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Intra-household Wealth Inequality and Economic Development: Evidence from Karnataka, India

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Abstract:

While wealth inequality has attracted attention in the recent inequality literature, such inequalities within the most elementary social unit -- the household -- remain neglected. We develop an empirical framework for measuring intra-household wealth inequality. Using unique individual-level wealth data from Karnataka, India, we report how a third of overall wealth inequality is attributable to inequality within the household. A significant barrier to interpreting intra-household wealth inequalities is the public goods nature of several household assets. We overcome this limitation with a simple normative framework derived from the Atkinson index. While welfare measures are incommensurable across different households, welfare loss resulting from intra-household inequality are usefully compared across households. We report losses in aggregate welfare for plausible values of the Atkinson inequality aversion parameter.

Recent work suggests a Gender Kuznets (GKC) hypothesis and finds evidence for a non-monotonic relationship between gender inequality and economic development in a country. We extend this literature in two ways. First, we propose a test of the GKC hypothesis at the sub-national level. We proxy economic development at the village level with satellite luminosity data (night lights) and find evidence for a non-monotonic relationship between women's wealth share at the village level and economic development. Second, we propose a micro-Kuznets hypothesis using intra-household wealth inequality. Results from micro data suggest a negative relationship between intra-household inequality and aggregate household wealth.

Keywords: Karnataka, gender wealth gap, intra-household; mean log deviation, inequality aversion parameter, Gender Kuznets Curve

1. Introduction

Wealth inequality has found new salience in recent inequality literature. However, certain aspects of wealth inequality are overlooked in this discussion. While the gender dimensions of wealth inequality are only beginning to be acknowledged, a study of the household as a social unit where inequalities play out has largely been ignored. Also, not much is known about how intra-household inequality in wealth evolves with economic prosperity. Is a social transformation also achieved with economic transformation? This paper addresses these gaps in the literature by first examining disparities in wealth distribution within couples and how this contributes to overall wealth inequality, and then delineating the relationship between gendered patterns of wealth inequality and level of economic development.

The idea of assets or wealth endowment as a critical factor affecting the welfare of individuals has gained traction in the last decade (Davies, Sandstrom, Shorrocks, & Wolff, 2008; Moser, 2007). An asset perspective enables a long-term view of poverty and can help us understand the trajectory of households' movement into, and out of poverty. Lack of assets is often a cause of structural poverty wherein households remain poor over long periods and possibly across generations, which is quite different from stochastic poverty where households are affected by temporary income shocks (Carter & Barrett, 2006). Assets are more stable than income over a given period, they are a store of wealth and can help smooth consumption in the event of negative income shocks, and also be used as a collateral for credit. Beyond economic virtues, wealth endowment has a social character. Oliver & Shapiro (1995) aptly describe the role as wealth as "[a] special form of money not used to purchase milk and shoes and other life necessities. More often it is used to create opportunities, secure a desired stature and standard of living, or pass class status along to one's children", (ibid, pp. 2). Given that wealth represents accumulated income or intergenerational transfers, wealth inequality tends to be higher than income or consumption inequality.

In conventional data collection, asset ownership and wealth is vested in households. Individual wealth distributions required for inequality metrics, are constructed by dividing household

aggregates by household size. In this per capita method, intra-household inequalities do not exist by definition with the consequence that such inequality is often underestimated (Haddad & Kanbur, 1990; Lahoti et al., 2011; Vijaya et al., 2014). Survey data typically informs us whether or not a household owns an asset. Gender analysis with such data is conflated with headship as it is limited to comparisons of male-headed and female headed households. Implicitly female heads are considered representative of all women which is problematic. Female heads are likely to be currently single (women are usually identified as heads only in the absence of an adult male) and also to be poorer. There are little insights on women or men in non-headship roles within the household which potentially biases our understanding of wealth disparities between men and women (Deere, Alvarado, & Twyman, 2010).

A greater challenge for intra-household analysis arises from the fact that household assets are a mix of public and private goods resulting in an incommensurability problem. An unambiguous normative welfare interpretation of intra-household wealth inequality is not possible given that public goods can benefit all household members (housing is the classic example of such a good) while private goods that benefit a single or only a few household member(s) (Chiappori & Meghir, 2014; Klasen, 2004; Malghan & Swaminathan, 2015). However, it is possible to make comparisons regarding welfare loss. We show that a straightforward adaptation of the Atkinson framework for normative measures of income inequality to intra-household wealth inequality resolves the incommensurability problem (Atkinson, 1970; Sen, 1997).

A related issue of interest is the trajectory of gender equality over the course of development. Will economic growth and development also deliver on gender equality goals? Is there a monotonic relationship between economic development and gender equality? Social norms that promote gender biases and entrenched patriarchal institutions are sometimes strengthened during the process of economic development. Eastin & Prakash (2013) using macro country-level data find a S shaped relationship between economic development and gender equality, which the authors label as Gender Kuznets Curve (GKC).

This paper makes several contributions to the emerging literature on gender and wealth inequality in two related but distinct domains. A key contribution is to contextualise intra-household inequality within the larger inequality discussions. To this end, we use a decomposition approach to measure the contribution of within household wealth inequality to overall wealth inequality. The within household measure focuses on differences in wealth endowments between spouses and thus, also provides a gender perspective on intra-household relations. This however, is not to be confused with the contribution of overall gender inequality to total wealth inequality. The difference lies in how we characterise the group; either as household (intra-household) or as sex (overall gender inequality). Our approach brings together traditional inequality analysis with intra-household research and draws attention to power symmetries within relationships which could have profound implications for individual wellbeing. At a societal level, the Atkinson framework provides a measure of the welfare loss due to unequal distribution of resources.

