Are female-headed households less resilient? Evidence from Oxfam's impact evaluations

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Abstract

Given the complexity of measuring resilience, development practitioners are constantly seeking observable proxies that can help target resilience-building initiatives. Evidence suggests that there are important differences between female-headed and male-headed households in terms of their vulnerability and resilience to crises, so household head gender may provide practitioners with important information on how best to focus their efforts. However, the extent to which these gender differences can be explained by other observable characteristics, such as wealth, education, and household demographics, has previously been unclear. Using an index of resilience employed by a large non-governmental organization (Oxfam), we provide evidence on this question by comparing the resilience of female- and male-headed households interviewed in a series of 16 evaluations of rural development projects carried out in 12 countries across Africa, Asia, and Latin America. We find that female-headed households, on average, have significantly lower resilience than male-headed households, and that only around half of the gap can be explained by observable characteristics. However, since the size of this difference is small, it appears that using information on household head gender does not significantly improve the accuracy of targeting methods, such as proxy means tests, that aim to identify households for resilience-building initiatives.

Keywords: resilience, adaptation, gender, female-headed households, targeting

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1 Introduction

It is often observed that gender matters for resilience. Women and men differ in their vulnerability to shocks and stresses and in the strategies they use to manage and cope with risk. As a consequence, policymakers often target interventions at female-headed households, on the basis that they are particularly at risk from shocks and stresses. However, existing evidence on differences in resilience between female- and male-headed households is somewhat mixed. In particular, the extent to which such differences in resilience can be explained by other observable characteristics – such as wealth, education levels, or household demographics – is unclear. This paper addresses this question by comparing the resilience of female- and male-headed households and decomposing these differences, in order to ascertain what drives gender gaps in resilience. We then consider the implications this has for policymakers in terms of targeting resilience-building programmes.

The analysis in this paper is based on data collected in the course of 16 evaluations of resilience-building programmes carried out in rural areas of 12 different countries by the non-governmental organization (NGO) Oxfam Great Britain (henceforth 'Oxfam'). The projects primarily focused on building resilience to climate change, by supporting participants either to adapt to climate trends or to cope better with climate-related shocks, or both. The original evaluations did not attempt to compare the resilience of female- and male-headed households, in part because the majority of the datasets were too small to provide sufficient statistical power for such comparisons to be made. We overcome this constraint by pooling the data from across the 16 evaluations into a single consolidated dataset.

To ensure that this analysis frames resilience in the same way as development practitioners, the same metric of resilience is used as employed by Oxfam in its original evaluations. NGOs like Oxfam need to measure resilience even before shocks and stresses have occurred, in order to target, monitor, and evaluate their resilience-building programmes. As such, resilience is measured using a series of characteristics selected to capture households' capacity to overcome shocks, stresses, and uncertainty, and thereby to increase households' wellbeing in the future.

Across the datasets, female-headed households are found to have considerably lower scores than male-headed households in terms of this index of resilience. Part of this difference is accounted for by differences in the wealth and the composition of female- and male-headed households. However, even after controlling for these and other observable household-level characteristics (including age and education of the household head, as well as participation in the project being evaluated), there remains a statistically significant difference between female- and male-headed households in their measured resilience. This size of this difference is estimated at 0.1 standard deviations of the resilience index. We use a methodology adapted from Blinder (1973) and Oaxaca (1973) to estimate what proportion of the raw difference in measured resilience between female- and male-headed households can be explained by households' observable characteristics. Observables are found to account for approximately half of the raw difference.

Following recent literature, we explore heterogeneity in our results by disaggregating the group of female-headed households into widows, those who are divorced or separated, those who have never married, and those who are currently married, for the subset of datasets for which this information is available. It emerges that the resilience gap between female- and male-headed households is primarily driven by widows; households headed by married women have resilience indices similar to those headed by men.

To check whether these findings are driven by Oxfam's particular resilience measurement approach, we also examine how the results change when focussing on indicators that are common across different contexts – such as livelihood diversification, ownership of assets, and access to credit – as opposed to those indicators that are defined idiosyncratically in each local context. The difference between female- and male-headed households is far clearer for the subset of context-specific indicators of resilience than for the subset of common indicators. Given that the context-specific indicators were typically more directly related to the projects being evaluated and many of the projects were explicitly aimed at promoting women's participation, it would be expected that, if anything, such indicators would be biased *in favour* of female-headed households. This provides some reassurance that the main results are not a simply an artefact of Oxfam's measurement approach.

The paper concludes by considering the implications of these results for policymakers wishing to improve the targeting of resilience-building programmes. To do this, the Oxfam data is used to assess how a series of proxy means test (PMT) models perform – in terms of their ability to identify households with low levels of resilience – with and without information about the gender of the household head. Including such information makes virtually no difference to the inclusion or exclusion errors of the PMT models. Therefore, despite the statistically significant difference between female- and male-headed households, gender of the household head appears to provide policymakers with little additional information for targeting if proxies of wealth, education, and household demographics are observed.

The remainder of this paper is structured as follows. Section 2 reviews existing evidence on how resilience and vulnerability differ between female- and male-headed households. Section 3 introduces the data and the methodology used in this analysis, including how resilience is measured. Section 4 presents the comparison of female-headed and male-headed households in terms of their measured resilience. Section 5 examines how gender of the household head affects the targeting of resilience-building programmes. Section 6 concludes.

2 Evidence on female-headed households, climate vulnerability, and resilience

The growing emphasis on resilience among development practitioners has sparked a wealth of research aiming to better understand what determines vulnerability to climatic shocks and stresses and, in turn, how the design and targeting of resilience-building initiatives can be improved. One strand of this research has considered the 'feminization of vulnerability', investigating whether women are disproportionately vulnerable to shocks and stresses (Klasen, Lechtenfeld, & Povel, 2015). This directly mirrors the longstanding debate about the 'feminization of poverty', which examines whether women comprise a disproportionate share of the world's poor (Pearce 1978; Wennerholm 2002; Chant 2008). These debates have focused not only on the individual level, but also on the household level, by examining whether female-headed households form a distinctively poor and/or vulnerable group (Buvinić & Gupta, 1997; Fukuda-Parr, 1999; Fuwa, 2000; Quisumbing, Haddad, & Peña, 2001; Milazzo & van de Walle, 2017).

