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Family Rules, Employment, Fertility and Women's Empowerment: Evidence from a Developing Country

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ABSTRACT

This research investigates the determinants of women's empowerment within households in a developing country. The investigation specifically focuses on the impact of employment and fertility, considering constraints imposed by family rules that play a pivotal role in shaping women's empowerment. The theoretical framework outlined in this study posits a simplistic model demonstrating that, within the prevailing family structure and household composition, earned income and fertility may bear significant relevance. Utilizing data extracted from the Pakistan Social and Living Standards Measurement Survey, we engage in estimating the level of female empowerment, operationalized as the extent of female authority over household expenditures. Notably, our empirical approach accounts for the endogeneity of employment and fertility through a two-stage estimation process. This involves leveraging information on family rules—representative of a family's cultural norms—pertaining to work and childbearing. Our empirical findings affirm the viability of family-specific rules as instruments to estimate and subsequently predict employment and fertility. Importantly, the evidence gleaned underscores the critical role of selecting valid threat options in theoretical analyses of women's empowerment.

KEYWORDS

Household Decision Making; Family Rules; employment; fertility; Women's empowerment

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1. Introduction

Extensive literature documents an association between women's empowerment in the developing world and a range of desirable outcomes for children[1] and the aggregate economy.[2] This has led scholars to explore the determinants of women's empowerment as a means to promote for family members and society. The convention in this literature is to use a husband-wife bargaining framework to generate insights into the sources of female autonomy.[3] This theoretical approach points toward working outside of the home for earnings and having more children as factors that promote female autonomy by providing women with leverage during bargaining.

A myriad of empirical papers has documented a positive association between female autonomy and working for pay in poor nations including India (Rahman and Rao 2004), Nepal (Acharya and Bennet 1982), Pakistan (Chaudhry and Nosheen 2009), and Turkey (Ecevit 1991).[4] However, as Basu (2006) noted in commenting on this literature, greater female autonomy can promote opportunities to work outside the home for pay making it challenging to determine if employment advances female autonomy.[5] Researchers have used a variety of terms in discussing women's decision-making capacity. We use women's empowerment, autonomy, bargaining power, and decision-making authority interchangeably in this paper. We gauge female empowerment by her authority to make important household spending decisions, which is similar to the approach taken by Anderson and Eswaran (2009), henceforth AE.

There is emerging empirical literature, focusing on women in India and Bangladesh, which offers evidence of a causal impact of earning and possession of assets on female autonomy – by using an instrumental variables estimation method. A recent addition to this literature (Debnath 2015) offered evidence that household type – living in a nuclear family relative to an extended one – also leads to greater married female empowerment. However, surprisingly, little is known about the causal determinants of women's empowerment in Pakistan one of the largest and poorest nations in the world.

Pakistan is the world's sixth-most-populous country with 207.77 million people in 2017 and ranks near the bottom of the United Nations Human Development Index (145th out of 187 nations). A report released by the Ministry of Planning, Development and Reform of Pakistan in 2016 revealed that based on a new means of measuring poverty in Pakistan – linked to caloric intake – 4 out of 10 Pakistanis are living in acute poverty.[6]

In Pakistan 97% of the people adhere to the Muslim faith, families are typically extended across generations, and the family patriarch has authority over family members. The family patriarch exercises this power by establishing and applying family rules – synonymous with family culture – regarding the decision-making process and activities of household members. In this context, it is unclear what factors impact women's empowerment, including working for pay and having children, since these important features of a married women's life in Pakistan are governed by the male patriarch of the family through the application of family rules. The purpose of this paper is to eliminate this shortcoming in the literature on women's empowerment.[7]

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[1] See Mukherjee (2013), Grabowski and Self (2013), and Eswaran (2002).

[2] For a review of this literature see Duflo (2012).

[3] Key papers in this literature include McElroy and Horney (1981), Lundberg and Pollak (1993), and Anderson and Eswaran (2009).