Our second contribution is that we extend the GKC hypothesis in two different directions. First, we ask if the GKC might hold up if we used wealth distribution as a marker of gender equality. This a departure from previous studies that have considered employment, earnings, or other status measures such as Gender Development Index or the Gender Empowerment Measure. Women's share of wealth provides another facet to gender inequality as it reflects not only labour market opportunities, but also the legal and social support for women's asset ownership. Second, we investigate how (if) scale and aggregation effects drive GKC results. We examine the relation between gender inequality and economic growth as different levels of aggregation, moving from the micro (household) to the sub-national level (village) as the unit of analysis. The proposed drivers of the non-monotonic relationship between gender equality and level of economic development operate at sub-national levels as much as at the level of the sovereign state; studying the relationship at lower levels of aggregation could help unmask the pathways of change. The analysis in this paper is operationalised using data from the Karnataka Household Asset Survey 2010-11 (KHAS), representative of Karnataka state, India that collected

detailed individual level asset data which enables an understanding of intra-household wealth disparities.

The remainder of this paper is organised as follows. The next section provides a brief overview of the related literature with a focus on intra-household inequality and the GKC. The research questions addressed in this paper are detailed in section 3. The data and methods are outlined in section 4 where we also provide a framework for addressing the incommensurability problem. The results are discussed in section 5, while the final section concludes with a brief discussion of extensions and work in progress.

2. Literature Review

2.1 Intra-household wealth inequality

Notwithstanding data constraints, there is some evidence of a differential wealth distribution between men and women. Based on data from the 2002 wave of the German Socio-Economic Panel, Sierminska, Frick, & Grabka (2010) find a raw gender wealth gap of about 30,000€. Significant gaps are also evident in developing countries. Based on specialised asset surveys conducted in 2010-11, it is seen that in Ecuador, women own 52% of household gross physical wealth while women in Ghana own only 30%. In Karnataka, India, the wealth gap is starker with women accounting for a mere 19% of household gross physical wealth (Doss, Deere, Oduro, & Swaminathan, 2014). Several studies reiterate the importance of marital status and household structures when examining wealth distributions, although the evidence is mixed; never married men and never married women tend to be less wealthy than married households (Schmidt & Sevak, 2006). Further, there also exists a significant wealth gap between never married women and never married men (Ruel & Hauser, 2013). Very few studies have looked at wealth distribution within couples. In Ecuador, married women own 44% of total physical and financial wealth. The comparable figures for Ghana and Karnataka are 19% and 9%, respectively (Deere, Oduro, Swaminathan, & Doss, 2013). For German couples in 2007, men's wealth on average is higher than women's wealth by 33,000€ (Grabka, Marcus, & Sierminska, 2015).

Individuals acquire assets or build up their wealth in several ways. They can purchase assets from their earnings or savings; they can inherit wealth or assets or receive them as gifts; or these can be transferred from the state. The gender wealth gap mirrors the differential wealth accumulation channels and the gendered constraints therein. Labour market characteristics (status of employment, experience, earnings) are evidently important (Ruel and Hauser 2013; Grabka et. al, 2013), but inheritance and martial regimes also have a part to play in the wealth accumulation process (Grabka et. al, 2013; Deere et al. 2013). Laws and norms governing marriage and inheritance are particularly relevant for women's asset ownership in India, where women's labour force participation is strikingly low and is showing a declining trend (Lahoti & Swaminathan, 2016).

Intra-household inequality in resources lead to power asymmetries that do not bode well for women's own welfare as well as that of her households. On the other hand, when women do control resources within the household, it has intergenerational positive impacts via better investments in children's human capital (Allendorf, 2007; Bobonis, 2009; Lundberg, Pollak, & Wales, 1997; Park, 2007). More specifically, when women own land or a house, it leads to greater empowerment as measured by involvement in household decision-making or mobility (Anderson, S., & Eswaran, 2009; Swaminathan, Lahoti, & Suchitra, 2012b), reduced risk of experiencing intimate partner violence (Bhattacharyya, Bedi, & Chhachhi, 2011; Oduro, Deere, & Catanzarite, 2015; Panda & Agarwal, 2005), and reduced risk of engaging in transactional sex for unpartnered women (Muchomba, Wang, & Agosta, 2014).

2.2 Gender Equality and Economic Development

The empirical evidence on the existence of the Gender Kuznets Curve (GKC) is mixed, partly due to differing definitions of gender equality and a lack of comparable data.[2] Forsythe, Korzeniewicz, & Durrant (2000) find differing results depending on the measure of gender

[2] The term was first used by Eastin & Prakash (2013).

inequality used in the analysis. The Gender Development Index used to proxy for women's status suggests only a linear relationship with growth with both cross-sectional and longitudinal data. However, a measure of gender inequality between men and women shows a curvilinear relationship with growth. If one treats labor force participation (LFP) as a proxy for gender equality, then once again the evidence is not conclusive. A U shaped relationship between women's LFP was first postulated and confirmed by Goldin (1995) and later reaffirmed by other studies (Luci, 2009; Mammen & Paxson, 2000; Tam, 2011). However, this is refuted by Gaddis & Klasen (2014) who suggest that the U shape is sensitive to the data used. The lack of a U relationship is supported for India based on state-level panel data analysis over 1983-84 to 2011-12 (Lahoti & Swaminathan, 2016).