Female-headed households may be more vulnerable than male-headed households to climate-related crises and other shocks and stresses partly because – at the individual level – women tend to be more vulnerable than men. Before shocks and stresses occur, the risk management strategies available to women may be more constrained than those available to men. For example, there is wide-ranging evidence that women face less favourable opportunities than men to diversify their livelihoods (Lanjouw, Quizon, & Sparrow, 2001; Smith, Gordon, Meadows, & Zwick, 2001; Niehof, 2004; Musinguzi, Natugonza, Efitre, & Ogutu-Ohwayo, 2017). In addition, women may be more restricted in their access to land and other assets, to credit markets, to social networks and informal risk-sharing mechanisms, and to formal insurance (Klasen et al., 2015; Kumar & Quisumbing, 2013). After crises occur, the risk coping strategies open to women may also be more limited than those open to men, due partially to traditional gender roles leaving women with an increased burden of domestic work and restricted mobility (Cannon 2002; Sabarwal, Sinha, & Buvinić, 2010; Drolet et al., 2015).

Additionally, female headship may be associated with a number of household-level factors that determine vulnerability. On the one hand, female-headed households typically have a higher ratio of dependents to income earners than male-headed households, amplifying the effects of shocks and stresses. Female household heads are often the sole adult member of the household, meaning that they face a 'dual burden' of generating income while also being responsible for domestic work such as childcare and household chores (Rosenhouse, 1989; Buvinić & Gupta, 1997). At the same time, there are other reasons to believe that female-headed households have characteristics that are *positively* associated with resilience. Chant (2016), for example, argues that establishing oneself as the head of a household can sometimes be an active choice, such as in the cases of women who leave abusive partners or who have become household heads involuntarily but elect to forego a subsequent union. Taking on headship in these instances can lead to gains in independence, confidence, and mobility, which in turn allow households to manage and cope with risks better.

A number of studies have sought to test differences in the vulnerability profiles of female- and male-headed households using longitudinal data to track their responses to shocks and stresses, but the findings are somewhat mixed. For example, using panel data from Peru, Glewwe and Hall (1998) find that female-headed households are no more vulnerable than male-headed households to macroeconomic shocks. In contrast, Ligon and Schechter (2003) observe that female-headed households were especially likely to have suffered a decrease in their welfare during the restructuring of the Bulgarian economy in the 1990s. In a comprehensive review of responses to the 2005–08 shock to food prices across 18 sub-Saharan Africa countries, Verpoorten, Arora, Stoop and Swinnen (2013) show that female-headed households generally experienced more of a deterioration in their food security than did male-headed households, but this pattern did not hold in every country in their sample.[1] Even within countries, the effect of female headship on vulnerability may differ by context. Using data from Ethiopia, Hill and Porter (2017) find that female-headed households in urban areas were more vulnerable to weather and price shocks than male-headed households but that the opposite is true in rural areas, potentially due to social safety net programmes being targeted at rural female-headed households.

One reason for the lack of a clear relationship between female headship and vulnerability may be that female-headed households form such a heterogeneous group. Testing this possibility, Klasen et al. (2015) find that, when female-headed households in Thailand and Vietnam are considered as a unified group, they differ little from male-headed households in terms of their exposure to shocks. However, there are clear differences when *de facto* female-headed households – those in which the woman has a male partner who is living elsewhere – are considered separately from *de jure* female-headed households, in which the woman is unmarried, divorced, or widowed. *De facto* female-headed households were mostly being supported by a partner working overseas. As a consequence, such households, at least in Thailand, were wealthier than male-headed household on average, but were also found to be more vulnerable to severe shocks. In a similar vein, Flatø, Muttarak, and Pelser (2017) find that, among women heads of household in South Africa, widows, those with a non-resident partner, and those who have never been married are particularly vulnerable to shocks from poor rainfall. In contrast, women who head households but have a resident partner, or those who are divorced or separated from their partners, do not differ in their vulnerability from male-headed households. In this paper, female headship is initially treated as a homogeneous concept, in line with the targeting strategies frequently used by programme implementers (White, 2017); the results are later disaggregated into different types of female-headed households, to reflect this more recent literature.

Although analysing the effects of shocks and stresses *after* they have occurred may be the most rigorous way of assessing vulnerability, development practitioners often conceptualize and measure resilience independently of crises, in order to plan, target, monitor and evaluate resilience-building initiatives. Such approaches typically hinge on identifying characteristics that are associated with resilience and which can be measured before shocks or stresses have taken place (Twigg, 2009). Even when resilience is measured using a 'characteristics' framework, the evidence on the role of female headship is still mixed. For example, Alinovi, d'Errico, Mane, & Romano (2010) and d'Errico and Zezza (2015) show using data from across sub-Saharan Africa that male-headed households are, on average, significantly better off than female-headed households in a wide range of potential components of resilience, including access to basic services, adaptive capacity, and access to food. However, using a relatively narrow definition of resilience based solely on household consumption and diversification of income sources, Andersen, Werner, and Wiebelt (2016) find that female headship may in fact be associated with greater resilience among households in Peru, Brazil, and Mexico.

This paper provides new evidence on the relationship between resilience – understood in terms of *ex ante* characteristics – and female headship. This analysis complements the existing literature in three main ways. Firstly, we consider the extent to which any differences between female- and male-headed households in measured resilience can be explained by other observable household characteristics that are associated with resilience. Not only are female-headed households likely to have a larger proportion of dependents, but they may also be poorer and have lower levels of education (as is the case in the data used for this paper). Analyses that control for these potential correlates of resilience are rare. Indeed, the only example of which we are aware is d'Errico and Di Giuseppe's (2016) study using the Food and Agriculture Organization's (FAO) measurement framework to examine the determinants of resilience in Uganda. Secondly, we not only explore how the resilience of female- and male-headed households differs, but also take an additional step to examine what this implies for the targeting of resilience-building initiatives. Thirdly, by adopting the measurement framework of a large NGO (Oxfam), the concept of resilience used in the analysis is anchored directly to the work of development practitioners.