[4] Additional papers on female autonomy in Pakistan, of this vintage, include Ashraf and Ashraf (1993), Kozel and Alderman (1990), and Azid et al. (2001). Researchers have also reported a direct empirical relationship between greater female autonomy and; pre-marital asset holding (Fafchamps and Quisumbing 2005; Folbre 1984; Kabeer 1999), ownership of land (Agarwal 1994), and access to credit (Hashemi et.al. 1996; Rahman and Rao 2004; Agarwal 1997).

[5] Researchers have used unexpected events including draught (Anderson and Eswaran 2009) and death of the family patriarch (Debnath 2015) to account for exogenous changes in married female employment.

[6] The report also reveals that there is wide variation in poverty rates across provinces and between urban and rural setting, using this approach.

[7] Having a better understanding of the determinants of female empowerment, and the potential importance of controlling for endogeneity in estimating her level of autonomy, can contribute to other literatures exploring the role of female empowerment such as the link between if her level of autonomy and family planning (Nadeem et al. 2021).

We advance the literature on female autonomy in four ways. First, we extend the standard bargaining model used to shed light on the determinants of female empowerment – best exemplified by AE (2009) – by accounting for family structure. We do this by acknowledging and incorporating into the model the role of family type (i.e., nuclear or extended household) and composition of the household – which varies with alternations in the number of children and adults residing in the family – on female autonomy. This leads to new propositions, and hence insights, about the effects on married female behavior and empowerment when she has either more biological children or lives with a greater number of her husband's adult relatives.

Second, we offer causal estimates of the determinants of married female empowerment in Pakistan by using an instrumental variables estimation that accounts for the potential endogeneity of both working for pay outside the home, and cumulative level of fertility – by this we mean the number of her biological children living with her in the household. We are unaware of any study that has accounted for the endogeneity of having children when investigating the impact of additional children on female empowerment.

Third, a number of researchers (for a review see Kabeer 1999) have asserted that family culture and norms shape important life course outcomes for women including labor force participation and the capacity to make decisions over household spending. Drawing on this tradition, Cigno et al. (2020) and Khan et al. (2023) argue that family *rules*, typically established by the household head – the family patriarch in many developing nations – are self-enforcing and remain in place for generations.[8] This perspective allows us to introduce to the literature on female agency a new instrumental variable, a family's rules regarding decision making, to address the endogeneity of women's work outside of the home for pay and fertility in estimating female empowerment.

There is extensive literature in development economics asserting that family culture or rules are likely to evolve due to – society-wide changes, and the activities and experiences of family members such as employment and childbearing (Jayachandran 2020; Bhatti & Jeffery 2012; Contreras & Plaza 2010; Seguino 2007; Fernandez 2007; Brah 1993). Thus, family rules may be endogenous for married women. However, a prevalent theme in this literature is that cultural beliefs and hence family rules adjust slowly because such alternations often reflect – transformations of societal norms, new public policies (Jayachandran 2020; Yasemin 2020), and changes secured by one generation of women for the generation to follow (Bhatti & Jeffery 2012). Seguino (2007), using World Bank data covering eighty independent developing countries, provides evidence that advances in economic activity ultimately (i.e., with a few year lags) leads to significant adjustments in – society-wide attitudes about the appropriate role and activities of women, and social norms regarding the stature and opportunities available to them. Thus, operationally it seems plausible to assert – as we do – that at a given moment, often thought of as the short-run, the family rules that impact and often constrain women are in place and are not subject to contemporaneous adjustment rendering them in a technical sense exogenous. Thus, we take advantage of the information in the PSLM about a family's rules regarding fertility and working for pay – which is assumed exogenous to a married woman in the household – to estimate the causal impact of these factors on her level of empowerment. However, we think of this as informative about short-period determinants of female autonomy.

