

What Makes Women's Empowerment Sustainable? Examining Durability and Diffusion of Women's Empowerment Using Panel Data from India

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Abstract

In this paper we empirically test the sustainability of women's empowerment using representative and rich individual-level panel data from India for the years 2004–2005 and 2011–2012. Sustainability is defined in terms of durability, that is, whether empowerment gains sustain over the long run, and diffusion, that is, whether empowerment has positive spillover effects. A domain-based framework is used to capture the multidimensional nature of empowerment. We find that durability varies across empowerment domains. Individual capabilities, asset endowment, and the opportunity structure within which women operate are significantly associated with durability of empowerment. Additionally, a significant diffusion effect of empowerment from empowered women to the other women in the household is observed across all domains. The diffusion effect is significant even when the respondents reside in a separate household but is connected to their empowered female kin through close family network.

Keywords: women's empowerment, sustainability, durability, diffusion, gender equality, multidimensional measurement, panel data, India

1. Introduction

Women's empowerment is argued to be an intrinsic human development goal that is valued as an end in itself (Kabeer 2005). It also has instrumental value and the Sustainable Development Goals (SDGs) recognize women's empowerment as a "precondition" to achieving other economic and social objectives (United Nations 2015). Specifically, empowerment of women is found to be positively correlated with economic growth and micro-level outcomes such as poverty reduction, food security, promoting investment in health and education, and the overall well-being of both girls and boys (Agarwal 1994, Duflo 2012, World Bank 2012). While there is no longer ambiguity around inclusion of empowerment as a central development goal and the specific targets to be achieved, questions that remain unanswered are what aspects of empowerment make it 'sustainable'? And how do we measure sustainability of empowerment? This paper attempts to answer these questions by positing that two aspects make empowerment sustainable – durability, that is, whether empowerment gains sustain over the long run, and diffusion, that is, whether empowerment has positive spillover effects. It presents a rigorous empirical examination of sustainability of empowerment.

The conceptualization of 'empowerment' varies across disciplinary traditions and contexts. Much of the development literature adopts a conceptualization of women's empowerment that focuses on gaining power and control over decisions and resources that determine one's ability to make strategic life choices (Kabeer 1999, Narayan 2002, 2005, Drydyk 2008). Strategic life choices refer to the choices that shape one's life such as the choice of livelihood, place of living, choice of spouse, and number of children (Kabeer 1999). A slightly different view suggests that

empowerment is not only the capacity to make choices but also the ability to translate choices into desired actions and outcomes (Mosedale 2005, Alsop et al. 2006).

Theoretical frameworks have commonly viewed empowerment as a dynamic and relative concept rather than an absolute outcome in a static sphere (Kabeer 2005, Mosedale 2005). Drydyk (2008) argues that empowerment can be ephemeral when a temporary enhancement in decision-making and influence to shape one's lives is gained, but the gain is not strong enough to withstand rigid social and institutional resistance. His concept of durable empowerment thus consists of two components. The first is to gain power to have greater influence to shape one's own life. And the second is to remain empowered and continue exerting that influence in the long run. Empowerment that is comprised of only the first component but missing the second component, is thus non-durable and a weaker form of empowerment, and considered less valuable (Drydyk's 2008).

Another important concept of empowerment that is embedded in its dynamic nature is diffusion. Diffusion is a process by which an idea or innovation becomes more prevalent through its spread among regions, social groups, or individuals through informal face-to-face social interaction or at a distance through media and networks (Casterline 2001). It is argued that empowerment not only has the potential to enhance over time, but it also diffuses among other individuals within a close social network where the empowered women play the role of catalysts (Sadan 2004). Empowered women become role models and acquire social skills through which they exert interpersonal influence consequently empowering their close networks and communities and also further empowering themselves as individuals (Maton & Rappaport 1984, Batliwala 1994). Therefore, another element vital to the diffusion of empowerment is social interaction within groups that are

defined by spatial proximity (household, villages, regions) and/or social proximity (ethnicity, education, occupation) resulting in transmission of information or ideas between change agents and less empowered individuals (Bongaarts and Watkins 1996).

Despite these theoretical conceptualizations, academics as well as policymakers have largely treated empowerment as a static concept and remained silent on its sustainability. We posit that durability and diffusion together provide a comprehensive understanding of sustainability of empowerment as they encompass its temporal and positive spillover aspects. We present an empirical examination of durability and diffusion of women's empowerment using a representative and rich individual-level panel data from India for the years 2004–2005 and 2011–2012. To our knowledge this is the first paper to empirically examine the sustainability of women's empowerment.

There is no empirical evidence specifically on the sustainability of empowerment, that is, both its durability and diffusion. The study that comes closest to examining durability of empowerment is by Arestoff and Djemai (2016) that uses pseudo-panel data from five African countries from 2000 to 2010 to examine the evolution of individual attitudes towards marital violence, which they argue is an important indicator of empowerment. So far there is no study that explicitly examines the diffusion of women's empowerment. However, relevant concepts can be found in the large body of literature on applications of diffusion theory to behavioral changes. First is that diffusion can occur through social interactions at different levels such as local (personal networks, communities), national (culture, government communication, migration), and global (aid organizations, international media, global religious and political networks) (Bongaarts and

Watkins 1996). Second, information flows and social learning can happen through homophily, where individuals interact with others sharing similar characteristics (Behrman et al. 2002). And third, persons in close proximity such as family and peers can influence an individual's likelihood of engaging in certain activities and behaviors similar to a contagion (Case and Katz 1991).

Our study offers three contributions to the literature. First, we examine empowerment durability by testing whether baseline empowerment is enhanced at some future point in time for the same set of women. Second, we identify factors that are associated with heterogeneity in empowerment durability explicitly controlling for individual unobserved factors and time. And third, we test whether empowerment has a diffusion effect. The diffusion effect is tested between women living in the same household and also those living separately but sharing family ties. We treat empowerment as a multidimensional concept using a domain-based framework of analysis. Five domains of empowerment are identified that are relevant for our analysis, namely, decision-making, financial control, freedom of mobility, freedom from domestic violence, and marital inclusiveness. This multi-dimensional framework allows us to test whether durability and diffusion effects vary across domains of empowerment.

We find that durability varies across domains. Specifically, on average, there is a significant increase in decision-making power, control over financial resources, freedom of mobility, and marital inclusiveness between Waves 1 and 2. However, on average, freedom from domestic violence has significantly declined between Wave 1 and Wave 2. Heterogeneity in individual-level durability is associated with, as expected from the theoretical framework, changes in individual capabilities, asset endowment, and opportunity structure. Women's age (interacted with time) and

wage earning opportunities at the individual-level; per capita consumption expenditure, household asset index, and collective assets at the household-level; and availability of basic public services such as water, electricity, and sanitation, and rule of law at the community-level are significant determinants of durable empowerment. Further, we observe that empowerment has a significant diffusion effect from empowered women to the other female members in the same household across all domains. The diffusion effect remains highly significant even when the women do not reside in the same household as their empowered female kin suggesting a network effect.