3 Data

3.1 Evaluation datasets

The data used in this analysis come from a series of impact evaluations (or 'Effectiveness Reviews') carried out each year by Oxfam on a randomly-selected sample of the organization's projects. By early 2016, Oxfam had carried out 16 such evaluations of projects that were seeking to build resilience at a household or community level. Each of the evaluations employed a quasi-experimental approach to compare outcomes for programme participants or beneficiaries to non-participants with similar pre-project characteristics. Data for each evaluation were collected through a single survey round, conducted towards the end of, or up to 18 months after the end of, the project in question. The analysis in this paper is based on data from all 16 of the evaluations.[2]

The evaluations were each carried out within a specific geographic area, in most cases consisting of one or two districts in rural areas. In several of the evaluations, survey respondents were sampled from a particular sub-population (such as particularly poor households, or members of agricultural cooperatives), rather than from the general population. The results are therefore not representative of the broader population in the countries in which they were carried out. Rather, they are representative of the populations that NGOs like Oxfam target with resilience-building initiatives.

The 16 evaluations relied on interviews that were conducted at the household level. The specific interviewee within each household varied across surveys, but in most cases this decision was made for the purposes of convenience: any adult household member who was at home at the time of the interviewer's visit would be asked to participate in the survey. In cases in which more than one household member was available, the most senior household member was selected to participate.

The populations sampled in each of the 16 evaluations are described in Table 1.

3.2 Identification of the head of household

The surveys adopted a 'normative' definition of household headship (Rosenhouse, 1989). In each of the surveyed households, a single individual was identified as the head. Although it would have been possible to impose a definition of the household head as the person who makes the greatest contribution to the household's income, the person who has the greatest influence or the final say in making decisions, or simply the oldest (Rogers, 1995; Fuwa, 2000; Budlender, 2003; Rogan, 2013), in the Oxfam evaluations, no such definition was used. Instead, in line with existing practice in many household surveys, respondents were asked to identify the head of household themselves. Respondents were not given any explicit criteria as to which household member should be identified as the head, other than that she or he should be a current member of the household.[3]

The robustness of the results in this paper were tested by replicating the analysis using two alternative definitions of female headship, which are based purely on household composition rather than on respondents' self-identification.[4] Using these alternative definitions has little impact on the main findings described in Section 4, although the magnitudes of some of the estimated effects are altered (and in many cases strengthened). This provides some reassurance that the conclusions of this paper are not an artefact of the way that female-headed households were identified in the surveys.

3.3 Measurement of resilience

Oxfam defines resilience as 'the ability of women and men to realize their rights and improve their wellbeing despite shocks, stresses and uncertainty' (Jeans, Thomas, & Castillo, 2016). Rather than conceptualizing resilience as a property of a system as a whole, and one that should not be assumed to promote the welfare of individuals within that system (for example, Levin et al., 1998), Oxfam's definition specifically emphasizes the role resilience plays in boosting the welfare of individual women and men.[5]

Under Oxfam's definition of resilience, the ideal approach to assess the degree of resilience would be to observe how women and men are actually affected by, respond to, and recover from shocks, stresses, and uncertainty. However, this would require the use of longitudinal data, and would also mean that resilience measurement – and hence the targeting of resilience-building initiatives – would rely on shocks and stresses having already occurred (Barrett & Headey, 2014; Béné, Frankenberger, & Nelson, 2015).

As such, the metric of resilience used in these evaluations is based on the 'characteristics approach' described by Twigg (2009), and is captured by cross-sectional data only. This approach involves identifying characteristics that are believed to be important for people's ability to manage, deal with, and respond to shocks, stresses, and uncertainty, and hence to improve their wellbeing over the long term. The list of characteristics is then used to develop a set of indicators for which data are collected. Given the practical advantage of decoupling resilience measurement from shocks and stresses having actually taken place, the characteristics approach is applied widely by the development sector (Schipper & Langston, 2015), including by FAO (2016) and the United Nations Development Programme (UNDP, 2014).

Part of the preparatory work for each of the evaluations involved drawing up a set of characteristics that were considered to be important indicators of resilience in the local context. This process involved discussions with programme implementation staff and local non-governmental partner organizations, as well as qualitative field work, collecting data from both women and men through focus group discussions. Some of the indicators identified were unique to particular contexts, while others were cited as important across many of the contexts in which evaluations were carried out. Examples of indicators that were included in the majority of the evaluations include diversification of income sources, access to productive assets, savings, access to credit, and the strength of social support networks. The full sets of indicators used in each of the evaluations are listed in Table 2.[6]

Given that the evaluations were based on household surveys, indicators of resilience could only be included if they were observable at the household level. Clearly there are many factors that contribute to the resilience of a household that are not directly within that household's control, such as the health of local ecosystems, the strength of social relations in the community, and the ability of local and national government to support communities in times of crisis. Nevertheless, attempts were made to collect data on these higher-level characteristics using household-level questions wherever possible. For example, several of the evaluations collected data on respondents' perceptions of the ability of community leaders and/or local government to respond to crises appropriately.

For each household surveyed, a resilience index score was created by aggregating data across all the indicators of resilience, using an approach adapted from Alkire and Foster (2011). This methodology involves converting each indicator into binary form, using a locally-appropriate threshold for the characteristic in question. Thresholds were provisionally identified through conversation with local consultants as well as local Oxfam and partner organization staff. These thresholds were then verified or adjusted during data analysis, to ensure that important variation was not obscured by dichotomising the variables in this way.

Once thresholds had been defined for each of the resilience indicators, the overall index of resilience was calculated as the proportion of resilience indicators in which the household meets the threshold. Each indicator is assigned equal weight in the resilience index.

