y}^i, \tilde{\Phi}\right) \tag{2}$$

We calculate household welfare lost due to intrahousehold inequality as:

$$\Delta_j^i = 1 - \left(\frac{W_j^i}{\tilde{W}_j^i} \right) \tag{3}$$

Under standard assumption of egalitarian preferences, $\tilde{W} \leq W$ so that $0 \leq \Delta \leq 1$ and Δ simply represents the fraction of aggregate household welfare lost due to intrahousehold inequality.

While welfare is not directly comparable across households, the loss in welfare computed by each household (or even separately by individuals within a household) are commensurable across households. $\Delta^i > \Delta^k$ implies that fraction of welfare lost in household i is greater than in household k, as measured by respective households. The difference could be result of differing distribution of aggregate assets; public versus private goods distribution in respective households; or a combination of two. To further clarify the drivers of household welfare loss, we adapt the well-established Atkinson framework to the assets space [Atkinson, 1970].

Following Atkinson's classic equally distributed equivalent income, we define a corresponding Equally Distributed Equivalent Wealth (EDEW) that represents the (equal) value of assets owned by each household member such that the household welfare remains unchanged from the one obtained under extant distribution of assets [Atkinson, 1970]. Let Θ_j^i be the EDEW that

is owned by all members of household i as evaluated by person j in the household so that using equation-1 we obtain:

$$W_j^i = U_j^i\left(\bar{Y}^i, \Phi^i\right) = U_j^i\left(\Theta_j^i, \tilde{\Phi}\right) \tag{4}$$

EDEW calculated in eq. (4) leads to a welfare loss metric that we define as the Atkinson Welfare Loss Metric:

$$\Delta A_j^i = 1 - \left(\frac{\Theta_j^i}{\bar{\bar{Y}}^i}\right) \tag{5}$$

The metric ΔA in Eq. (5) is consistent with the general welfare loss metric Δ defined in Eq. (3). The difference between average wealth and EDEW (Θ_j^i) represents the wealth equality trade-off from the perspective of person j, and $\Theta \leq \bar{Y}$ so that $0 \leq \Delta A \leq 1$.

3 Atkinson Welfare Loss Metric and the Household Asset Matrix

We define a household asset matrix (HAM) such that for each household $i \in \{1, 2, \ldots, n\}$, the HAM $(\mathbf{Y}^i)$ records the value of $m \in \mathbb{Z}_+$ different assets,

owned by k adults in the household.

$$\mathbf{Y}^i = \begin{pmatrix} y^i_{11} & \dots & y^i_{1j} & \dots & y^i_{1k} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ y^i_{\beta 1} & \dots & y^i_{\beta j} & \dots & y^i_{\beta k} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ y^i_{m1} & \dots & y^i_{mj} & \dots & y^i_{mk} \end{pmatrix} \tag{6}$$

$y^i_{\beta j}$ represents the value of asset β owned by person j in household i. The k columns of the asset matrix each represent asset vectors that record the value of each individual's asset ownership. The total value of household assets owned by individual j in household i is simply the sum of all elements of column j of the asset matrix, $\mathbf{Y}^i$:

$$Y^i_j = \begin{pmatrix} 1, \dots, 1_m \end{pmatrix} \begin{pmatrix} y^i_{1j} \\ \vdots \\ y^i_{\beta j} \\ \vdots \\ y^i_{mj} \end{pmatrix} \tag{7}$$

The intrahousehold distribution of assets Φ^i is derived from the distribution of this vector sum across all k adults in the household:

$$\Phi^i = \Phi\left(Y^i_1, Y_2, \dots, Y^i_j, \dots, Y^i_{k-1}, Y^i_k\right) \tag{8}$$

Consider an elementary additive social welfare function, $W(\cdot)$ defined for each household, i that is computed as as a simple average of individual utilities, U, that takes on total individual assets (Y_j^i) as the argument.

$$W_j^i = \frac{1}{k} \sum_{j=1}^{j=k} U_j^i \left(Y_j^i\right) \tag{9}$$

Using Atkinson's specification [Atkinson, 1970] for U_j^i

$$U_j^i \left(Y_j^i\right) = \begin{cases} \frac{\left(Y_j^i\right)^{1-\varepsilon_j^i}}{1-\varepsilon_j^i} & ; \quad \varepsilon_j^i \neq 1,\ \varepsilon_j^i \geq 0 \\ \ln\left(Y_j^i\right) & ; \quad \varepsilon_j^i = 1 \end{cases} \tag{10}$$

The values taken by the inequality aversion parameter (ε_j^i) determines the functional form of Eq.(10). With $\varepsilon_j^i = 0$, Eq.(10) reduces to an utilitarian SWF, consistent with the unitary model of the household [Alderman et al., 1995]. As $\varepsilon \to \infty$ Eq.(10) assumes the Rawlsian form. From the perspective of person j in household i, ε fully characterizes the trade-offs consistent with extant distribution of household assets (Φ^i). This formulation underscores the fact that the inequality aversion parameter, ε can vary across household members.