The following section reviews the empirical literature on empowerment. Section 2 presents the data and lays out the empirical strategy. Section 3 presents the descriptive statistics and Section 4 presents the results from our regression analyses and discusses our main findings. Section 5 concludes.

2. Data and empirical strategy

2.1 Data

We use the India Human Development Survey (IHDS) I & II for this study (Desai et al. 2005, 2012). The IHDS data were collected by researchers from the University of Maryland, USA and the National Council of Applied Economic Research (NCAER), New Delhi, India. This is a nationally representative open access panel data comprising of two waves. In Wave 1, which was conducted in 2004–2005, 41,554 households were interviewed from all districts of India. Wave 2 was conducted in 2011–2012 where about 85% of the Wave 1 households plus any split households that resided in the same community were interviewed. New households were added in Wave 2 to

replace those households who dropped out. In addition to standard modules on household income and expenditure, land and non-land assets, employment, education, and health, the survey questionnaires of both waves include a module exclusively designed for eligible women.

Eligible women (EW) are defined as those aged between 15 to 49 years and ever married. Ever married consists of the following categories – married, widowed, separated or divorced, married but no ‘gauna’ (marriage not consummated), and married but spouse absent. The EW module is further divided into sub-modules comprising questions on gender relations, marital and fertility history, and financial control. Not all EW in each household were necessarily interviewed. In Wave 1, a maximum of one EW per household was interviewed, with interviewees being randomly selected if a household had multiple EW. On the other hand, in Wave 2, a maximum of two EW per household were interviewed whenever possible, with priority given to interviewing women who were interviewed EW in Wave 1 (regardless of her age in Wave 2).

In this regard, 47,529 EW were interviewed over Wave 1 and Wave 2. Of the 33,482 EW who were interviewed in Wave 1, 25,476 (~76%) were re-interviewed in Wave 2. The remaining 14,047 were interviewed in Wave 2 only, and for one of the following reasons:

- (i) To make up for attrition from Wave 1 (n= 2,294) or
- (ii) To become the 1st interviewed EW in Wave 2 households that are related to a Wave 1 household (this includes Wave 2 households that had split from a Wave 1 household), but excluding those who had made up for attrition (n= 7,356) or
- (iii) To make up the 2nd interviewed EW in Wave 2 households (n=4,397).

2.2 Operationalizing empowerment

Measuring empowerment is a challenging task since empowerment is not directly observable and most aspects of empowerment are intangible (Mahmud et al. 2012). Following previous literature on empowerment, we operationalize empowerment using a multiple domain-based framework (Narayan 2005, Mahmud et al. 2012, Alkire et al. 2013). Decision-making is the most commonly used domain of empowerment in the empirical literature (see for example Pitt et al. 2006, Mahmud et al. 2012). It measures how much control women have on the important and strategic life choices such as marriage and fertility choice. It also captures women's ability to make decisions about day-to-day family affairs including household expenditure.

Yet another commonly defined domain is access to or control over financial and economic resources (Sathar and Kazi 2000, Alkire et al. 2013). This refers to women having cash in hand to spend on household expenditure and buying clothes, jewelry, and gifts for themselves, and ownership of assets. Women's ability to move freely in the public domain is another widely used domain of empowerment (Kabeer 1999; Kabeer et al. 2011, Mahmud et al. 2012). This domain captures the social norms pertaining to women being able to visit common public places such as health center, grocery shop, and friend's home alone or without seeking permission.

In recent years, domestic violence has received considerable scholarly attention in the literature as a measure of empowerment (see for example Eswaran & Malhotra 2011, Heath 2014, Ellsberg et al. 2015, Arestoff and Djemai 2016). Domestic violence is the ultimate form of intra-household power struggle where men seek to regain power and control over women through physical

oppression. Although freedom from domestic violence is an indicator of absence of oppression, it does not necessary reflect women's relationship with their spouse. Hence, some empirical studies use a separate domain to capture marital inclusiveness (Sathar and Kazi 2000). This domain measures how much women's opinions pertaining to the household, work, and general happenings are valued by their husbands.

Based on the literature, we identify five domains that are relevant for our analysis. They are (1) decision-making (2) financial control (3) freedom of mobility (4) freedom from domestic violence, and (5) marital inclusiveness. The indicators used to measure each of these domains are listed in Table 1. Each indicator is a dummy variable taking value 1 if women report as being empowered and 0 otherwise.

Table 1. Domains of empowerment and their indicators

Domains	Indicators
1 Decision-making	Respondent had a say in choosing her husband Respondent has a say in how many children to have Respondent has a say in purchasing decisions Respondent has a say in cooking decisions Respondent has a say in decisions when child falls ill Respondent has a say in decisions about children's marriage
2 Financial control	Respondent has cash in hand Respondent has a bank account Respondent has her name on house papers
3 Freedom of mobility	Permission not required to visit health center Permission not required to visit friend's home Permission not required to visit grocery shop

4	Freedom from domestic violence	Not usual in community to beat wife if she leaves without permission
		Not usual in community to beat wife if she brings no dowry
		Not usual in community to beat wife if she neglects the house
		Not usual in community to beat wife if she cooks badly
		Not usual in community to beat wife if she is suspected of having an extramarital affair
5	Marital inclusiveness	Respondent and husband discuss work/farm
		Respondent and husband discuss expenditure
		Respondent and husband discuss politics and other happenings

Note: All variables are coded as dummies with value of 1 indicating that the woman is empowered.

A commonly used approach to operationalize empowerment is constructing an index, which is a sum score of dummy variables representing a particular empowerment domain (Mahmud et al. 2012). Following a similar approach, we generate five domain indices by summing up the indicators within each domain and giving them equal weightage as shown in Equation (1).¹

$$Empowerment\ Index_i = \left(\sum_{i=1}^n y_1, \dots, y_n \right) \quad Eq(1)$$

An alternative approach to measuring empowerment is treating it as an unobserved latent variable. In doing so, the correlation among a large set of empowerment indicators is accounted for and they are reduced to a smaller number of “true underlying dimensions” (Pitt et al. 2006). Therefore, as a robustness check, we perform a principal component analysis (PCA) to identify the empowerment domains. The PCA is performed using promax rotation to allow for correlation among factors. There is a significant overlap between PCA and our domain definitions. Table A1 shows the factor

¹ Making normative judgments about assigning weights to individual indicators is beyond the scope of our analysis.

loadings for the components identified by PCA. For ease of interpretation, our preferred empowerment domain variables are the sum score indices.