Fourth, we allow the feedback effect between employment and fertility which has been previously ignored in the empirical literature on women's empowerment modelling, to account for a potential source of endogeneity in the application of our instrumental variables estimation procedure. New Home Economics (Becker 1991) and the

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[8] In Cigno et al., (2020) a married woman is incentivized to adhere to the family rule under consideration – the expectation of taking care of her husband's parents (i.e., the family patriarch and matriarch) by an intergenerational opportunity cost. In essence by doing so, in a visible manner, it is more likely her offspring will take care of her and her husband when they are old and in need of assistance. For other family rules including those related to working and having a larger family, other costs could promote adherence such as social and emotional sanctions that would make life in her extended family less pleasant. Moreover, Cingo (2021) argues that the evolution of gender roles regarding the division of labour adopted by ancient farmers – which reflected comparative advantage in terms of physical strength leading to women specializing in rearing children – transitioned slowly to a modern world where education is the key to productivity, through family rules often agreed to at the outset of marriage.

Second Demographic Transition theory (Lesthaeghe 2010) predict a negative employment-fertility link for women due to the opportunity cost of foregoing wages on childbearing and raising children on workplace activity. However, changing gender roles leading to dual career oriented societies and policy environments that support work and childrearing (Kreyenfeld & Andersson 2014) point towards – and find – a positive association between work and fertility especially for more educated women (Wood, J. & Neels 2017). Thus, Bernhardt (1993) in her review of the literature notes that on conceptual grounds the interplay between work and fertility is complex – in terms of timing (i.e., age), history (i.e., number of children), and education – resulting in micro-level empirical work on causality that is inconclusive while documenting a connection at the aggregate macroeconomic level.[9] In our empirical work we take the position that employment and fertility are jointly determined and we allow family rules regarding employment and childbearing to be a determinant of each of these outcomes.

The remainder of the paper is organized as follows: Section 2 presents a simple theoretical model to gain insights about the determinants of female empowerment, Section 3 describes the PSLM data along with the construction of variables used to test hypotheses about female autonomy, Section 4 discusses the estimation strategy we adopt including how we use measures of family rules to identify the effects of female employment and female fertility on female empowerment, Section 5 present summary statistics regarding the analysis sample, Section 6 presents our first and second stage estimates, and Section 7 offers concluding remarks.

2. The Model

Anderson and Eswaran (2009), in a seminal paper, present a model of how, earned and unearned income affect the bargaining power of a woman relative to that of her husband, in a developing country. They used this model to guide the estimation of the determinants of women's empowerment or decision-making autonomy, using data on residents of Bangladesh (from one of the rural districts). In this section, we extend their conceptual theoretical framework to account for family structure which entails both family type and composition. However, we emphasize the influence of household composition as the family becomes larger on the bargaining power, and hence the extent of female empowerment of married women in Pakistan, a nation that is predominantly Muslim. We consider two separate ways in which the household can become larger, and hence influence the family composition. First, the expansion of the nuclear family through childbirth. The vast majority of Muslim families in Pakistan are extended, which means they include; a married couple, their sons, their sons' wives, and children all living under one roof. Besides, these multigenerational families often contain other kin of the family patriarch – generally the oldest male member of the household – and their direct relations.[10] Thus, an enlarged extended family is another way the household or family a married woman resides in can grow and reflect a change in composition.

The convention in the literature is to assert that a married woman's autonomy in decision-making – empowerment – depends on negotiations with her husband in which bargaining power or leverage, referred to as *threat utility*, flows from economic and social factors. We use similar notation to AE (2009), since we extend their model to allow family composition, an element of family structure, to influence the threat utility or bargaining power of a married woman, and hence her realized level of decision-making autonomy or empowerment.