A recent study of the GKC covering 146 countries from 1980 to 2005 suggests a S shaped relationship delineated by three phases of development (Eastin & Prakash, 2013). The first stage of development is conducive to gender equality followed by a second stage where gender equality measures show a decline with the third stage showing an improvement yet again. The authors argue that the deterioration in gender equality is due to the pushback on progressive values by patriarchal forces and sticky social norms that take time to change. The proxies for gender inequality women's status and LFP variables; (GDI), Gender Equality Measure (GEM), female LFP and female parliamentary participation. Malghan & Swaminathan (2017) apply an intra-household lens by examining the relationship between woman's share of aggregate couple earnings and per capita disposable household income. Applied to micro data from the Luxembourg Income Study (LIS), their results also suggest a non-monotonic relationship between gender equality (as measured by her share of earnings) and household economic status. However, disaggregating by household income deciles, present a slightly different picture in that the curvilinear relationship does not uniformly hold across all deciles.

3. Research Questions

In this paper, we estimate the contribution of within-household wealth inequality to total wealth inequality for coupled households in Karnataka. For the same sample, using wealth inequality between spouses as a proxy for gender inequality we test the existence of a micro GKC. We also consider the GKC relationship at the sub-national where women's wealth share in the village is the measure of gender equality.

The concept of gender equality is multidimensional. No one measure can fully capture complex structural and agency variables that determine overall gender equality in a society. We argue that women's wealth share captures certain central facets of gender equality – women's ability to seek employment outside the home as well as laws and social norms that promote egalitarian inheritance and marital regimes – therefore, its behaviour need not mirror the pattern evinced by earnings.

What happens within the household is a cause and consequence of larger societal trends. As power asymmetry within households diminish, it should lead to a change of social norms that facilitate greater gender equality. This in turn can exert pressure on patriarchal institutions at all levels to accelerate the process of change and spread it more evenly within a country. Thus, a virtuous cycle of progressive change is possible. Economic growth can be a powerful catalyst of change as it can translate into improved opportunities in both, the economic and non-economic domains. Growth is potentially an aspirational force which benefits men and women alike and thus, can reduce gender inequalities by giving women better human capital investment and the ability to have an independent voice (Eastin & Prakash, 2013). With improved economic prospects, households do not have to make trade-offs between sons and daughters.

To better understand these issues, in this paper we attempt to answer the following related questions:

1. What is the contribution of intra-household wealth inequality to overall wealth inequality? Given the fairly large gender wealth gaps in the population, we expect intra-household to be a significant contributor to overall inequality.

2. Is there a Gender Kuznets Curve relationship at the sub-national (village) level and at the micro (household) level?

4. Data and Empirical Approach

The Karnataka Household Asset Survey 2010-11 (KHAS), overcomes the data limitations of regular household surveys by providing detailed information on asset ownership at the individual level. KHAS is representative of the state of Karnataka located in Southwest India. The survey followed a stratified random sampling method covering eight districts across four agro-ecological zones.

The KHAS survey is innovative in a couple of aspects. First, unlike traditional household surveys where asset ownership information can be assigned only to households, with KHAS data one can assign ownership information to individuals. The survey had two instruments, a household and an individual questionnaire. The household questionnaire in addition to socio-demographic information also administered a household asset inventory where individual owners of assets were identified. Second, two household members were interviewed. The individual questionnaire was administered separately to the primary respondent (who also answered the household questionnaire) and to a second person in the household. If the primary respondent was married, then his/her spouse was interviewed as the second respondent. If the primary was not married, another adult household member was selected following a set of established protocols. Every attempt was made to ensure that the principal couple was interviewed or the two members were of the opposite sex to get both men's and women's perspectives. The individual questionnaire obtained detailed information on the assets owned by the respondents,

including mode of acquisition of assets, and transactions rights over assets. Financial asset data was also obtained for the two individual respondents.

KHAS collected information on values for all physical assets. Valuation based on sale, replacement, lease/rental were obtained for immoveable property (housing, land and other real estate), while only sale value was recorded for the smaller assets (livestock, agricultural tools and equipment, non-farm business activities and consumer durables). We work with a couple sub-sample (sample size of 3,109 households), *i.e.,* households with the principal couple as respondents for the inequality decomposition and the micro-Kuznets. This is largely driven by the notion that it is between spouses that one expects (or it is desirable) that wealth inequality be at a minimum. Among other household members and certainly across generations there will be differences in wealth accumulation due to a life cycle effect, which would of course lead to intra-household inequality. For this sample, wealth refers to gross physical and financial wealth, while for the sub-national Kuznets, it includes only physical gross wealth. This is because the financial information was obtained only for the respondents and not all household members due to the concern that respondents may not be fully aware of the financial details of other individuals.

4.1 Inequality Decomposition

We use the class of Generalised Entropy (GE)[3] measure with $\alpha = 0$, the mean log deviation (MLD) index to calculate the contribution of intra-household inequality to total inequality. The advantage of an entropy index is that it is perfectly sub-group decomposable, unlike the Gini coefficient. In this paper, each household is a group and is comprised of an adult heterosexual couple. The application of a GE measure to intra-household inequality is not typically the norm, but has been used across several studies for inequalities in calorific consumption, nutritional status and labor market earnings (Haddad & Kanbur, 1990; Malghan & Swaminathan, 2015; Rodriguez, 2016; Sahn & Younger, 2009). The mean log deviation is the only one of the GE class

[3] $E(\alpha) = \frac{1}{n(\alpha^2-\alpha)} \sum_i \left[\left(\frac{y^i}{\bar{y}} \right)^{\alpha} - 1 \right]$

of perfectly decomposable metrics that allows for a path independent decomposition (Foster & Shneyerov, 2000; Shorrocks & Wan, 2005). Let *W* be the within component of the total inequality, *I;* and *B* the between-component. Once the value of *I* is determined, one of either *B* or *W* can be conceptualized as a residual after computing the other. The path independence of mean log deviation ensures that *B* or *W,* are independent of the order in which they are calculated (Foster & Shneyerov, 2000).