2.3 Empirical strategy – empowerment durability

In the empirical examination of empowerment durability we are interested in whether there is a statistically significant difference in mean empowerment levels between Wave 1 and Wave 2 for an observed EW. Only EW interviewed in *both* Wave 1 and Wave 2 were retained for the examination of empowerment durability. As we have a dependent sample, we use paired t-tests to test the null hypothesis that there is no difference between the means of the paired observations against the alternative that there are differences. Specifically, we consider a woman's empowerment as durable if there is a statistically significant increase (positive change) in her empowerment domains between the two waves. While we have only two observations for each EW, the time between the two observations (6 to 8 years) is long enough to deem the statistically significant gain as enduring.

To examine the determinants of durable empowerment, again, we limit our analysis to EW observed in both waves. We include three sets of independent variables to capture the effect of individual capabilities, asset endowment, and opportunity structure on empowerment durability. Indicators for individual capabilities are marital status, education, employment status, number of years the EW is observed for between the two waves and its quadratic form, and EW's age in Wave 1 interacted with number of years observed and its quadratic form. Durability is essentially about sustaining empowerment over time. Therefore, including time measured in terms of the

number of years an EW has been observed allows us to estimate the effect of time on the empowerment domains. As the EW in our sample were interviewed at different points in time across the two waves, there is a natural variation in number of years observed ranging from 6 to 8 years. Age cannot be incorporated directly in our individual-level fixed effects specification (elaborated subsequently) as change in age is equivalent to years between the survey waves. We include age in Wave 1 interacted with number of years observed to generate variation over time. This can be interpreted as the effect of time conditional on age of the EW in Wave 1. For employment status, we construct three distinct dummy variables from a larger set of employment categories – has wage work, is self-employed, or has non-wage work. Asset endowment includes per capita consumption expenditure (financial asset), household asset index, and index of participation in community groups (collective asset). Heterogeneity in opportunity structure is measured using region of residence (rural/urban), access to public services (water, electricity, sanitation), and rule of law (safety from theft, breaks-ins, attacks). Additional controls include caste of the household head, religion of the household head, and household size.²

We then estimate the following fixed effects OLS model with individual and wave fixed effects. Robust standard errors are clustered at the household-level.

$$Y_{idt} = \alpha_0 + \alpha_1 \mathbf{X}_{it} + \alpha_2 \boldsymbol{\varphi}_{it} + \alpha_3 \boldsymbol{\gamma}_{it} + \rho F_i + \theta W_t + \varepsilon_{it} \quad Eq(2)$$

where, Y_{it} is the empowerment index for EW i in domain d and wave t . \mathbf{X}_{it} is a vector of individual-level time variant capabilities, $\boldsymbol{\varphi}_{it}$ is a vector of time variant asset endowment controls,

² There are minor changes in the caste and religious composition of the sample.

and γ_{it} is a vector of time variant opportunity structure controls. F_i and W_t are individual EW and wave fixed effects respectively. ε_{it} is the random disturbance. Robust standard errors are clustered at the household-level. The advantage of our fixed effects specification is that it explicitly controls for individual unobserved heterogeneity that could affect the empowerment durability outcomes. However, we cannot entirely rule out the possibility of reverse causality between empowerment and household- and community-level asset endowment and opportunity structure controls. We therefore interpret the relationship between the three sets of determinants and empowerment domains as correlations.

2.4 Empirical strategy – empowerment diffusion

Drawing upon the theoretical literature, empowerment can diffuse either because of spatial proximity or because of interaction within a social network. The IHDS survey does not ask questions about who the EW talk to or interact with on a regular basis. Therefore, we conceive diffusion effect as that manifesting within the household or the family network. We estimate diffusion effects from the primary female member in the household, who we presume to be the primary change agent or role model, to other women within the household or family network (whom we henceforth refer to as secondary females). EW interviewed in *both* Wave 1 and Wave 2 have been designated as primary females. On the other hand, EW interviewed in Wave 2 only, and who were part of the same Wave 2 household or family network as a primary female, have been designated as secondary females.

2.4.1 Diffusion via spatial proximity

The fact that some Wave 2 households contained both these two types of interviewed EW – (i) a primary female interviewed in *both* Wave 1 and Wave 2 and (ii) a secondary female interviewed in Wave 2 only – provides us with an opportunity to examine diffusion effects owing to spatial proximity within the same household. We identify primary-secondary female ‘proximity’ pairs, the details of which are provided in Appendix 1.

We specify a regression model, which estimates the relationship between the average empowerment over the two waves of the primary female member with whom the respondent resides (as illustrated in Appendix 1) and the respondent’s own empowerment. We use the average empowerment of the primary female member as our interest is in the effect of long run (sustained) and not contemporaneous empowerment. The coefficient on empowerment of the primary female member thus captures the spillover effect of her long run empowerment on the newly added respondent. We estimate the following OLS regression model.

$$Y_{id} = \alpha_0 + \mu\beta_d + \alpha_1\mathbf{X}_i + \alpha_2\boldsymbol{\varphi}_i + \alpha_3\boldsymbol{\gamma}_i + \varepsilon_i \quad Eq(3)$$

where, Y_{id} is the empowerment of the respondent i in domain d . β_d is the average empowerment over the two waves in domain d of the primary female member living in the same household. \mathbf{X}_i is a vector of individual-level capabilities of the respondent i , $\boldsymbol{\varphi}_i$ is a vector of asset endowment controls, and $\boldsymbol{\gamma}_i$ is a vector of opportunity structure controls. ε_i is the random disturbance. Robust standard errors are clustered at the household-level. Here again, simultaneous causation between

empowerment and household- and community-level asset endowment and opportunity structure controls cannot be ruled out.

2.4.2 Diffusion via family (or social) network

The fact that some Wave 1 households had split by Wave 2 offers us an opportunity to examine diffusion via the family network. Examples of such split households include sons who no longer live in the same household as their parents; and brothers who lived in a joint family but now have their own households. We identify primary-secondary female ‘network’ pairs, the details of which are provided in Appendix 2.

The regression specification to estimate diffusion via family network is the same as equation (3) with the exception that β_d is the average empowerment over the two waves in domain d of the primary female member in the family network and its coefficient measures the spillover effect of her long run empowerment on other women in the network (as illustrated in Appendix 2). We cluster the robust standard errors two-ways at the network-level.

3. Descriptive Statistics

We present descriptive statistics for EW who appear in both waves in our sample in Table 2 by Wave. The average age of EW in Wave 1 is 33 years while that in Wave 2 is 40 years. 94% of EW in Wave 1 are married while 88% remain married in Wave 2. In Wave 1, 47% women had no education and this proportion decreased slightly to 45% in Wave 2. We observe an increase in

proportion of women completing higher than secondary level of education from 4.3% to 4.6%. There is an increase of women in wage earning work from 24.5% to 32%. Proportion of self-employed women increased from 4.5% to 6%. The proportion of women in non-wage earning work increased from 29% to 33%.