3.4 Estimation approach

To assess the difference in resilience between female- and male-headed households, we estimate a series of pooled regression models of the form:

$$\begin{aligned} Y_i = \beta F_i + \gamma_1 + \theta_1 T_i + \rho_1 (T_i \cdot F_i) + \boldsymbol{X}_i \boldsymbol{\varphi}_1 \\ + D_{2i} \cdot (\gamma_2 + \theta_2 T_i + \rho_2 (T_i \cdot F_i) + \boldsymbol{X}_i \boldsymbol{\varphi}_2) \\ + \cdots + D_{ki} \cdot (\gamma_k + \theta_k T_i + \rho_k (T_i \cdot F_i) + \boldsymbol{X}_i \boldsymbol{\varphi}_k) \\ + \cdots + D_{16i} \cdot (\gamma_{16} + \theta_{16} T_i + \rho_{16} (T_i \cdot F_i) + \boldsymbol{X}_i \boldsymbol{\varphi}_{16}) + \varepsilon_i \end{aligned}$$

where *i* is a household identifier, Y_i is the index of resilience, F_i is a binary variable that takes the value of 1 for female-headed households and 0 for male-headed households, $\boldsymbol{X}_i$ is a vector of other observable household characteristics, T_i is a dummy variable representing treatment status in the project being evaluated (which takes the value of 1 for households included in the intervention group for each evaluation, and 0 for households in the comparison group), and D_{ki} is a dummy variable identifying observations from dataset *k* (for $k = 1, \dots, 16$).

These regression models are estimated using ordinary least squares, with the estimates of the coefficient β being reported in Tables 3 and 5. We start by estimating the simple bivariate relationship between F_i and Y_i, including only the dataset dummy variables D_{ki}: the model applied is a special case of the regression model specified above, but with the coefficients θ_k, ρ_k and all the elements of $\boldsymbol{\varphi}_k$ at zero. In the subsequent rows of Tables 2 and 3, covariates are added incrementally to the regression models, so as to control for additional observable household-level characteristics.

The resilience indices are normalized by dividing by the standard deviation within each dataset, to ensure that they can be meaningfully aggregated across different contexts.[7]

4 Resilience by gender of the household head

4.1 Bivariate regressions

The forest plot in Figure 1 shows the results of running a bivariate regression of the resilience index on the gender of the household head in each of the 16 evaluation datasets. The estimated coefficient of the effect of household head gender on the resilience index is shown as a point, with the horizontal bars representing the corresponding 95% confidence interval. Points to the left of the vertical axis represent female-headed households having lower values of the resilience index than male-headed households, and vice versa for points to the right of the vertical axis.

The proportion of female-headed households in each dataset varies widely, depending both on the composition of the sample for each evaluation and on the characteristics of the underlying population. This results in large differences between the evaluations in terms of the precision of the estimates. Nonetheless, it is clear that the evaluations generally estimate female-headed households to have lower values of the resilience index on average than male-headed households.

The rhombus in the last row of Figure 1 represents the 95% confidence interval for the average effect using the pooled data from all 16 evaluations. On average, female-headed households have resilience indices that are 0.21 standard deviations lower than male-headed households, with the 95% confidence interval ranging from 0.16 to 0.27 standard deviations.

4.2 Controlling for observable household characteristics

The finding that female-headed households have, on average, lower resilience index scores than male-headed households is not surprising: the female-headed households in our data are generally poorer than male-headed households, and they tend to have higher dependency ratios. However, the extent to which lower measured resilience among female-headed households is a consequence of their relative poverty, household size, and other observable characteristics of female-headed households is unclear.

To investigate the latter question, the regression analysis used to derive the results in the last row of Figure 1 is repeated, but this time controlling for additional household characteristics. Table 3 shows how the coefficient on female headship changes as additional covariates are added. Row (a) of the table shows the coefficient from the regression of the resilience index on household head gender without any controls, matching the results shown in Figure 1. In row (b) the number of adults living in the household (aged 16 or over) is added as a covariate. The reasons for considering the number of adult household members to be an important covariate are, firstly, that larger households may be able to realise economies of scale in consumption, and secondly, that a larger number of working adults means that the household has more potential for diversifying its livelihood activities. In row (c) of the table a measure of household wealth, based on indicators of housing conditions and asset ownership, is added as an additional covariate.[8] In rows (d) and (e) controls for the education level and age of the household head are then added. After controlling for these characteristics, female-headed households are found still have resilience index scores that are significantly lower than male-headed households, although the size of the difference is reduced to 0.09 standard deviations.

As discussed above, the 16 datasets were collected in the course of evaluations of Oxfam projects. Most of these projects had explicitly sought to promote women's empowerment, and some had worked mainly or exclusively with female participants. It is possible, therefore, that these projects had different effects on the resilience of women and men. If so, the effects of the projects would contribute to the measured difference between female- and male-headed households in the (post-project) surveys. For this reason, in row (f) of Table 3, the regression analysis is repeated, while also controlling for whether the household was in the intervention group of the project being evaluated. In row (g) an interaction term is added, allowing for the effects of the projects being evaluated to differ between female- and male-headed households. After controlling for project participation in this way, the magnitude of the estimated difference in resilience between female- and male-headed households is found to be 0.11 standard deviations.

The right-hand column of Table 3 shows how much of the variation between female-headed and male-headed households in the bivariate regression is explained by the covariates in each model. By comparing row (g) to row (a) of the table, it is possible to disaggregate the raw difference between female- and male-headed households into 'explained' and 'unexplained' portions, in the spirit of the

Blinder (1973) and Oaxaca (1973) method for decomposing gender earnings gaps (Elder, Goddeeris & Haider, 2010). It emerges that the full set of observable characteristics accounts for approximately half (51%) of the difference in resilience between female-headed and male-headed households.

4.3 Decomposition by type of household headship

Several of the evaluation datasets include data on marital status, enabling us to investigate heterogeneity between different types of female-headed households. We differentiate female household heads who are widowed (43% of female-headed households in the nine datasets for which this information is available), those who are divorced or separated from their spouse (8%), and those who were never married (5%), from married female household heads (44%). In reality, this last category is highly heterogeneous in itself: it includes women who have become *de facto* household heads by virtue of their spouses living elsewhere (for example, as migrant workers), women in polygamous marriages whose husbands reside outside their core household, as well as women who live together with their spouses but who are nevertheless recognized as the head of household. However, most of the Oxfam datasets lack the information required to differentiate between these types of married female household heads, so the analysis in this paper is focused on the four categories outlined above.[9]

In order to test whether the measured resilience of these four categories of female-headed household differs, the regression model used to derive the results in Sections 4.1 and 4.2 is modified by including four dummy variables representing each of the four different categories of female-headed household. The estimated coefficients on these four variables are shown in Table 4.