4.2 The Incommensurability Problem

The public goods nature of certain household assets renders direct comparison between households based on intra-household 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 that of household A by private assets, it is plausible that the woman in household 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 intra-household distribution, Φ^i:

$$W_j^i = U_j^i(\bar{Y}^i, \Phi^i) \quad [1]$$

W_j^i is the aggregate household welfare evaluated by individual *j* in household *i*. It is important to note that aggregate household welfare evaluated by some other person, $k \neq j$ can be different from one evaluated by *j*. In the subsample of heterosexual coupled households, this

allows for the household welfare function of man to be different from that of the woman. Let $\widetilde{W}_j^i$ be the maximum welfare this household can achieve with perfect intra-household equality in asset ownership ($\widetilde{\Phi}$).

$$\widetilde{W}_j^i = U_j^i(\bar{Y}^i, \widetilde{\Phi}) \quad [2]$$

As measured by individual *j*, the welfare lost due to intra-household inequality is:

$$\Delta_j^i = 1 - \frac{w_j^i}{\widetilde{w}_j^i} \quad [3]$$

With standard egalitarian preferences, $\widetilde{W} \geq W$ so that $0 \leq \Delta \leq 1$ and Δ simply represents the fraction of aggregate household welfare lost due to intra-household inequality.

While welfare is not directly comparable across households, welfare-loss computed by each household (or even separately by individuals within a household) is 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 specific individuals in 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 for household *i* as evaluated by its member, *j.* Using Eq. (1), and once again denoting perfectly equal distribution by $\widetilde{\Phi}$, we obtain:

$$W_j^i = U_j^i(\bar{Y}^i, \Phi^i) = U_j^i(\Theta_j^i, \widetilde{\Phi})$$ [4]

EDEW calculated in Eq. (4) enables the calculation of the Atkinson welfare loss metric:

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

ΔA in Eq. (5) is consistent with the general welfare loss metric Δ defined in Eq. (3). The difference between average income and EDEW (Θ_j^i) represents the intra-household income equality trade-off from the perspective of person *j*, and $\Theta \leq Y$ so that $0 \leq \Delta A \leq 1$. We illustrate the actual computation of the Atkinson metric in Appendix A.

4.3 Gender Kuznets Curve

Micro GKC: In this study, we use woman's share of total couple gross wealth (physical and financial) as the dependant variable and the key explanatory variable is the per capita total household gross wealth. For ease of exposition these are simply referred to as couple wealth and total household wealth, respectively. The use of wealth share captures her relative status compared to her spouse and also allows us to overcome theoretical difficulties with measuring inequality between two individuals using standard inequality metrics like the Gini index, which are used to measure inequality in large-*n* distributions. In addition to the OLS, we also estimate quantile regressions to study the relationship between the variables of interest at different points in the distribution of the dependent variable. Figure 1 presents the cumulative distribution function of the wife's share of couple wealth. Her share is close to zero till the tenth percentile and is only 7 per cent at the 50th percentile (median), beyond which it registers an increase, gradually at first and then sharply with the share of wealth close to 70 per cent at the 90th percentile.

Sub-national GKC: Estimates of economic output at subnational scales – especially in developing countries – are generally not reliable. To get around this problem, we use the DMSP Luminosity data (Night Lights) as a proxy for aggregate sub-national economic activity (Chen & Nordhaus, 2011; Ebener, Murray, Tandon, & Elvidge, 2005; Henderson, Storeygard, & Weil, 2012). Night

light data has been used previously at the village-level, the most elementary administrative aggregation in India (Min, Gaba, Sarr, & Agalassou, 2013; Roychowdhury, Jones, Reinke, & Arrowsmith, 2012). The use of night lights data as a suitable proxy for sub-national economic activity is often contested on the grounds that satellite luminosity data reflects public goods and infrastructure provisioning rather than economic output (Burlig et al., 2016; Paik & Shapiro, 2013). However, electrification patterns in rural Karnataka obviate this concern. Over 92% of the villages in Karnataka were electrified by 2001, and night light data in Indian villages reflects hours of electricity rather than grid connectivity (Chakravorty, Pelli, & Ural Marchand, 2014), and for villages in Karnataka, the coefficient of variation in hours of electricity supply is high (0.45) to make night lights data suitable for empirical work (Bharathi, Malghan, & Rahman, 2016). Recent empirical work provides evidence for positive economic spillovers from reliable electricity supply. Electricity directly impacts rural economic growth through higher non-farm enterprise income (Chakravorty et al., 2014; Rao, 2013; van de Walle, Ravallion, Mendiratta, & Koolwal, 2015).

As the DMSP luminosity data is top-coded, it is unsuitable as a good proxy for economic growth in urban areas (especially in our sample that includes metropolitan Bengaluru, an urban agglomeration of more than ten million residents). We therefore restrict our GKC models to the rural subsample in the KHAS data. However, unlike with the micro-Kuznets analysis we do not restrict ourselves to only coupled households or coupled wealth. Our dependent variable here is women's share of wealth at the village-level. This is obtained by dividing the weighted sum of gross physical wealth owned by all women in a village by the weighted sum of total gross physical wealth of the village where the weights are the inverse of the probability of an individual being selected into the sample. The sex-disaggregated population data from Census 2011 is used for the construction of respective sex-specific weights.

5. Results

The Lorenz Curves based on individual level data as well as aggregate couple data not only suggest high levels of wealth inequality but also illustrate the underestimation of inequality due to household level data collection methods (Figure 2).