Inflation adjusted monthly household per capita consumption expenditure increased from US\$24 (INR 1563) to US\$35 (INR 2218).³ Household asset index increased significantly from 11.928 in Wave 1 to 15.786 in Wave 2. There is also a significant increase in the household collective asset index from 0.26 to 0.46.

In Wave 1, about 69% of the EW reside in rural areas and this proportion drops to 67% in Wave 2 indicating possible migration and urbanization. We observe changes in caste composition of the sample over the two waves. In Wave 1, 22.5% of the women identified themselves as upper caste and this proportion increased to 28.5% in Wave 2. Religious composition of the sample does not change significantly with 82% of the EW in our sample being Hindu followed by approximately 11.5% being Muslim and 2.5% being Christian. Time spent by women on collecting water decreased from 35 minutes in Wave 1 to 23 minutes in Wave 2. Hours of electricity per day increased from 12 to 13 while households owning their own toilet increased significantly from 41.5% to 55%. Thus, there seems to be significant improvement in access to basic infrastructure over the two waves. Rule of law index increased marginally from 2.923 to 2.931.

[<Table 2 here>](#)

³ 1 INR = 0.016 US\$

4. Results

4.1 Durability of empowerment

We first examine the durability of empowerment by comparing empowerment domains across Waves 1 and 2 for EW who were observed in both waves. The paired t-test results for difference in means of empowerment indices are reported in Table 3. It is observed that there is an increase in decision-making index from 4.732 to 5.047; increase in financial control index from 1.148 to 1.552; increase in freedom of mobility index from 0.952 to 0.992; and increase in the marital inclusiveness index from 2.334 to 2.44, and all increases are statistically significant. On the other hand, there is a statistically significant decrease in freedom from domestic violence index from 2.911 to 2.55.

Clearly, empowerment is not durable across all domains. While women in India seem to have made considerable progress on the economic and decision-making fronts, they are becoming increasingly vulnerable to domestic violence. These findings are consistent with the general trends observed in other national surveys. For example, the National Family Health Survey (NFHS) 3 & 4 conducted in 2005–06 and 2014–15 reveal that women’s participation in household decision making has significantly increased in all states of India in 2014–15 compared to 2005–06 (Singh et al. 2016). The same surveys also reveal that women’s ownership of a bank account increased from 15% in 2005–06 to 50% in 2014–15. The latter finding that freedom from domestic violence has worsened over time also corroborates with recent statistics from India. As reported by official

statistics, between 2008 and 2012, there has been a 25% increase in crimes against women including domestic violence, molestation, and sexual crimes (National Crime Records Bureau 2013).

<Table 3 here>

6.2 Determinants of durable empowerment

Next, we explore the relationship between individual capabilities, asset endowment, and opportunity structure and durability of empowerment following our specification in Equation (2). Results are presented in Table 4. Looking first at individual capabilities, marginal effect of change in empowerment domains over time conditional on age in Wave 1 is negative across all domains. This means, as women get older, they become more disempowered. Indeed, it has been previously argued that women are likely to be disempowered in later life conditional on their ability to adapt with the physical and social changes such as disability, loss of spouse, children living apart, and degree of dependence (Wray 2004).

<Table 4 here>

Widowed women have significantly more durable empowerment across most domains than married women. Similarly, women whose spouses are absent also have more durable empowerment across decision-making, financial control, and mobility domains but lower marital inclusiveness index. Women who are separated or divorced also have significantly higher mobility

index but significantly lower marital inclusiveness index relative to married women. These findings imply that married women are less empowered (except for marital inclusiveness). This may be because married women are more likely to be exposed to male domination and other forms of social suppression, and conduct their lives under the authority of their spouses in a patriarchal society such as India as has also been argued by Kabeer (1999).

Only higher levels of education are positively and significantly associated with the financial control domain. Women with some middle school, some secondary, and higher than secondary education have significantly higher financial control index relative to women with no education. Consistent with previous evidence on the positive correlation between wage work or work outside the family farm or business and women's empowerment, we also find that there is a positive and significant association between wage work and the durability of decision-making, financial control, mobility, and marital inclusiveness domains (Kabeer 1997, Anderson & Eswaran 2009, Kabeer et al. 2011). The negative association between wage work and domestic violence is supported by findings from Bangladesh where women entering the work force, especially those with lower education and married at a younger age, are found to be more vulnerable to domestic violence than those who do not work (Heath 2014).

Among other forms of employment, being self-employed is positively correlated with the mobility index but negatively correlated with decision-making index. The negative association with decision-making is plausible because 'self-employment' as defined using IHDS work categories includes women whose primary activity is to work in the household nonfarm business. As women are more likely to be substitutes for paid labor and rarely own the household nonfarm business,

being self-employed would not necessarily enhance their decision-making power. Non-wage work has a positive and significant correlation with the durability of the marital inclusiveness domain but negative and significant correlation with mobility. ‘Non-wage work’ as defined using IHDS work categories includes women whose primary activity is to work on household domestic production such as chores, caregiving, and household farm work. There is vast amount of literature on gender division of household work and gender differences in caregiving (Finley 1989, Greenstein 1996, Craig 2006). The overarching conclusion is that even though there are shifts in traditional gender roles with men also contributing to housework and caregiving, women still contribute more time to these activities and bear much of the caregivers burden. As these activities are likely to restrict their mobility outside the home, the negative correlation with the mobility index is not surprising (Wiles 2003).

Moving on to asset endowment, in line with our expectations, per capita household consumption expenditure has a significant positive correlation with the durability of the financial control domain. It also has a significant positive association with the durability of freedom from domestic violence and marital inclusiveness domains. Household asset index has a positive correlation with decision-making index (by 0.017 points) and financial control index (by 0.018 points). These findings imply that some of the dimensions of women’s empowerment are significantly correlated with household economic well-being. Particularly, in richer households, women’s financial autonomy, which includes women having cash-in-hand, title to the house, and a bank account, is also likely to be higher. This finding is consistent with the theory that suggests economic development reduces inequality and increases choices and opportunities for women (Mosedale 2005, Duflo 2012). An increase in assets however has a significant negative relationship with

mobility, freedom from domestic violence, and marital inclusiveness indices. Previous studies have shown a negative correlation between women's movement and wealth (Mahmud et al. 2012). However, the empirical evidence on the association between wealth and domestic violence is mixed. Some studies report a significant positive association, others reveal no significant association, and some others show that higher wealth is associated with more domestic violence (Kishor and Johnson 2006).

Participation in community groups or collective assets is positively and significantly correlated with the durability of decision-making and financial control domains, and negatively and significantly correlated with the durability of mobility and freedom from domestic violence domains. Previous empirical studies on microfinance reveal that access to financial resources can alter intra-household bargaining and resource allocation and consequently empower women (Pitt et al. 2006, Ashraf et al. 2010). Rising domestic violence has also been documented as an unintended consequence of women's participation in credit and savings groups, social groups, and vocational training groups (Koenig et al. 2003, Rocca et al. 2008). Although participation is measured at the household level in our data, from the nature of the groups, that is, women's groups, SHGs, and credit and savings groups, it appears safe to assume that women are more likely to participate.