The overall difference in resilience between female- and male-headed households is found to be concentrated among widows and those who never married. For these two groups, the coefficients remain negative regardless of the control set used, although in the presence of *all* the covariates, the coefficient for widowed household heads is not statistically significant at the 10 percent level (but it is close to that benchmark: the *p*-value is 0.104). In contrast, households headed by women who are married do not differ on average in their measured resilience from households headed by men regardless of the control set used. These results suggest, therefore, that the lower resilience of female-headed households is driven by households in which women have become the head ‘involuntarily’, due to the death of a spouse, rather than those households in which women have taken up headship whilst still accompanied by spousal support.

4.4 Decomposition into ‘generic’ and ‘context-specific’ indices of resilience

One potential concern with the approach taken in this paper is that the indicators comprising

Oxfam's resilience index may be biased towards allocating higher scores to male-headed than to female-headed households. To test whether such bias may be affecting the results, we examine whether the difference between female- and male-headed households depends on the *types* of resilience indicators that are included in the index. Specifically, an alternative resilience index is constructed that is composed only of the 14 indicators that are most commonly applied across the evaluations (that is, those shown in the upper panel of Table 2). The left-hand columns of Table 5 show the results of analysis similar to that shown in Table 3, but in terms of this 'generic' index of resilience. We find a significant difference (of 0.16 standard deviations) between female- and male-headed households in the bivariate regression. However, this difference is eliminated after controlling for the covariates listed in Table 3: the coefficient reduces in size to 0.05 standard deviations, and is not statistically significant, even at the 10% level.

In contrast, the right-hand columns of Table 5 show the regression results for an index composed only of the indicators that are specific to each local context: that is, all those indicators that are *not* included in the list of 14 most common indicators. The difference between female- and male-headed households in terms of this index of idiosyncratic indicators is larger in size, and remains statistically significant at the 5% level even after controlling for the covariates listed in Table 3. Comparison of rows (a) and (g) of the table shows that only 32% of the bivariate difference between female- and male-headed households is explained by the covariates.

These results imply that the difference between female- and male-headed households lies more in the index of context-specific indicators of resilience than in the 'generic' indicators. In general, the context-specific indicators tend to be more closely tied to the activities of the project being evaluated than the 14 generic indicators. For example, the context-specific indicators include characteristics such as the adoption of specific improved agricultural practices, access to early-warning systems, or participation in community-level disaster preparedness activities. In contrast, the generic indicators mostly involve more complex, higher-level aspects of household behaviour and attitudes.

Is it possible that the types of practices and activities on which many of the context-specific indicators focus are biasing downwards the measurements of resilience among female-headed households? In fact, if anything, these indicators would be expected to be biased *in favour* of female-headed households. The majority of the projects being evaluated were explicitly aimed at promoting women's engagement in climate-resilient productive activities and/or women's participation in community-level decision-making on climate risk reduction and mitigation approaches, so the evaluation teams were conscious of the need to reflect the perspectives and priorities of women when identifying indicators. This provides some reassurance that our results are not purely a product of the measurement approach adopted by Oxfam in its evaluations.

5 Targeting

Despite there being a statistically significant difference between the measured resilience of female- and male-headed households, the extent to which using data on gender of the household head can improve targeting remains an open question. To explore this issue, we estimate and assess a series of targeting models both with and without information on household head gender. Regressions similar to those reported in Section 4 are used to fit proxy means test (PMT) scores for the resilience index using a 'calibration' sample, consisting of two-thirds of the original sample selected at random. The PMT scores are simply the predicted values for the resilience index coming from each regression. The remaining third of the original sample is used for validation, to check how well the PMT scores predict the true resilience index.[10]

One way to assess the accuracy of PMT models is to test how well they can identify households below some 'cut-off' in the resilience index (Sharif, 2009; Kidd & Wylde, 2011).[11] Policymakers typically seek targeting models that minimize the number of households that are incorrectly predicted to be above the cut-off ('exclusion error') or incorrectly predicted to be below the cut-off ('inclusion error'). Two key metrics are used to evaluate exclusion and inclusion errors: (1) 'undercoverage' refers to the number of households excluded in error divided by the number of households truly under the cut-off; and (2) 'leakage' is the number of households included in error divided by the number of households classified as under the cut-off by the PMT model. It is also informative to examine where those households targeted by the PMT model are positioned in the true distribution of the resilience index. If those households excluded in error are only just below the cut-off and those included in error are only just above the cut-off, then practitioners may be less concerned than if those with very low measured resilience are excluded and those with very high measured resilience are included.

To examine how the gender of the household head affects inclusion and exclusion errors, three separate PMT models are estimated. In the first model, the resilience index is regressed on all the observable characteristics aside from gender of the household head – that is, on wealth, household demographics, and the household head's age and education. As in Section 4, the regressions include dataset fixed effects, which are interacted with each of the explanatory variables. However, intervention status and its interactions with household head gender are excluded from all the PMT models because this information would never be available to policymakers *before* implementation. The second and third models then add gender of the household head without and with interactions with the dataset fixed effects respectively.[12] By interacting *all* the explanatory variables with dataset fixed effects, the PMT scores created are, in effect, specific to each dataset.

Despite the statistically significant differences between female- and male-headed households observed above, including gender of the household head appears to have little effect on the performance of the targeting models. As Table 6 shows, undercoverage and leakage are virtually unchanged across the three models, regardless of whether the cut-off is placed at the 30th, 40th, or 50th percentile of the distribution of the resilience index. As the R^2 and adjusted R^2 values demonstrate, the explanatory power of the calibration regressions increases only marginally when gender of the household head is added. Additionally, there is no clear pattern in how these targeting errors are distributed. Figure 2 plots the deciles of the true resilience distribution in which the households targeted by each of the three models are placed, using a cut-off at the 40th percentile. However, it is not clear that including gender of the household head in the PMT prediction reduces the number of very high resilience households that are erroneously included or the number of very low resilience households that are incorrectly predicted to be above the cut-off.

This analysis suggests, therefore, that the statistically significant differences observed between the measured resilience of female- and male-headed households do not necessarily mean that gender of the household head gives policymakers useful additional information for targeting, if other observable characteristics are available.