A measure of intra-household wealth inequality is obtained by decomposing the MLD index into between and within household components (Table 1). The decomposition differences between rural and urban subsamples and their respective deviations from the overall sample are along expected lines. Additionally, the table also presents results using sex and caste as decomposition axes. The decomposition by sex is of course, the traditional method for describing gender inequality. Gender wealth inequality measured by both sex group decomposition and household group decomposition is relatively smaller in urban Karnataka. If the intra-household contribution to overall wealth inequality is 38% across the state, it is 51% in rural areas and 25% in urban areas. As measured by inequality between sexes, the between-sex contribution is 28% in rural Karnataka, and 17% in urban Karnataka. These findings are consistent with the fact that land (agrarian in rural areas or residential in urban areas) accounts for the bulk of household wealth. Women are much less likely to own agrarian land than they are urban residential land.

Further, Table 1 illustrates the relationship between level of aggregation, number of subgroups and inequality decomposition for the overall sample, urban subsample, and rural subsample respectively. The overall KHAS couple sample as well as the rural and urban subsamples are consistent with the expectation that as the number of subgroups increase, the between-component of inequality increases (Shorrocks & Wan, 2005). This is due to the fact that number of individuals *within* a subgroup decreases as the total number of subgroups increases. With smaller subgroups, there is greater variability in means of subgroups that is captured by the between-component of overall inequality. The table also successively disaggregates subgroups and shows how intra-household inequality is the smallest-size subgroup that can be

constructed. The first and the last rows in each sample trivially show that when there are no subgroups and the unit of analysis for inequality decomposition is the highest level of geographic aggregation (Karnataka in our case), there is no "between" component. Similarly, when the unit of inequality analysis is the individual, there are no subgroups and the "within" component vanishes as all inequality is not "between" individuals. Indian states are divided administratively into districts and sub-districts (called *Taluks* in Karnataka; alternate nomenclature includes *Thesil*, *Mandal*). Finally, the sub-districts have recognized villages and towns. Districts, taluks, town, and villages have constitutionally mandated local governments with varying levels of autonomy.

In Table -2 we present median welfare loss (ΔA) as evaluated using Eq. (5) for three values of the inequality aversion parameter, ε**.** The welfare loss with $\varepsilon = 1$ corresponds to each household using a Foster 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. The medial welfare loss ranges from 0.6% to 95% for differing values of inequality aversion and show an increasing monotonic relationship from poorer to richer households. The numbers reported in this table are consistent with results that we report in the micro Kuznets model below.

Figure 3 graphs the relation between woman's share of couple wealth and log per capita total household wealth based on OLS and quantile regressions. The Loess fitted curve suggests a curvilinear relationship between woman's wealth share and total household wealth; there is a slight increase in wealth share initially followed by a steep fall with increasing household wealth, after which it flattens out or shows a slight uptake in wealth share at the right tail. However, the confidence bands are very wide at the extreme ends of the distribution, but tight in the middle where we see a negative relationship between woman's wealth share and total household wealth. The negative relationship is reinforced by the OLS and quantile regressions. The 0.75 quantile suggests a very steep decline, while the lower quantile, 0.25 has a gentler slope. Not surprisingly, the median regression and the OLS line are almost parallel to each other.

Overall, this suggests that woman's share of couple wealth monotonically declines as households get richer. Of course, this is a simple bivariate relationship that does not control for other factors.

Table 3 presents the OLS and the quantile regression (0.25, 0.5 and 0.75) results. A simple model that considers the relationship between woman's share of wealth and total household wealth indicates a significant negative relationship between the two variables; the cubic and the polynomial terms of the household wealth variable are significant, but the coefficients are very small and there is no real impact on woman's wealth share. Thus, as households become richer, woman's share of couple wealth is declining. This is also supported by the quantile regression results for the higher order terms of total household wealth. We see that the effect of household wealth shows some heterogeneity, having a stronger impact on wife's wealth share at the median, a weak impact at the lowest quantile (0.25) and an intermediate impact at the highest quantile (0.75). The OLS estimate shows a weaker relationship than the median estimate.

This result is in contrast to the non-monotonic relationship between woman's share of couple earnings and total disposable household income; the linear and the cubic terms of household income show a positive association with earnings while the square term shows a negative association (Malghan & Swaminathan, 2017). However, there is little reason to expect that wealth behaviour will mimic earnings behaviour. Earnings depend on the intensity of labour market engagement and other structural factors such as occupational concentration in certain types of job, formal or informal employment, and wage rates. Wealth on the other hand, depends not only on earnings but also inheritance and marital regimes, savings, and state transfers.

Two factors, asset composition of households and how these assets are owned within a household, could possibly explain why women's wealth share is higher in poorer households and lower in richer households. Poorer households do not possess many assets and almost

certainly no immoveable property, which is the chief source of wealth. Their assets are mostly consumer durables, livestock, small agricultural equipment and jewellery. Consumer durables are typically owned by all household members while women are considered owners of jewellery (Swaminathan, Lahoti, & Suchitra, 2012a). It also possible that poorer households benefit from government asset transfer programmes, many of which target women as beneficiaries. On the other hand, in richer households, wealth is concentrated in real estate which is largely owned individually by men (ibid). Using the KHAS data, for the couple sample, more than 80 per cent of the residence and agricultural land is owned solely by men while only 6 per cent and 3.3 per cent, respectively, are owned solely by women (Deere et al., 2013).