Finally, we examine the relationship between opportunity structure and durability of empowerment domains. There are no significant differences in the empowerment durability between rural and urban women except that rural women have lower financial control and higher freedom from domestic violence. Previous studies concur that rural women have lower access to

financial services such as credit, savings, and insurance thus giving them lesser control over household financial resources (Fletschner & Kenney 2011). However, there is limited evidence to suggest that rural women are less vulnerable to domestic violence as compared to urban women (Koenig et al. 2003).

Among access to public services, as women spend more time collecting water for the household (implying poor access), they have significantly lower durability in the mobility, freedom from domestic violence, and marital inclusiveness domains. In line with these correlations, more hours of electricity has a significant positive association with the aforementioned three domains. These results are confirmed by previous studies which find that providing women with better access to basic services expands their education, health, and labor market opportunities and also reduces their vulnerability to violence, thus empowering them (Koolwal & van de Walle 2013, van de Walle et al. 2015). The correlation between time spent collecting water and decision-making domain is contrary to our expectation though only marginally significant. Somewhat counterintuitive is the finding that owning a household toilet is negatively and significantly correlated with the durability of the decision-making domain. In developing countries such as India, the decision to own a toilet is typically made by male members of the family (Cameron et al. 2012). In contrast, people with greater need for in-house toilets are women, children, and elderly in the family who are not the economic decision-makers (Coffey et al. 2014). The negative correlation between toilet ownership and decision-making domain plausibly reflects this disconnect. Rule of law has a positive and significant association with the durability of financial control, mobility, and freedom from domestic violence domains, which is widely supported in the literature (Valentine 1989, Viswanath & Mehrotra 2007, Whitzman 2007).

4.2 Examining diffusion of empowerment

We now examine the diffusion of empowerment using Equation (3). We begin by looking at diffusion effect via spatial proximity. Results are reported in Table 5. Our coefficient of interest is the association between average empowerment of the primary female member in each domain and the respondent's (in the 'proximity pair') empowerment in each domain. The results show a significant positive diffusion effect from the primary female member to the respondent in each of the empowerment domains controlling for all observed characteristics. The magnitudes are also very high ranging from a minimum of 0.336 points to a maximum of 0.720 points increase in the empowerment of the respondent due to a one point increase in the corresponding domain of the primary female member in the household. Proximity therefore seems to be a key factor facilitating diffusion of empowerment.

[<Table 5 here>](#)

Next, we look at diffusion effect via family (or social) network. Results are reported in Table 6. We find that empowerment effects extend beyond proximity and there may be gains for women sharing close social and family networks. In particular, the more empowered the primary female member is in the family network, the more empowered is the respondent (in the 'network pair') across all empowerment domains. Social networks are therefore another powerful factor promoting diffusion of empowerment.

<Table 6 here>

While there is no empirical study that explicitly examines diffusion of empowerment, diffusion effects have been observed in participatory development programs where certain female agents have the ability to influence a larger group of women to participate and make an impact on development outcomes (Mayoux 1998). “Role model effects” have also been identified at a more aggregate level where villages in India that were assigned to a female leader for two election cycles exhibited significantly lower gender gap in aspirations (Beaman et al. 2012). Thus, our empowerment diffusion findings corroborate with the broader literature.

4.3 Robustness checks

We conduct robustness checks that are summarized below for brevity. All results are available from the authors upon request.

- i. We re-run regression in Equation (2) using random effects and include age gap between respondent and her spouse, and education gap between respondent and her spouse as additional controls. Our main findings are robust to this alternate specification. This is not our preferred specification as it remains vulnerable to bias from individual unobserved fixed factors.
- ii. We re-run regressions in Equations (2) and (3) using factor scores from the PCA. The factor loadings we use are – decision-making (component 1), financial control (component 6), freedom of mobility (components 3 and 4), freedom from domestic violence (component 2), and marital inclusiveness (component 5). Our main findings are robust.

5. Conclusion

In this paper we use a rich panel dataset from India to empirically examine the sustainability of women's empowerment. We posit that two aspects make empowerment sustainable – its durability and diffusion. Using panel data and rigorous empirical analysis, we investigate the durability and diffusion effects of women's empowerment. We use a domain-based analytical framework to account for the multidimensional nature of empowerment. We have three main findings.

First, examining domain specific changes in empowerment using paired t-tests we find that durability of empowerment varies across domains. While women in India, on average, have gained significantly higher decision-making power, greater control over financial resources, increased freedom of mobility, and higher marital inclusiveness, their freedom from domestic violence has significantly declined between the period 2004–2005 and 2011–2012. Second, as theoretically expected, the variation in durability of empowerment gains is associated with changes in individual capabilities, asset endowment, and opportunity structure. The advantage of our empirical strategy is that we explicitly control for individual unobserved heterogeneities and the effect of time. We find that the association between these three sets of determinants and empowerment varies across domains. For example, while wage work (an individual capability indicator) enhances decision making, financial control, mobility, and marital inclusiveness, it worsens women's freedom from domestic violence. Although the correlation between asset endowment (measured in terms of consumption expenditure, household asset index, and participation in community groups) and the durability of financial control is unambiguously positive, its association with the durability of

decision-making, mobility, and freedom from domestic violence remains mixed. Same is also the case with opportunity structure. Although we do find evidence that better opportunity structure in the form of better access to basic public services, particularly water and electricity, and rule of law can facilitate the durability of empowerment.

Finally, our results show a significant diffusion effect of empowerment from empowered primary female members to other women across all domains. This effect is evident when diffusion is modeled assuming interaction of the primary female member with other women living in the same household. The diffusion effect is significant even when the respondents do not reside in the same household as their empowered female kin. Thus, the diffusion effect seemingly manifests both via spatial proximity and social networks. Therefore, the mechanisms underlying diffusion of empowerment are similar to diffusion of health and employment behaviors found in previous studies.

In conclusion, both durability and diffusion are critical aspects of sustainability of empowerment. Sustainability implies that empowerment has the potential to generate a ripple effect that can continue and strengthen over time. The sustainability of women's empowerment also has important implications for social and economic policy design in low income countries. Given women's instrumental role in poverty alleviation and in delivering other development outcomes, donor agencies have prioritized and intensified investment in empowering women in the recent decade (Gates 2014, USAID 2015). Much of these investments, however, account for static benefits of women's empowerment. Our results suggest that though empowerment can generate positive spillover effects, its sustainability cannot be assumed. Women can experience

enhancement in specific domains and a simultaneous loss in others. Disregarding these dynamic and compounding long-term effects of empowerment will significantly undermine the social return on the investment in women's empowerment.