6 Conclusions

Using data from rural areas in Africa, Asia and Latin America that are typical of the contexts in which development practitioners are working to build resilience, we find that female-headed households have significantly lower measured resilience than male-headed households. Only about half of this difference is explained by wealth, household size, or other demographic characteristics, or by households' participation in the projects being evaluated. The remaining difference in resilience between female- and male-headed households (estimated at approximately 0.1 standard deviations of the resilience index) does not seem to be explained by those characteristics. These results appear to be driven mainly by widows as opposed to married female household heads, suggesting that households headed by women that take up headship 'involuntarily' may be especially vulnerable. However, since the size of the effects are small, using information on the gender of the household head offers little improvement to the accuracy of targeting methods, such as PMT models.

There are a number of avenues for future research that could build on these findings. Linking longitudinal data to the resilience characteristics recorded in the cross-sectional data, including details of how household composition changes over time, could help disentangle the underlying causal relationship between gender of the household head and resilience by better accounting for the endogenous process through which household heads are selected. Moreover, this would enable development practitioners to test the assumptions behind the characteristics approach. Additionally, individual-level data could help ascertain whether the patterns found at the household level correspond to differences in resilience between women and men within the same household. Nevertheless, by directly analysing the importance of observable differences between female- and male-headed households – including wealth, education, and household composition – we believe this paper is a useful step in trying to understand the complex association between gender and resilience.

Notes

1. Kumar & Quisumbing (2013) corroborate this finding with data from Ethiopia, showing that the more severe impact of the crisis on female-headed households is maintained, even after controlling for other household-level characteristics.
2. Reports describing the full results for each of the Effectiveness Reviews can be found at www.oxfam.org.uk/effectiveness.
3. The two evaluations carried out in Nepal are exceptions to this. In these evaluations – carried out in an area in which many men migrate abroad to work – the questionnaire allowed respondents to identify an individual who was *not* currently resident in the household as the head of household. For the analysis in this paper, in households that were recorded with an absent head, the spouse of that individual, or (if she/he has no spouse) the oldest member currently resident in the household, is assumed to be the actual household head.
4. Under the first alternative definition, households were considered to be female-headed if and only if there were no adult men (aged 16 years or over) living in the household. Under the second definition, households were considered to be female-headed if the oldest female household member was at least 12 years older than the oldest male household member. The correlation coefficients between the three definitions across the pooled dataset range from 0.55 to 0.63.
5. Pain and Levine (2012) have a useful discussion of this distinction.
6. Further details of the process of identifying indicators and the challenges involved are discussed in Fuller and Lain (2015).
7. The outcomes in this paper are therefore effectively reported in terms of Cohen's *d*, a measure of standardized mean difference between groups (Cohen, 1992).
8. The housing and asset indicators were used to construct an index of household wealth, following the approach of Filmer and Pritchett (2001).
9. As such, it is not possible to distinguish *de facto* from *de jure* female-headed households, using the terminology of Klasen et al. (2015).
10. When splitting the calibration and validation sample, the randomization was stratified by evaluation dataset.
11. The resilience index scores are normalized before pooling the data from each evaluation dataset, so applying a consistent cut-off for the pooled dataset is a tenable approach.
12. We also attempted to use information on different types of female household head, as in Section 4.4, but this reduced the number of datasets that could be included in the analysis and substantially worsened the performance of the PMT models.

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Table 1: Characteristics of the 16 datasets included in this analysis

Country	Year of data collection	Sampling frame	Sample size	Number of resilience indicators in index	Proportion of households female headed (%)			Data available on marital status of the household head
					Respondents' self-identification	No male adults in household	Oldest female household member >12 years older than oldest male member	
Mali	2011	Members of cotton producers' cooperatives in two regions of southern Mali	693	13	3.8	0.4	11.4	Yes
Niger	2011	Pastoralist households in two rural communes	643	12	7.8	6.4	13.4	Yes
Pakistan	2011	Population of selected rural communities, in three districts of Punjab Province	841	14	3.9	1.1	9.2	Yes
Ethiopia	2012	Population of selected rural communities, in two districts of Somali Region	651	31	12.0	3.7	14.0	Yes
Indonesia	2012	Population of selected rural communities, in two districts of Nusa Tenggara Barat Province	605	15	11.1	6.6	12.9	Yes
Kenya	2012	Population of selected rural communities in Turkana County	513	20	28.2	11.2	27.7	Yes
Nepal	2012	Population of selected rural communities in one district of western Nepal	437	23	14.6	7.6	19.0	Yes
Nepal	2013	Population of selected rural communities in one district of western Nepal	610	21	25.6	12.0	25.9	Yes
Pakistan	2013	Population of selected rural communities in two districts of Sindh Province	786	27	1.6	0.4	5.8	No
Zambia	2013	Population of selected rural communities in one district of western Zambia	491	27	34.6	21.2	33.2	Yes
Mali	2014	Households identified as 'poor' or 'very poor' through a participatory targeting exercise, in selected communities in one district of southern Mali	802	15	11.4	5.8	16.6	No
Nicaragua	2014	Members of agricultural cooperatives in one department of Nicaragua	505	23	25.1	8.7	21.0	No

Country	Year of data collection	Sampling frame	Sample size	Number of resilience indicators in index	Proportion of households female headed (%)			Data available on marital status of the household head
					Respondents' self-identification	No male adults in household	Oldest female household member >12 years older than oldest male member	
Niger	2014	Population of selected rural communities in one department in western Niger	629	22	8.7	3.0	17.3	No
Bolivia	2015	Project participant households in rural communities and peri-urban areas of a city in lowland Bolivia; general population in comparison communities and peri-urban areas	584	18	27.7	5.3	16.6	No
Chad	2015	Households identified as 'poor' or 'very poor' through a participatory targeting exercise in selected communities in Bahr al Gazal Region; households participating in women's groups in selected communities in Guéra Region	1,144	19	36.8	12.5	22.4	No
Thailand	2015	Members of farmers' associations in three sub-districts of Yasothorn Province	757	15	27.2	10.1	23.5	No
Total sample size			10,691					