India follows a separation of property regime in marriage where there is no concept of marital property. Under this system, natal inheritance or assets acquired prior to marriage remain separate within marriage; most importantly, any assets acquired post marriage belong to the individual in whose name they are legally held. In a patriarchal society like India, high-value assets (land, house) are usually in men's name; thus, a separation of property regime disadvantages women. Further, this regime disregards women's role in defining their household's economic circumstances and reinforces the traditional distinction between *productive* and *reproductive* work. Women tend not to work outside the home, and even when they do, more often than not, are engaged in poorly remunerated activities (Lahoti & Swaminathan, 2016). Women typically attain ownership of marital assets only on the death of their husbands as their legal heirs. With regard to natal inheritance, post the 2005 amendment to the Hindu Succession Act that affects a majority of the Indian population, daughters and sons are entitled to an equal share in their parents' property. This however, does not always translate into practice due to social discrimination. Indeed, an analysis of KHAS data is illustrative of these trends. Among women who solely own land or their residence, approximately only 20-25 per cent (across rural and urban areas) are currently married, while 68-74 per cent are widows, while less than 5 per cent are currently single (Swaminathan, Suchitra, & Lahoti, 2011).

The regressions also control for key individual (age, occupation) and household socio-economic characteristics (caste, religion) as well as location (rural/urban and district dummies). In keeping with expectations, compared to being a homemaker, wage or self-employment increases wife's share of wealth, specially for women in the higher quantiles. However, being a contributing family worker shows a negative association with intra-household wealth share, compared to being homemaker.

The preliminary results from the sub-national regressions are indicative of an S shaped relationship (-, +, -) with a first phase of a decline in women's wealth share, followed by an increase in the second phase and once again a decline in the third phase (Table 4). This is in contrast to the GKC relationship between various measures of gender equality and economic development (+, -, +). As a first pass, this suggests that wealth share as a proxy for gender equality behaves differently than other macro measures of gender equality that have been examined in the literature. It is also different than the intra-household wealth equality relationship. It is not entirely clear why we observe this particular pattern; of course, the current specification has obvious omitted variable bias that need to be addressed – caste and religious composition of the villages, household structure (proportion of female headed households, for example) – are potentially important for understanding this relationship.

6. Concluding thoughts and way forward

This paper makes three primary contributions. First, we have shown that intra-household inequality accounts for a significant portion of overall wealth inequality. Intra-household inequality in general, and distribution of wealth within a household in particular shed new light on gendered patterns of overall inequality. Second, our empirical results from the decomposition exercise make strong case for collection of individually disaggregated assets data. A choice modelling module to determine the inequality aversion parameter (ε) will fully operationalize the framework presented here (Bellemare et al., 2008). By enabling comparison of inequality within households, our framework provides an effective tool for policy to address gender discrimination besides resolving theoretical difficulties with intra-household inequality

accounting. Third, we present compelling evidence for multidimensionality of gender equity, and the need to pay attention to measurement contexts. The relationship between economic development and gender equality is especially sensitive to how equality (or inequality) is operationalized, measured, and the specific unit of analysis employed. We tested the GKC hypothesis using a micro-approach as well as the more traditional macro approach applied to sub-national aggregations (we used the village as our unit of analysis). We showed how the existence of a non-monotonic relationship and the direction of such a relationship is sensitive to both dependent variable and the unit of analysis.

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Table 1: Decomposition of mean log deviation using gross wealth

Aggregation unit	No. of subgroups	MLD	% contribution to inequality	
			Within	Between
Overall		**2.54**		
Karnataka	1		100	0
Urban/rural	2		99.2	0.8
District	8		98.7	1.3
Taluk	22		96.5	3.4
Village/ward	188		87.6	12.4
Households	3109		37.8	62.1
Individuals	6218		0	100
Sex	2		78.2	21.7
Caste	6		94.6	5.4
Rural		**2.18**		
Karnataka	1		100	0
District	7		99.1	0.9
Taluk	14		97.2	2.8
Village	112		92.1	7.9
Households	2008		51.2	48.8
Individuals	4016		0	100
Sex	2		72.2	27.8
Caste	6		96.8	3.2
Urban		**2.97**		
Karnataka	1		100	0
District	8		98.5	1.5
Taluk	15		96.7	3.3
Ward	76		84.6	15.4
Households	1101		25.2	74.8
Individuals	2202		0	100
Sex	2		82.9	17.1
Caste	6		92.5	7.4

Table 2: Household welfare loss due to intra-household inequality in physical assets for select values of ε (only coupled households)

	ΔA (%)		
	(ε=0.25)	**(ε=1.0)**	**(ε=2.0)**
Quintile			
1	0.6	2.4	4.7
2	11	45.7	70.6
3	14.9	63.8	86.9
4	16.9	73.6	93.1
5	17.7	78.3	95.3
Rural (n=2,006)	15.3	65.5	88.1
Urban (n=1,100)	6.9	28.2	48.4
Overall (n=3,106)	13.8	58.5	82.8

Table 3: Micro-Kuznets models (OLS and QR): Wife's share of couple wealth and total household wealth