Following AE (2009) we assume that a wife can allocate her time to three activities: Producing a household public good (i.e., housework and childrearing), working in an activity that provides her with earnings, and leisure. Her husband has two possible uses for his time; working in the labor market and leisure. The husband is assumed

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to provide financial input (income), but no time, to the production of the household public good – the wife is the sole contributor of time to this endeavour. This set of assertions, known as the *separate spheres* framework – first advanced by Lundberg and Pollak (1993) – stipulates that traditional gender roles characterized how the household public good is generated.[11] Data from the *Pakistan Time Use Survey-2007* is largely consistent with the separate spheres conjecture since married women, relative to married men, are substantially more likely to participate in cooking (by 76%) and household cleaning (by 62%).

The utility function of a married female (f), expressed in log-linear form, is assumed to be:

$$U_f\left(x_f, z, l_f\right) = \beta_f \ln x_f + \gamma_f n_1 \ln\left(\frac{z}{n_1}\right) + \delta_f \ln l_f + \psi_f \ln\left(b - n_2\right) \qquad (1)$$

where x_f, z and l_f respectively denote wife's private consumption, consumption of the household public good she helps produce, and her leisure. The number of children in the household who are biologically related to the married female is represented by n_1, and $ln\left(\frac{z}{n_1}\right)$ is the amount of the public good (z) per-biological child in the household. We assume that the wife derives utility from living with her nuclear family, and more children directly bring her greater utility.[12] However, as the size of her nuclear family advances, *ceteris paribus*, the amount of the public good per biologically related person in the household declines leading to less utility. Thus, the total utility for the wife generated by the household public good is $n_1 ln\left(\frac{z}{n_1}\right)$.

Living in an extended or joint family can also affect a wife's level of utility. Let n_2 represent the number of persons other than the wife's biological children and husband, living in the household – the size of her extended family. As the size of her extended family expands the likelihood of tensions arising due to a myriad of factors including a lack of privacy, demands placed on the wife from other family members, and a lower level of status in the family – especially if her mother-in-law resides in the household – leads to a decline in utility. However, consanguinity (intermarriage) is common among Pakistani Muslims.[13] Thus, married women in Pakistan are likely to have a deep knowledge of their extended family members, which can be a great source of support and pleasure. We let b reflect the wife's attitude toward her extended family members, which conceivably can account for the composition of her extended family. Positive values of $(b - n_2)$ reflect warmth, a sense of antipathy is captured by a negative value of $(b - n_2)$, which could result from an overly assertive or invasive mother-in-law. A neutral view is depicted by b. Thus, the direct impact of being in an extended family on a wife's utility is ambiguous, and can turn out to advance her utility if she holds a warm enough view of her extended family members. The parameter ψ_f reveals the strength of the link between living in an extended family and utility for the wife.

The wife's time allocation to housework tasks – household public good production – and working outside of the house for an independent income are denoted by e_f^1 and e_f^2 respectively. Thus, her leisure time is

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[11] Lundberg and Pollak (1993) provide convincing arguments for the general validity of the separate sphere perspective in the developing world context.

[12] It is also possible that the contribution of children to the utility of a wife depends on the gender composition of her children. However, for simplicity we do not account for the gender of her children in the bargaining model advanced.

[13] Darr and Modell (1988) claim that about 75% of couples in Pakistan are in consanguineous relations with 50% married to a first cousin. Hussain (1999) offers evidence that two-thirds of marriages in Pakistan are consanguineous based on data from the Pakistan Demographic and Health Survey.

$l_f = 1 - e_f^1 - e_f^2$. We normalize the parameters of the wife's utility function so that; $0 \leq \beta_f, \gamma_f, \delta_f, \psi_f \leq 1$ and

$\beta_f + \gamma_f + \delta_f = 1$ [14]. As noted by AE (2009) this imposes the assumption that x, z and l are normal goods.

Moreover, we are asserting that the influence of living in an extended family on the utility of a wife is independent

of the decisions she makes over these three variables; n_2 is essentially treated as exogenous to her as she chooses

levels of these variables to maximize her utility.