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7. Results tables

Table 2. Summary Statistics

Variables	Wave 1					Wave 2				
	N	Mean	Std.	Min	Max	N	Mean	Std.	Min	Max
Panel A: Individual capabilities										
Age	25,475	33.205	7.911	15	49	25,075	40.150	8.024	20	57
No. of years observed between waves	25,051	0.000	0.000	0	0	25,051	7.107	0.260	6	8
Marital status										
Married	25,476	0.940	0.237	0	1	25,476	0.876	0.330	0	1
Widowed	25,476	0.031	0.174	0	1	25,476	0.072	0.259	0	1
Separated/divorced	25,476	0.006	0.079	0	1	25,476	0.006	0.080	0	1
Married, no gauna	25,476	0.000	0.000	0	0	25,476	0.000	0.000	0	0
Married, spouse absent	25,476	0.022	0.147	0	1	25,476	0.046	0.208	0	1
Education category										
No education	25,363	0.468	0.499	0	1	25,476	0.451	0.498	0	1
Some primary education	25,363	0.162	0.368	0	1	25,476	0.176	0.381	0	1
Some middle school education	25,363	0.197	0.398	0	1	25,476	0.200	0.400	0	1
Some secondary education	25,363	0.130	0.337	0	1	25,476	0.128	0.334	0	1
> secondary education	25,363	0.043	0.203	0	1	25,476	0.046	0.210	0	1
Employment status										
Has wage work	25,476	0.245	0.430	0	1	25,467	0.322	0.467	0	1
Has self-employment	25,476	0.045	0.207	0	1	25,469	0.060	0.237	0	1
Has non-wage work	25,476	0.287	0.452	0	1	25,469	0.329	0.470	0	1
Panel B: Asset endowment										
Monthly household per capita consumption expenditure (Rupees)	25,476	1562.83 1	1479.24 9	0	33,633	25,471	2218.07 7	2516.72 3	59	121,790

Household asset index	25,476	11.928	6.014	0	30	25,469	15.786	6.444	0	33
Participation in community groups index	25,432	0.263	0.616	0	3	25,434	0.460	0.777	0	3
Panel C: Opportunity Structure										
Rural	25,476	0.692	0.462	0	1	25,476	0.669	0.471	0	1
<i>Caste of household head</i>										
Upper	25,476	0.225	0.418	0	1	25,436	0.285	0.452	0	1
Lower	25,476	0.775	0.418	0	1	25,436	0.715	0.452	0	1
<i>Religion of household head</i>										
Hindu	25,476	0.816	0.388	0	1	25,476	0.822	0.383	0	1
Muslim	25,476	0.114	0.318	0	1	25,476	0.115	0.319	0	1
Christian	25,476	0.024	0.154	0	1	25,476	0.025	0.157	0	1
Sikh	25,476	0.025	0.157	0	1	25,476	0.023	0.150	0	1
Buddhist	25,476	0.007	0.085	0	1	25,476	0.007	0.083	0	1
Jain	25,476	0.003	0.052	0	1	25,476	0.002	0.049	0	1
Tribal	25,476	0.009	0.097	0	1	25,476	0.004	0.064	0	1
Others	25,476	0.000	0.021	0	1	25,476	0.001	0.031	0	1
None	25,476	0.000	0.009	0	1	25,476	0.000	0.020	0	1
Time spent collecting water daily, all adult women in household (minutes)	25,043	35.337	60.097	0	720	24,945	23.326	40.166	0	540
Hours of electricity (daily)	25,320	12.367	8.969	0	24	25,417	13.329	8.101	0	24
Household has own toilet	25,341	0.415	0.493	0	1	25,461	0.550	0.498	0	1
Rule of law index	25,419	2.923	0.327	0	3	25,446	2.931	0.308	0	3

Notes:

Sample only includes eligible women who appear in both waves.

Employment status variables are 3 distinct dummy variables based on work activity.

Monthly household per capita consumption (Rupees) reflected at Wave 2 price levels.

Upper caste comprises: Brahmin and Forward/General (except Brahmin) castes.

Lower caste comprises: Other Backward Caste (OBC), Scheduled Caste (SC), Scheduled Tribe (ST), and Other castes.

Table 3. Durability of Empowerment Domains - Paired t-tests of Difference in Mean Empowerment

	Wave 1					Wave 2					(Wave 2 - Wave 1)	
	N	Mean	Std.	Min	Max	N	Mean	Std.	Min	Max	Difference	P-Value
Empowerment Domains												
Decision-Making	25,476	4.732	1.524	0	6	25,476	5.047	1.259	0	6	0.315	0.000
Financial Control	25,476	1.148	0.736	0	3	25,476	1.552	0.743	0	3	0.404	0.000
Freedom of Mobility	25,476	0.952	1.124	0	3	25,476	0.992	1.155	0	3	0.040	0.048
Freedom from Domestic Violence	25,476	2.911	1.675	0	5	25,476	2.55	1.656	0	5	-0.361	0.000
Marital Inclusiveness	25,476	2.344	0.938	0	3	25,476	2.44	0.848	0	3	0.096	0.000

Note: Sample only includes eligible women who were interviewed in both waves.

Table 4. Individual Capabilities, Asset Endowment, and Opportunity Structure factors associated with durable empowerment – Fixed Effects OLS regression

Dependent Variables	(1) Decision-Making	(2) Financial Control	(3) Freedom of Mobility	(4) Freedom from Domestic Violence	(5) Marital Inclusiveness
Panel A: Individual Capabilities					
Marginal effect of age(wave 1), at means	-0.0098*** (0.0008)	-0.0020*** (0.0004)	-0.0017*** (0.0006)	-0.0034*** (0.0009)	-0.0029*** (0.0005)
Marital Status					
Widowed	0.2212*** (0.0534)	0.3147*** (0.0333)	0.9069*** (0.0570)	0.1335* (0.0750)	-0.7473*** (0.0478)
Separated/Divorced	0.1692 (0.1428)	0.1158 (0.0858)	0.8986*** (0.1531)	-0.1267 (0.2215)	-0.8401*** (0.1341)
Married, spouse absent	0.0993* (0.0586)	0.1116*** (0.0286)	0.5012*** (0.0511)	-0.0089 (0.0673)	-0.0744* (0.0445)
Education Category					
Some primary education	-0.0079 (0.0400)	-0.0160 (0.0201)	-0.0241 (0.0315)	0.0372 (0.0486)	-0.0299 (0.0263)
Some middle education	0.0315 (0.0529)	0.0473* (0.0265)	-0.0392 (0.0423)	0.1072* (0.0614)	0.0133 (0.0337)
Some secondary education	0.0981 (0.0666)	0.0755** (0.0359)	-0.0452 (0.0565)	0.0610 (0.0803)	-0.0288 (0.0433)
> Secondary education	0.1605 (0.1021)	0.1513** (0.0589)	0.0015 (0.0938)	-0.0585 (0.1219)	0.0437 (0.0664)
Employment Status					
Has wage work	0.1329*** (0.0255)	0.1349*** (0.0129)	0.0778*** (0.0213)	-0.1009*** (0.0316)	0.0387** (0.0170)
Has self-employment	-0.1459*** (0.0431)	-0.0002 (0.0213)	0.1075*** (0.0359)	0.0221 (0.0521)	-0.0033 (0.0275)
Has non-wage work	-0.0473 (0.0288)	0.0028 (0.0145)	-0.0563** (0.0227)	-0.0142 (0.0336)	0.0967*** (0.0183)