Variables	(1) OLS 1	(2) OLS 2	(3) QR(0.25)	(4) QR(0.50)	(5) QR(0.75)
Per capita total household wealth[a]	-0.036***	-0.038***	-0.009***	-0.023***	-0.046***
	(0.004)	(0.004)	(0.002)	(0.006)	(0.010)
Per capita total household wealth^2	0.000***	0.000***	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Per capita total household wealth^3	-0.000***	-0.000***	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wife's age		-0.006**	-0.001	-0.003**	-0.015***
		-0.002	-0.0005	(0.002)	(0.0048)
Wife's age^2		0.000*	0.000	0.000	0.0002***
		(0.000)	(0.000)	(0.000)	(0.000)
Spousal age difference		-0.0003	-0.0004**	-0.001	0.003
		-0.0011	(0.0002)	(0.0006)	(0.003)
<u>Wife's occupation (base: homemaker)</u>					
Wage employed		0.120***	0.030*	0.168	0.157***
		(0.023)	(0.018)	(0.107)	(0.033)
Self employed		0.078***	0.014	0.045	0.115**
		(0.026)	(0.009)	(0.032)	(0.054)
Casual labourer		0.024*	-0.004*	-0.010	0.041
		(0.014)	(0.002)	(0.009)	(0.034)
Contributing family worker		-0.036***	0.0008	-0.007	-0.069***
		(0.013)	(0.003)	(0.008)	(0.023)
Others		-0.016	-0.004	-0.015	-0.015
		(0.043)	(0.009)	(0.020)	(0.141)
Caste		Yes			
Religion		Yes			
Urban		Yes			
District		Yes			
Constant	0.264***	0.402***	0.110***	0.346***	0.554***
	(0.006)	(0.059)	(0.028)	(0.116)	(0.140)
Observations	3,109	3,109	3,109	3,109	3,109
R-squared/Pseudo R-squared	0.039	0.149	0.025	0.094	0.142

*Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

[a:] Coefficients scaled by 10^6 for only the linear term

Table 4: Sub-national Macro-Kuznets: Rural women's share of gross physical wealth, OLS

Variables	1	2	3
Per capita lumens, 2010	-7.829***	-7.732***	-9.942**
	(1.978)	(2.031)	(3.861)
Per capita lumens^2, 2010	85.874***	83.360***	107.451**
	(23.672)	(24.502)	(43.225)
Per capita lumens^3, 2010	-242.106***	-232.195***	-294.510**
	(75.032)	(78.491)	(129.31)
Growth per capita lumens, 2000-2010		0.000	0.000
		0.000	0.000
Growth per capita lumens, 1990-2010			
Proportion scheduled caste			
Proportion scheduled tribe			
Constant	0.394***	0.392***	0.417***
	(0.043)	(0.045)	(0.083)
Observations	105	104	61
Adjusted R2	0.099	0.087	0.062

Notes: Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Figure 1: Wife's share of couple wealth, quantile plot

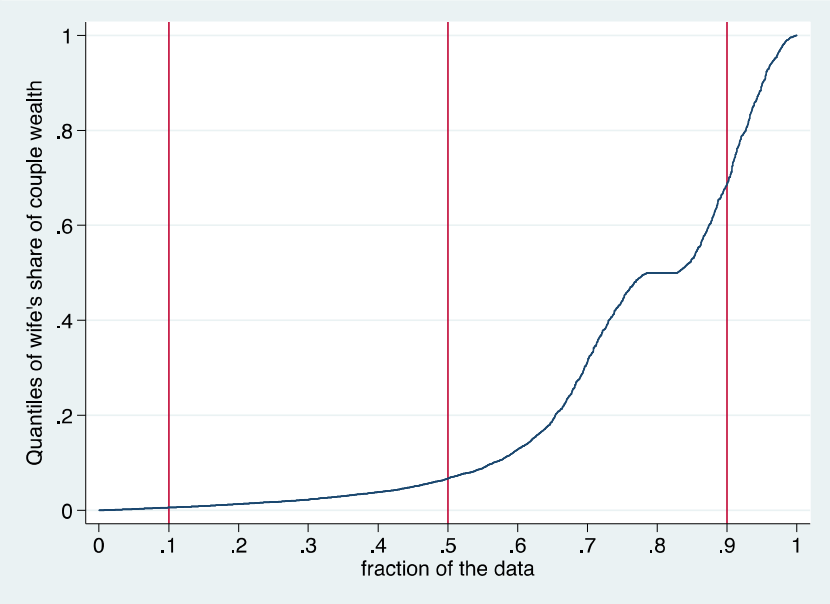


Figure 2: Lorenz Curves, total gross wealth (coupled households)