The husband's utility function, which is analogous to that of the wife is specified as:

$$U_m \left(x_m, z, l_m \right) = \beta_m \ln(x_m) + \gamma_m n_1 \ln \left(\frac{z}{n_1} \right) + \delta_m \ln(l_m) + \psi_m \ln \left(n_2 \right) \qquad (2)$$

where x_m denotes the husband's private consumption and l_m leisure. The husband's leisure is the amount of time

remaining after time is allocated to work in the labor market, therefore $l_m = 1 - e_m$. The term $\ln \left(n_2 \right)$ captures the

effect of living in an extended family for the husband. As in the case of the wife, there are likely both positive and negative impulses of residing in a joint household for the husband. It is possible that as the size of the extended family grows a desire for privacy and the tensions that may arise from so many different personalities living under a common roof can reduce the husband's level of utility. However, the combination of support from biologically related family and a sense of duty to attend to the needs of the husband's aging parents,[15] who likely are the patriarchs of the extended family, provide the husband with substantial utility from living in an extended family. Thus, on net, it seems reasonable to assume that for husbands the benefits of living in an extended family outweigh the costs – ψ_m is positive. Finally, the greater the impact of the extended family on the utility of the husband, the larger the value of ψ_m, and as in the case of the wife, the husband's preference parameters can be normalised as,

$0 \leq \beta_m, \gamma_m, \delta_m, \psi_m \leq 1$ and $\beta_m + \gamma_m + \delta_m = 1$.

Recall that it is assumed that a wife provides labour (e_f^1) and a husband provides a financial contribution (y_m)

in the production of the household public good $\left(z \right)$ given the *separate spheres* framework. For simplicity and

tractability we assume the production function for the household public good is linear in its inputs:

$$z = f(y_m, e_f^1) = y_m + (b - n_2)e_f^1, \ b > 0 \qquad (3)$$

The second term in equation 3 stipulates that the effectiveness of the time a wife allocates to the production of the household public good is influenced – weighted – by the presence of extended family members and by her attitude towards them; by household structure. This specification posits that the efficiency of the wife's time contribution to the production of the household public good declines when the size of the extended family rises.

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[14] Notice that $\beta_f + \gamma_f + \delta_f + \psi_f > 1$ (< 1) when $\psi_f > 0$ (< 0). This means her preference for non-children members of the household in a joint family is treated as an externality. This is appropriate since the last term is exogenous and does not play any role in her the optimal behavior.

[15] See Dhami and Sheikh (2000) and Lang (1995).

The wife's effectiveness also declines if she has antipathy towards her extended family. On the other hand, if she has a warm view of them, it will lead to her time in household public good production being more effective. However, even if she enjoys her extended family members, there may be so many of them – especially if they are children – that on net the wife's overall effectiveness in producing the household public good falls (i.e., $n_2 > b$).

In conventional bargaining models, the allocation of resources by a husband or wife is determined by the threat utilities – fall-back position – of each individual. Following the standard approach in the literature (Woolley 1988, Lundberg and Pollak 1993, Chen and Woolley 2001, and Anderson and Eswaran 2009) the threat option is normally defined in the context of the non-cooperative outcome within a marriage. In our analysis, the possibility of divorce is ruled out, since the model is used to guide subsequent empirical work on the determinants of women's empowerment in Pakistan where divorce is uncommon.[16] This assertion is consistent with the idea that women in Pakistan tend to have children because they provide them with joy and they deter the threat of divorce from a male counterpart. This is the key reason for identifying biological children as a threat option for women in the non-cooperative scenario within marriage. Finally we utilize Nash conjectures as an appropriate characterization of agents (husband and wife) regarding their choice making (strategic decisions) in the non-cooperative scenario.