Table 2: Indicators of resilience, by dataset

Sampling frame	Mali 2011	Niger 2011	Pakistan 2011	Ethiopia 2012	Indonesia 2012	Kenya 2012	Nepal 2012	Nepal 2013	Pakistan 2013	Zambia 2013	Mali 2014	Nicaragua 2014	Niger 2014	Bolivia 2015	Chad 2015	Thailand 2015
Most common indicators (applied in at least eight of the 16 datasets)																
Diversification in sources of income	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Savings or convertible assets	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Access to credit	•		•	•	•	•	•	•	•	•	•	•	•	•		•
Social support networks			•	•	•		•	•	•	•	•	•	•	•	•	•
Ownership of or access to productive assets		•		•		•	•	•	•	•	•	•	•	•	•	•
Attitude to change		•	•	•	•	•	•	•	•	•	•			•	•	•
Diversification in crops produced	•	•		•		•	•	•	•	•	•	•	•			•
Awareness or understanding of climate change	•		•	•	•	•	•	•	•			•		•	•	•
Access to irrigation or water source for dry-season farming				•			•	•	•	•	•	•	•		•	•
Income from regular employment, social transfers or remittances				•		•	•	•	•	•		•	•	•	•	
Access to agricultural extension services	•		•	•	•		•		•	•			•	•	•	
Participation in community groups				•		•	•	•	•	•	•		•	•	•	
Confidence in local government structures to provide support during crises				•			•	•	•	•	•		•	•		
Adoption of innovative practices (other than those promoted by the project being evaluated)				•			•	•		•		•	•	•	•	
Other indicators																
Multiple income earners in the household														•		
Women and men both have drought-resistant sources of income				•			•									
Adoption of soil management techniques	•										•	•				
Adoption of other improved agricultural techniques									•		•	•	•		•	•
Ownership of or access to land for farming												•			•	•
Soil fertility							•		•	•						

Sampling frame	Mali 2011	Niger 2011	Pakistan 2011	Ethiopia 2012	Indonesia 2012	Kenya 2012	Nepal 2012	Nepal 2013	Pakistan 2013	Zambia 2013	Mali 2014	Nicaragua 2014	Niger 2014	Bolivia 2015	Chad 2015	Thailand 2015
Extent of soil erosion				•			•	•		•						
Farmland protected by vegetation							•									
Volume of crop production												•				•
Storage of part of production for own consumption												•				•
Availability of wild plants for foraging													•			
Ownership of livestock		•		•		•					•		•		•	
Ownership of fungible livestock				•		•			•	•						
Diversification in livestock types		•		•		•			•							
Ownership of a pack animal				•												
Access to grazing land				•									•			
Frequency of bush fires													•			
Vaccination and/or deworming for livestock				•		•			•							
Access to veterinary care		•				•			•						•	
Access to safe drinking water							•		•	•	•	•	•		•	
Access to improved water sources for livestock		•		•		•							•		•	
Access to improved sanitation										•						
Access to medical care									•						•	
Physical protection of assets			•					•	•			•		•		
Security of tenure of dwelling														•		
Participation in community-level decision-making			•	•	•	•				•		•		•		
Participation in district-level planning processes								•								
Knowledge of community risk management plan			•	•	•		•	•		•		•				
Perceived effectiveness of community leaders and institutions				•			•	•	•	•						
Community-level disaster risk reduction or adaptation initiatives				•			•	•		•		•				
Social cohesion in the community									•		•		•			
Adoption of drought or flood preparedness practices		•		•	•	•		•		•						

Sampling frame	Mali 2011	Niger 2011	Pakistan 2011	Ethiopia 2012	Indonesia 2012	Kenya 2012	Nepal 2012	Nepal 2013	Pakistan 2013	Zambia 2013	Mali 2014	Nicaragua 2014	Niger 2014	Bolivia 2015	Chad 2015	Thailand 2015
Adoption of natural resource management practices					•											
Access to seasonal forecasting information	•	•	•	•	•	•										•
Access to information on long-term climate trends	•		•		•											
Access to disaster early-warning information								•		•		•		•		
Access to information on drought or flood preparedness	•					•				•						
Access to livestock extension services									•							
Access to social protection systems									•							
Access to markets										•		•				
Access to market price information	•	•	•	•	•	•										
Advice or support on marketing production	•	•														
Support in adopting innovative practices	•		•		•											
Ability to influence others												•				
Experience of disputes				•			•			•						
Attitude towards changing practices in water management																•
Access to and use of information on water availability													•			
Use of improved water management techniques																•
Access to a grain bank									•		•		•		•	
Access to a desalination pump									•							
Total number of indicators	13	12	14	31	15	20	23	21	28	27	16	23	22	17	19	16

Table 3: Results of pooled regressions of resilience index on household head gender, with and without additional covariates

Covariates			Standardized mean difference in resilience index, by gender of household head (95% confidence interval)	Standardized mean difference in resilience index explained by covariates (i.e. comparison with row (a))
(a)	None		–0.21*** (–0.27,–0.16)	–
(b)	Number of adult household members		–0.16*** (–0.22,–0.11)	0.05***
(c)	+	index of wealth indicators	–0.13*** (–0.18,–0.07)	0.09***
(d)	+	education level of household head*	–0.09*** (–0.14,–0.04)	0.12***
(e)	+	age and age squared of household head	–0.09*** (–0.14,–0.03)	0.13***
(f)	+	intervention group in project under evaluation	–0.09*** (–0.14,–0.04)	0.12***
(g)	+	interaction between intervention and female household head	–0.11*** (–0.17,–0.04)	0.11***

* Binary indicators of whether the household head has any education, has primary education or has secondary education, as appropriate in the context in each evaluation.
The statistical significance of the differences in the resilience index explained by the covariates are confirmed through Wald tests ($p < 0.01$ in each case).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Pooled regression of resilience index on indicators of type of household head gender

	Standardized mean difference in resilience index		
	No additional covariates	With additional covariates, listed in rows (a) to (e) of Table 3	With additional covariates, listed in rows (a) to (g) of Table 3
Female household head: married	–0.09 (0.06)	–0.01 (0.06)	0.03 (0.06)
Female household head: never married	–0.33* (0.17)	–0.12 (0.16)	–0.37* (0.18)
Female household head: widowed	–0.30*** (0.06)	–0.14*** (0.06)	–0.11 (0.07)
Female household head: divorced or separated	–0.28** (0.13)	–0.06 (0.12)	0.11 (0.15)
Adjusted R^2	0.004	0.125	0.293
Observations	5,484	5,484	5,484