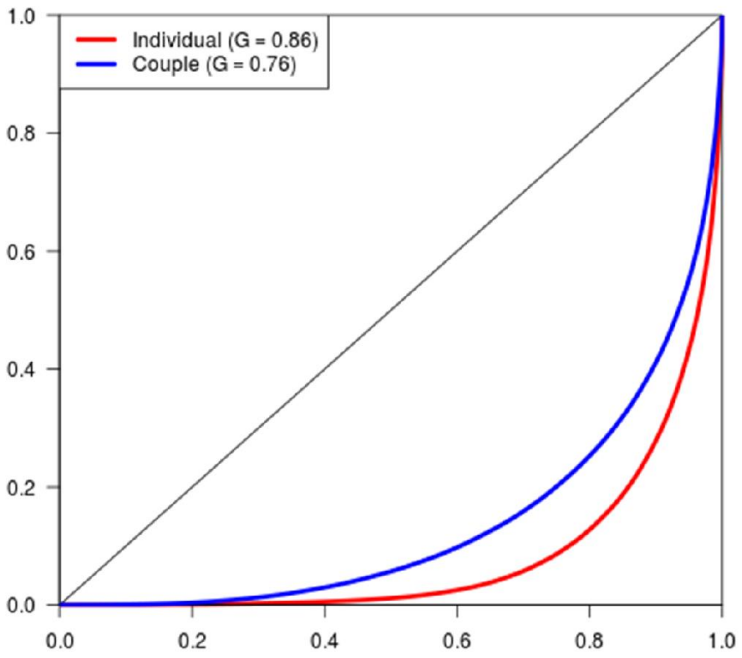
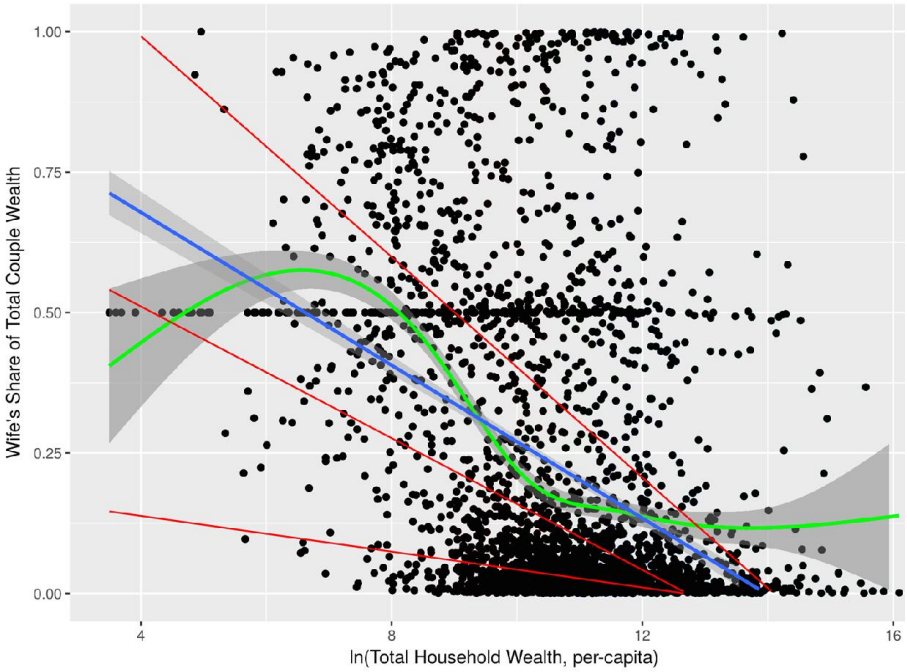


Figure 3: Bivariate relationship: intra-household wealth inequality and total household wealth. The blue line is the OLS line and the three red lines are quantile fits (25th percentile, 50th percentile, and 75th percentile). The green curve is the Loess fit.



Appendix A

Atkinson Welfare Loss Metric and the Household Asset Matrix

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

$$Y^i = \begin{pmatrix} y_{11}^i & \cdots & y_{1j}^i & \cdots & y_{1k}^i \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ y_{\beta 1}^i & \cdots & y_{\beta j}^i & \cdots & y_{\beta k}^i \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ y_{m1}^i & \cdots & y_{mj}^i & \cdots & y_{mk}^i \end{pmatrix} \qquad \text{[A.1]}$$

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, $\mathbf{Y}^i$:

$$Y_j^i = (1,\dots,1_m)\begin{pmatrix} y_{1j}^i \\ \vdots \\ y_{\beta j}^i \\ \vdots \\ y_{mj}^i \end{pmatrix} \qquad \text{[A.2}\}$$

The intra-household distribution of assets Φ^i is derived from the distribution of this vector sum across all *k* adults within the household:

$$\Phi^i = \Phi\left(Y_1^i, Y_2^i, \dots, Y_j^i, \dots, Y_{k-1}^i, Y_k^i\right) \qquad \text{[A.3]}$$

Consider an elementary additive social welfare function, W (·) defined for each household, *I* that is computed as a simple average of individual utilities, *U*, that takes individual net income $\left(Y_j^i\right)$ as the argument.

$$W_j^i = \frac{1}{k}\sum_{j=1}^{j=k} U_j^i\left(Y_j^i\right) \qquad \text{[A.4]}$$

Using Atkinson's specification (1970) for U_j^i

$$U_j^i\left(Y_j^i\right) = \begin{cases} \frac{\left(Y_j^i\right)^{1-\varepsilon_j^i}}{1-\varepsilon_j^i}; & \varepsilon_j^i \neq 1, \varepsilon_j^i \geq 0 \\ ln\left(Y_j^i\right); & \varepsilon_j^i = 1 \end{cases} \qquad \text{[A.5]}$$

The values taken by the inequality aversion parameter $\left(\varepsilon_j^i\right)$determine the functional form of Eq. (A.5). With $\varepsilon_j^i = 0$, Eq. (A.5) reduces to a utilitarian social welfare function (SWF), consistent with perfect income pooling.

As $\varepsilon_j^i \to \infty$, Eq. (A.5) assumes the Rawlsian form. From the perspective of person *j* in household *i*, ε fully characterizes the trade-offs consistent with extant intra- household distribution of income. This formulation underscores the fact that ε can vary across household members.

To calculate welfare loss from intra-household income inequality, we first compute the equivalent equal income Θ_j^i following Eq. (4):

$$\frac{1}{k}\sum_{j=1}^{j=k} U_j^i\left(Y_j^i\right) = U_j^i\left(\Theta_j^i\right) = W_j^i \qquad \text{[A.6]}$$

Combining Eqs. (A.5) and (A.6),

$$\Theta_j^i = \begin{cases} \left(\frac{1}{k}\Sigma_j\left(\left(Y_j^i\right)^{1-\varepsilon_j^i}\right)\right)^{\frac{1}{1-\varepsilon_j^i}}; \ \ \varepsilon_j^i \neq 1, \varepsilon_j^i \geq 0 \\ \left(\prod_j\left(Y_j^i\right)^{\frac{1}{k}}\right); \ \ \varepsilon_j^i = 1 \end{cases} \qquad \text{[A.7]}$$

The Atkinson Welfare loss metric ΔA_j^i, is evaluated by substituting Eq. (A.7) in Eq. (5). For ε = 1, ΔA is the same as welfare loss calculated using a Foster welfare function based on the log-mean deviation (Sen, 1997).