Eliminating the wife's budget constraint by substituting $x_f = \left(w_f e_f^2 + R_f\right)/p_f$ and $z = y_m + (b - n_2)e_f^1$ into her objective function, her optimization problem can be written as:

$$\max_{x_f, e_f^1, e_f^2} U_f = \beta_f \ln\left(\frac{w_f e_f^2 + R_f}{p_f}\right) + \gamma_f n_1 \ln\left(\frac{y_m + (b - n_2)e_f^1}{n_1}\right) + \delta_f \ln\left(1 - e_f^1 - e_f^2\right) + \psi_f \ln\left(b - n_2\right) \quad (4)$$

$$s.t. \qquad 0 \le e_f^1,\ e_f^2 \le 1,\ e_f^1 + e_f^2 \le 1,\ p_f x_f \le w_f e_f^2 + R_f$$

where p_f is the price of the wife's private good consumption and w_f is the implicit wage rate she earns in her independent income earning activity. R_f denotes a wife's financial endowments.

In an analogously manner we eliminate the husband's budget constraint by substituting $x_m = (w_m e_m + R_m - y_m)/p_m$ and $z = y_m + (b - n_2)e_f^1$ into his objective function. Thus, the husband's optimization problem can be expressed as:

$$\max_{x_m, e_m} U_m = \beta_m \ln\left(\frac{w_m e_m + R_m - y_m}{p_m}\right) + \gamma_m n_1 \ln\left(\frac{y_m + (b - n_2)e_f^1}{n_1}\right) + \delta_m \ln\left(1 - e_m\right) + \psi_m \ln(n_2) \qquad (5)$$

$$s.t. \qquad 0 \le e_m \le 1,\ p_m x_m + y_m \le w_m e_m + R_m$$

where p_m is the price of the husband's private good consumption, w_m is the wage rate he earns in the labour market and R_m denotes a husband's endowment of financial assets.

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[16] According to Dommaraju and Jones (2011) only 1.5% of ever-married women in Pakistan in 2006 were currently divorced or separated.

We assume that the utility function for wives and husband's leads them each to consume a positive amount of the private good. Besides, following convention, we assume that both the implicit wage rate w_f and financial endowments R_f of the wife are positive, and likely relatively small compared with the wage w_m rate and endowment R_m of the husband.

Given this set up it is important to remember that an increase in household size, by having more biological children, will likely increase the utility of the wife. However, an expansion of the size of her extended family may enlarge or reduce her level of utility, depending on her relationship with the members of her extended family, and their influence on her role in household production of the public good. Thus, the composition of any increase in household size will play a role in determining the wife's level of happiness.

The first order conditions (FOCs) Nash settings for wife's and husband's optimization problem are respectively shown in the following:

$$\frac{\partial U_f}{\partial e_f^1} = \frac{(b - n_2)\gamma_f n_1}{\left(y_m + (b - n_2)e_f^1\right)} - \frac{\delta_f}{\left(1 - e_f^1 - e_f^2\right)} = 0 \tag{6}$$

$$\frac{\partial U_f}{\partial e_f^2} = \frac{\beta_f w_f}{\left(w_f e_f^2 + R_f\right)} - \frac{\delta_f}{\left(1 - e_f^1 - e_f^2\right)} = 0 \tag{7}$$

Analogously,

$$\frac{\partial U_m}{\partial y_m} = -\frac{\beta_m}{\left(w_m e_m + R_m - y_m\right)} + \frac{n_1 \gamma_m}{\left(y_m + (b - n_2)e_f^1\right)} = 0 \tag{8}$$

$$\frac{\partial U_m}{\partial e_m} = \frac{\beta_m w_m}{\left(w_m e_m + R_m - y_m\right)} - \frac{\delta_m}{\left(1 - e_m\right)} = 0 \tag{9}$$