Results from OLS regression. Robust standard errors in parentheses. The nine evaluation datasets included in these regression models are identified in the right-hand column of Table 1. Regression models control for dataset fixed effects; the models in columns (2) and (3) also controls for interactions of each of the covariates with these fixed effects. Estimated coefficients on the fixed effects, covariates and interactions are not shown.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Results of pooled regressions of indices of generic and locally-specific resilience indicators on household head gender, with and without additional covariates

Covariates			Index of generic resilience indicators		Index of locally-specific resilience indicators	
			Standardized mean difference by gender of household head (95% confidence interval)	Standardized mean difference in resilience index explained by covariates	Standardized mean difference by gender of household head (95% confidence interval)	Standardized mean difference in resilience index explained by covariates
(a)	None		–0.16*** (–0.22,–0.11)	–	–0.17*** (–0.23,–0.12)	–
(b)	Number of adult household members		–0.11*** (–0.17,–0.06)	0.05***	–0.14*** (–0.20,–0.09)	0.03***
(c)	+	index of wealth indicators	–0.08*** (–0.13,–0.02)	0.09***	–0.12*** (–0.18,–0.07)	0.05***
(d)	+	education level of household head*	–0.04 (–0.09,0.01)	0.13***	–0.10*** (–0.15,–0.04)	0.07***
(e)	+	age and age squared of household head	–0.04 (–0.09,0.02)	0.13***	–0.10*** (–0.15,–0.04)	0.08***
(f)	+	intervention group in project under evaluation	–0.04 (–0.09,0.02)	0.13***	–0.11*** (–0.16,–0.05)	0.07***
(g)	+	interaction between intervention and female household head	–0.05 (–0.11,0.02)	0.12***	–0.12*** (–0.18,–0.05)	0.05**

* Binary indicators of whether the household head has any education, has primary education or has secondary education, as appropriate in the context in each evaluation.
The statistical significance of the differences in the resilience indices explained by the covariates are confirmed through Wald tests.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Performance of PMT models with and without gender of the household head

	R-squared	Adjusted R-squared	30th Percentile Cut-off		40th Percentile Cut-off		50th Percentile Cut-off	
			Undercoverage	Leakage	Undercoverage	Leakage	Undercoverage	Leakage
PMT without HHH gender	0.1557	0.1403	0.9439	0.3965	0.8052	0.3168	0.3720	0.3848
PMT with HHH gender	0.1565	0.1411	0.9458	0.4129	0.7991	0.3040	0.3762	0.3843
PMT with HHH gender interacted	0.1591	0.1418	0.9415	0.4107	0.7957	0.3497	0.3760	0.3853

HHH = household head

Figure 1: Difference in resilience index between female-headed and male-headed households, without controlling for observed characteristics

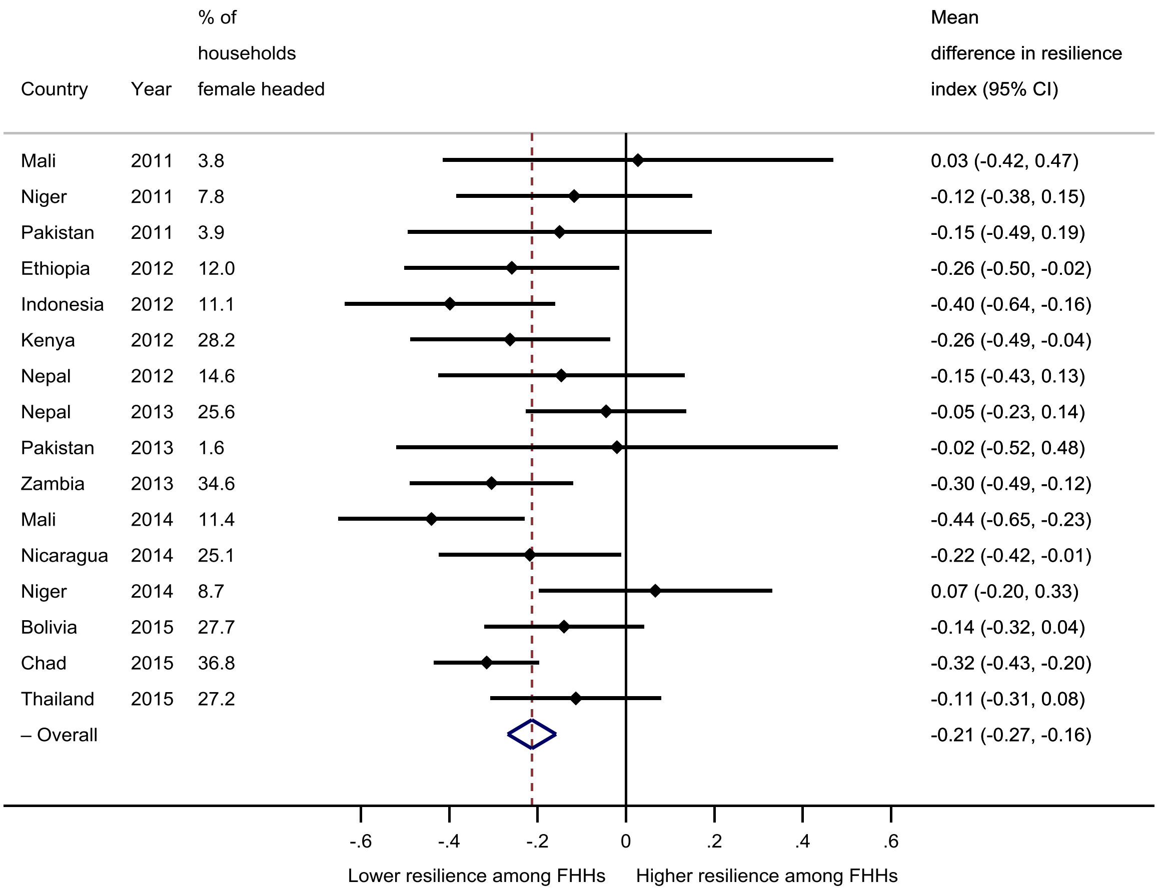

Figure 2: Percentage of targeted households using a 40th percentile cut-off selected by different targeting models, by decile of the resilience index