To calculate welfare loss from intrahousehold asset inequality, we first

compute EDEW (Θ_j^i) following Eq. (4):

$$\frac{1}{k}\sum_{j=1}^{j=k} U_j^i\left(Y_j^i\right) = U_j^i\left(\Theta_j^i\right) = W_j^i \tag{11}$$

Combining Eqs.(10) and (11), EDEW is calculated as:

$$\Theta_j^i = \begin{cases} \left(\frac{1}{k}\sum_j \left(\left(Y_j^i\right)^{1-\varepsilon_j^i}\right)\right)^{\frac{1}{1-\varepsilon_j^i}} & ; \quad \varepsilon_j^i \neq 1,\ \varepsilon_j^i \geq 0 \\ \left(\prod_j \left(Y_j^i\right)\right)^{\frac{1}{k}} & ; \quad \varepsilon_j^i = 1 \end{cases} \tag{12}$$

The Atkinson Welfare loss metric, ΔA_j^i is evaluated by substituting Eq. (12) in Eq. (5).

For $\varepsilon = 1$, ΔA is the same as welfare loss calculated using a Foster welfare function based on the log-mean deviation or the Theil's L index [Theil, 1967].

4 Empirical Application

We apply the framework developed here to the Karnataka Household Asset Survey (KHAS) 2010-11, a state representative household data set that has individual level asset information [Swaminathan et al., 2012]. Departing from the standard survey methodology of obtaining asset ownership at the household level, the KHAS data is able to assign ownership to individual members of the household. Information on asset values is also available enabling the construction of the HAM, Eq.(6). For collectively owned assets,

an equal partitioning of the total asset value between all owners determines individual valuation. Eq.(6). KHAS contains data from 4,110 households, with up to two individual members interviewed in each household [Swaminathan et al., 2012]. Our analysis here is restricted to those households where a principal hetrosexual couple was interviewed yielding an analytic sample of 3,106 households. Here we consider key physical assets owned by the principal couple (including immoveable property, agricultural equipment, livestock, non-farm business assets, consumer durables, and jewellery). This simplified illustration is easily extended to the general HAM in Eq.(6).

Table-1 summarizes intrahousehold wealth inequality using simple decomposition of the Theil-T index into *between* households and *within* households components. Nearly one third of total asset inequality (38% in rural and

	T_w	T_b	T_T	**Median**	**Mean**	n (Individuals)
Rural	0.54	0.90	1.44	9,357	78,146	*4012*
Urban	0.53	1.45	1.98	4,050	116,326	*2200*
Overall	**0.54**	**1.15**	**1.69**	**6,031**	**94,359**	*6212*

Table 1: *Decomposition of Asset Inequality. T_w is the Theil index for inequality within households, and T_b is the 'between-household' Theil index. T_T is the overall Theil. Means and medians reported here are for value of physical assets included in Theil calculations, in 2010 PPP International Dollars.*

27% in urban subsamples) is contributed by intrahousehold inequality. This is not surprising if we consider the average gender asset gap measured as the

ratio of wealth owned by the wife to that owned by the husband (GAP, last column of Table-2). In the median household, the wife's wealth is only 5.8% that of the husband's. The lower value of the GAP in rural areas (3.5 %) is driven by the fact that land is the primary agrarian asset and one that is most gendered in its distribution between men and women. Perfect equality in the lowest quintile is accounted by the fact that poorer households do not own much immoveable property while the assets they do own (consumer durables, jewellery) are more likely to be equally distributed between the husband and wife [Swaminathan et al., 2011].

	$\Delta A(\varepsilon = 0.25)$	$\Delta A(\varepsilon = 1.0)$	$\Delta A(\varepsilon = 2.0)$	**Median GAP**
Quintile-1	0.6	2.4	4.7	100.0
Quintile-2	11.0	45.7	70.6	11.6
Quintile-3	14.9	63.8	86.9	3.8
Quintile-4	16.9	73.6	93.1	2.1
Quintile-5	17.7	78.3	95.3	1.4
Rural (n=2006)	15.3	65.5	88.1	3.5
Urban (n =1100)	6.9	28.2	48.4	37.9
Overall (n=3106)	**13.8**	**58.5**	**82.8**	**5.8**

Table 2: *Percentage household welfare lost due to intrahousehold asset inequality for select values of inequality aversion. All numbers reported here are percentages, and are survey weighted medians. Quintiles combine rural and urban samples. See text for more explanation.*

4.1 Atkinson Welfare Loss

Table-2 also presents the median welfare loss (ΔA) as evaluated using Eqs. (5), (12) for three values of ε. The welfare loss with $\varepsilon = 1$ also corresponds to

each household using a Foster Welfare function to evaluate household welfare [Sen and Foster, 1997]. Interpretation of these welfare loss numbers assumes an implicit *ceteris paribus* condition so that losses reported here correspond only to physical assets with everything else held constant (other assets as well as income). The median welfare loss due to intrahousheold inequality ranges from 0.6% to 95% for differing values of ε and show an increasing monotonic relationship from poorer to richer households mirroring the trend of the GAP.

5 Discussion

We demonstrated that intrahousehold inequality is a significant contributer to overall wealth inequality and present a method for characterization of equality trade-offs within a household. Our results make a strong case for the collection of individually disaggregated assets data. A choice modelling module to determine inequality aversion, ε will fully operationalize the framework presented here [Bellemare et al., 2008]. The welfare theoretic framework developed here allows for tracking intrahousehold inequality, thus providing an effective tool for policy addressing gender discrimination.

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