The equilibrium is solution to the above FOCs (6-9) for $e_f^1, e_f^2, \; y_m \;$ and $\; e_m$ such as:

$$(b - n_2)\left(\delta_f + n_1 \gamma_f\right)e_f^1 + (b - n_2)n_1 \gamma_f e_f^2 + \delta_f y_m + 0 e_m = (b - n_2)n_1 \gamma_f \tag{10}$$

$$\beta_f w_f e_f^1 + w_f\left(\delta_f + \beta_f\right)e_f^2 + 0 y_m + 0 e_m = \beta_f w_f - \delta_f R_f \tag{11}$$

$$0 e_f^1 + 0 e_f^2 - \delta_m y_m + w_m\left(\delta_m + \beta_m\right)e_m = \beta_m w_m - \delta_m R_m \tag{12}$$

$$(b - n_2)\beta_m e_f^1 + 0 e_f^2 + \left(\beta_m + n_1 \gamma_m\right)y_m - n_1 \gamma_m w_m e_m = n_1 \gamma_m R_m \tag{13}$$

From above set of equations (A5-A8) we can write explicitly the solution for $e_f^1, e_f^2, \; y_m \;$ and $\; e_m$:

$$e_f^1 = \frac{\left[(b - n_2)\gamma_f\left(w_f + R_f\right) - \gamma_m w_f\left(\beta_f + \delta_f\right)\left(w_m + R_m\right) + (b - n_2)\gamma_f\left(w_f + R_f\right)\left(n_1 - 1\right)\gamma_m\right]}{(b - n_2)w_f\left[\gamma_f + \gamma_m\left(\beta_f + \delta_f\right) + \gamma_f \gamma_m\left(n_1 - 1\right)\right]} \tag{14}$$

$$e_f^2 = \frac{\left[\beta_f \gamma_m w_f \left(R_m + w_m + (b - n_2)\right) - (b - n_2)\left[\gamma_f + \gamma_m \delta_f + (n_1 - 1)\gamma_f \gamma_m\right]R_f\right]}{(b - n_2)w_f\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]} \tag{15}$$

$$y_m = \frac{\left[\gamma_m w_f\left[1 + (n_1 - 1)\gamma_f\right](w_m + R_m) - (b - n_2)\gamma_f(\beta_m + \delta_m)(R_f + w_f)\right]}{w_f\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]} \tag{16}$$

$$e_m = \frac{\left[w_f w_m(\gamma_m + \beta_m \gamma_f) - \gamma_f \delta_m w_f((b - n_2) + R_m) - (b - n_2)\gamma_f \delta_m R_f + w_f w_m(n_1 - 1)\gamma_f \gamma_m\right]}{w_f w_m\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]} \tag{17}$$

Equations 14 and 15 are the reaction functions of a wife, while the Equations 16 and 17 are the husband's reaction functions. Inspection of these reaction functions reveals the factors that influence the strategic behaviour of each partner in the bargaining framework. Using these response functions we develop the following propositions.

We present the proofs of all 4 propositions and 1 corollary directly below. The propositions are constructed to indicate the impact of threat options generated by alterations in: earned income (wage rate—from participating in the labor market), unearned income, household size, the number of children, and the number of adult extended family members. These propositions guide our empirical analysis.

Our analysis of the wife's and husband's optimization problems generates four propositions and a corollary regarding the effects of an increase in earned income, unearned income (i.e., the endowment of financial assets) and household size – through more biological children and the addition of extended family members – on spousal threat utility in Nash equilibrium settings. Propositions 1 and 2, which explain the strategic actions taken by husbands and wives due to an increase in earned and unearned income (employed and unemployed in our context), are virtually identical to the two proposition presented by Anderson and Eswaran (2009).[17] Propositions 3 and 4 discuss the impact of an increase in the size of a wife's nuclear family and her extended family, respectively, on the behaviour of husbands and wives. Thus, directly below we provide insights on the effects of these two heretofore unconsidered threat effects on the bargaining power of married individuals.