Panel B: Asset Endowment

Log per capita consumption expenditure	-0.0118 (0.0200)	0.0443*** (0.0100)	0.0114 (0.0163)	0.0405* (0.0237)	0.0378*** (0.0129)
Household asset index	0.0169*** (0.0036)	0.0181*** (0.0017)	-0.0181*** (0.0030)	-0.0130*** (0.0043)	-0.0095*** (0.0024)
Participation in community groups index	0.0814*** (0.0135)	0.0578*** (0.0076)	-0.0403*** (0.0124)	-0.1214*** (0.0179)	0.0153 (0.0094)

Panel C: Opportunity Structure

Rural	0.0801 (0.0666)	-0.1792*** (0.0405)	0.0546 (0.0727)	0.5474*** (0.0946)	0.0044 (0.0527)
Time spent collecting water by all adult women in household	0.0003* (0.0002)	0.0001 (0.0001)	-0.0004** (0.0002)	-0.0025*** (0.0002)	-0.0004*** (0.0001)
Hours of electricity	-0.0018 (0.0015)	0.0011 (0.0007)	0.0198*** (0.0012)	0.0119*** (0.0018)	0.0093*** (0.0009)
Household has own toilet	-0.0856*** (0.0274)	-0.0021 (0.0141)	0.0029 (0.0230)	0.0128 (0.0340)	-0.0067 (0.0181)
Rule of law index	0.0278 (0.0299)	0.0723*** (0.0143)	0.0835*** (0.0228)	0.0604* (0.0352)	0.0022 (0.0177)

Additional Opportunity Structure Controls

Caste of household head	Y	Y	Y	Y	Y
Religion of household head	Y	Y	Y	Y	Y
No. of household members	Y	Y	Y	Y	Y
Constant	4.7161*** (0.1907)	0.4852*** (0.0943)	0.6585*** (0.1549)	2.2801*** (0.2246)	2.0391*** (0.1227)
Individual FE	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y

Observations	48,552	48,552	48,552	48,552	48,552
No. of clusters	25,028	25,028	25,028	25,028	25,028
R-squared	0.0553	0.1876	0.0379	0.0420	0.0338

Notes:

Panel OLS regressions with individual and wave fixed effects.

Sample includes eligible women who were interviewed in both Wave 1 & Wave 2

Includes controls for caste & religion of household head, and number of household members.

Robust standard errors in parentheses. (*) p<0.1 (**) p<0.05 (***) p<0.01

Reference categories for:

- Marital status: Married

- Education category: No education

Table 5. Diffusion of Empowerment via Spatial Proximity Effect

Dependent variable: Respondent's empowerment	(1) Decision-Making	(2) Financial Control	(3) Freedom of Mobility	(4) Freedom from Domestic Violence	(5) Marital Inclusiveness
<i>Independent variable:</i>					
<i>Ave. empowerment of primary female member in the household</i>					
Decision-Making	0.5556*** (0.0239)				
Financial Control		0.3362*** (0.0198)			
Freedom of Mobility			0.3565*** (0.0164)		
Freedom from Domestic Violence				0.7204*** (0.0171)	
Marital Inclusiveness					0.3385*** (0.0233)
<i>Other controls:</i>					
Individual capabilities controls	Y	Y	Y	Y	Y
Asset endowment controls	Y	Y	Y	Y	Y
Opportunity structure controls	Y	Y	Y	Y	Y
Observations	4,012	4,012	4,012	4,012	4,012
R-squared	0.2231	0.2220	0.1637	0.3305	0.1116

Notes:

Estimates from OLS regressions

Sample includes Wave 2 households that have a primary female member who appears in both waves, and an additional eligible woman interviewed in Wave 2

Robust standard errors clustered at the household-level in parenthesis. (*) p<0.1 (**) p<0.05 (***)

p<0.01

Individual capabilities controls:

- age, age squared, marital status, education, employment status, age gap and education gap between respondent and husband

Asset endowment controls:

- log monthly household per capita consumption expenditure, household assets index, participation in community groups index

Opportunity structure controls:

- rural/urban, caste and religion of household head, access to public services, no. of household members

Table 6. Diffusion of Empowerment via Network Effect

Dependent variable: Respondent's empowerment	(1) Decision-Making	(2) Financial Control	(3) Freedom of Mobility	(4) Freedom from Domestic Violence	(5) Marital Inclusiveness
Independent variable:					
<i>Ave. empowerment of primary female member in different 'branch' household</i>					
Decision-Making	0.4533*** (0.0281)				
Financial Control		0.2326*** (0.0235)			
Freedom of Mobility			0.4501*** (0.0259)		
Freedom from Domestic Violence				0.6594*** (0.0235)	
Marital Inclusiveness					0.2648*** (0.0272)
Other controls:					
Individual capabilities controls	Y	Y	Y	Y	Y
Asset endowment controls	Y	Y	Y	Y	Y
Opportunity structure controls	Y	Y	Y	Y	Y
Observations	3,054	3,054	3,054	3,054	3,054
R-squared	0.2529	0.1567	0.1675	0.2691	0.0908

Notes:

Estimates from OLS regressions

Sample includes eligible women who were only interviewed in Wave 2, and who are related to a primary female member in the following manner:

- although both women reside in different Wave 2 households, their households are 'branches' of a Wave 1 'stem' household

Robust standard errors two-way clustered at the (i) Wave 1 'stem' and (ii) Wave 2 'branch' household-levels in parenthesis. (*) p<0.1 (**) p<0.05 (***) p<0.01

Individual capabilities controls:

- age, age squared, marital status, education, employment status, age gap and education gap between respondent and husband

Asset endowment controls:

- log monthly household per capita consumption expenditure, household assets index, participation in community groups index

Opportunity structure controls:

- rural/urban, caste and religion of household head, access to public services, no. of household members

Table A1. Principal Component Analysis Factor Loadings

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexpl ained
Respondent has had a say in choosing her husband						0.7099	0.414
Respondent has a say in how many children to have	0.4566						0.4029
Respondent has a say in purchasing decisions	0.4494						0.3928
Respondent has a say in cooking decisions	0.3157						0.7004
Respondent has a say in decisions when child falls ill	0.4858						0.3252
Respondent has a say in decisions about children's marriage	0.4984						0.2877
Respondent has cash in hand					0.394	-0.3736	0.5315
Respondent has a bank account					0.6506		0.4442
Respondent has her name on house papers					0.6215		0.4642
Respondent does not require permission to visit health centre			0.5753				0.2763
Respondent does not require permission to visit friend's home			0.5904				0.2436
Respondent does not require permission to visit grocery shop			0.5603				0.3225
Not usual in community to beat wife if she leaves without permission		0.4422					0.3948
Not usual in community to beat wife if she brings no dowry		0.4703					0.405
Not usual in community to beat wife if she neglects the house		0.5239					0.2801
Not usual in community to beat wife if she cooks badly		0.5138					0.3043
Not usual in community to beat wife if she is suspected of having an extramarital affair						0.5086	0.5625
Respondent and husband discuss work/farm				0.5998			0.3329
Respondent and husband discuss expenditure				0.6068			0.3079
Respondent and husband discuss politics & other happenings				0.4987			0.4864

Note: Principal Component Analysis using promax rotation. Components with eigen value > 1 included in the analysis.

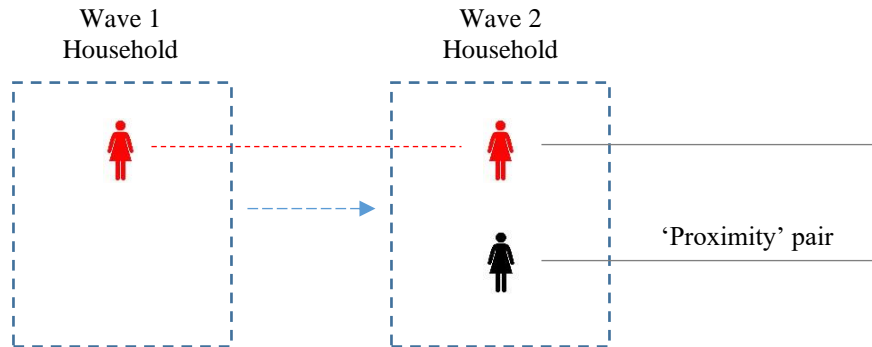
Appendix 1

To estimate diffusion via spatial proximity, we first identified primary-secondary female ‘proximity’ pairs among Wave 2 households, regardless of whether these households had split from a Wave 1 household. For convenience, we refer to Wave 2 households that had split from a Wave 1 household as Wave 2 ‘branch’ households; and the Wave 1 households they had split from as Wave 1 ‘stem’ households. Figure A1 illustrates how these ‘proximity’ pairs were identified.

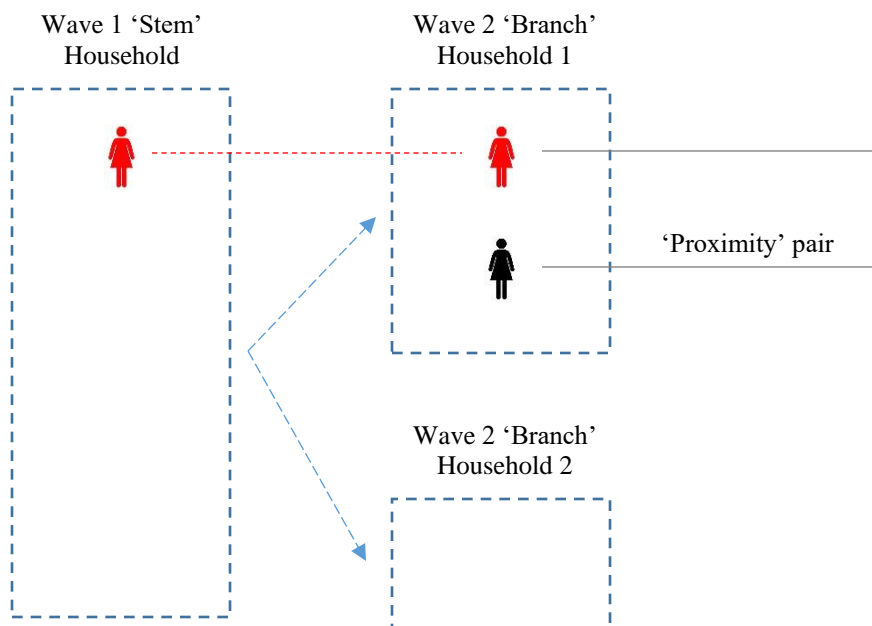
Wave 2 households with ‘proximity’ pairs are essentially households that contain (i) an EW interviewed in *both* Wave 1 and Wave 2, and (ii) an additional EW interviewed in Wave 2 only. However, not all Wave 2 households with an EW interviewed in both Wave 1 and Wave 2 had an additional interviewed EW to form a ‘proximity’ pair. In this regard, selection bias may have resulted in some Wave 2 households having ‘proximity’ pairs, while others did not (due to the lack of an additional interviewed EW). We conduct two-sample t-tests of difference in mean household characteristics between households with and without ‘proximity’ pairs and find that the absolute differences in means are at best marginal and therefore unlikely to bias our results and interpretations.

Figure A1 – Identification of ‘Proximity’ Pairs for Examining Diffusion via Spatial Proximity

Case 1: ‘Proximity’ pair resides in a Wave 2 Household that did not split from a Wave 1 household



Case 2: ‘Proximity’ pair resides in a Wave 2 Household that had split from a Wave 1 household



Primary Female: EW interviewed in *both* Wave 1 & Wave 2



Secondary Female: EW interviewed in Wave 2 only

Appendix 2

To examine diffusion via the family network, we first identified Wave 1 households that had split by Wave 2, and identified clusters of Wave 2 ‘branch’ households that belong to the same family network (that is, originate from the same Wave 1 ‘stem’ household). As diffusion via the family network has been conceived to occur across households that share family ties, primary-secondary female ‘network’ pairs were identified such that females in a ‘network’ pair were from different Wave 2 ‘branch’ households that nonetheless belonged to the same family network. Figure A2 in the appendix illustrates how these ‘network’ pairs were identified.

The presence of ‘network’ pairs within a family network is contingent on several factors. Firstly, the presence of an EW who was interviewed in both Wave 1 and Wave 2. Secondly, the splitting of the Wave 1 household containing such an EW into several Wave 2 ‘branch’ households. Finally, the presence of secondary females in other Wave 2 ‘branch’ households whom EW interviewed in both Wave 1 and Wave 2 can form ‘network’ pairs with.

On this note, not all EW interviewed in both Wave 1 and Wave 2 became part of a ‘network’ pair, due to non-fulfilment of one or more of the conditions listed above – which could be a reflection of selection bias being present. Therefore, we conduct two-sample t-tests of difference in mean household characteristics between households with and without ‘network’ pairs. Here again, we find only marginal absolute differences and argue that selection bias is unlikely to be present.

Figure A2 – Identification of ‘Network’ Pairs for Examining Diffusion via Network Effects