Proposition 1: An increase in the wife's unearned income (unemployed status) is expected to: (a) increase the time she devotes to the production of the public good, (b) reduce the amount of time she devotes to earning independent income, (c) increase her consumption of leisure, (d) decrease her husband's labour contribution to the public good, and (e) reduce the amount of time her husband works.

Proof of proposition 1:

a. $$\frac{\partial e_f^1}{\partial R_f} = \frac{\gamma_f[1 + \gamma_m(n_1 - 1)]}{w_f[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)]} > 0 \tag{18}$$

b. $$\frac{\partial e_f^2}{\partial R_f} = \frac{-\left[\gamma_f + \gamma_m \delta_f + (n_1 - 1)\gamma_f \gamma_m\right]}{w_f\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]} < 0 \tag{19}$$

c. $$\frac{\partial l_f}{\partial R_f} = \frac{\gamma_m \gamma_f}{(b - n_2)w_f(\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)} > 0 \tag{20}$$

d. $$\frac{\partial y_m}{\partial R_f} = \frac{-(b - n_2)\gamma_f(\beta_m + \delta_m)}{w_f\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_2 - 1)\right]} < 0 \tag{21}$$

$$e. \quad \frac{\partial e_m}{\partial R_f} = \frac{-(b-n_2)\gamma_f\delta_m}{w_f w_m \left[\gamma_f + \gamma_m(\beta_f+\delta_f) + \gamma_f\gamma_m(n_1-1) \right]} < 0 \tag{22}$$

Proposition 2: *An increase in a wife's implicit wage rate (employed status) is expected to: (a) decrease the amount of time she devotes to the public good, (b) increase the amount of time she devotes to earning income, (c) increase her husband's contribution to the public good, (d) increase the amount of time the husband works in the labour market, and (e) decrease the husband's private good consumption.*

Proof of proposition 2:

$$a. \quad \frac{\partial e_f^1}{\partial w_f} = \frac{-\gamma_f\left[1+(n_1-1)\gamma_m\right]R_f}{\left(w_f\right)^2\left[\gamma_f+\gamma_m(\beta_f+\delta_f)+\gamma_f\gamma_m(n_1-1)\right]} < 0 \tag{23}$$

$$b. \quad \frac{\partial e_f^2}{\partial w_f} = \frac{\left[\gamma_f+\gamma_m\delta_f+(n_1-1)\gamma_f\gamma_m\right]R_f}{\left[\gamma_f+\gamma_m(\beta_f+\delta_f)+\gamma_f\gamma_m(n_1-1)\right]\left(w_f\right)^2} > 0 \tag{24}$$

$$c. \quad \frac{\partial y_m}{\partial w_f} = \frac{(b-n_2)\gamma_f(\beta_m+\delta_m)R_f}{\left(w_f\right)^2\left[\gamma_f+\gamma_m(\beta_f+\delta_f)+\gamma_f\gamma_m(n_1-1)\right]} > 0 \tag{25}$$

$$d. \quad \frac{\partial e_m}{\partial w_f} = \frac{(b-n_2)\gamma_f\delta_m R_f}{\left(w_f\right)^2 w_m\left[\gamma_f+\gamma_m(\beta_f+\delta_f)+\gamma_f\gamma_m(n_1-1)\right]} > 0 \tag{26}$$

$$e. \quad \frac{\partial x_m}{\partial w_f} = \frac{-(b-n_2)\gamma_f\beta_m R_m}{p_m(w_f)^2(\gamma_f+\gamma_m(\beta_f+\delta_f)+\gamma_f\gamma_m(n_1-1))} < 0 \tag{27}$$

Proposition 3: *More children – an expansion of the nuclear family – are expected to: (a) increase the amount of time a wife devotes to the public good, (b) decrease the amount of time she devotes to earning income, (c) decrease the total amount of her leisure time, (d) decrease the wife's private good consumption (e) increase the husband's contribution to the household public good production, (f) increase the amount of time the husband devotes to labour market, and (g) decrease the husband's private good consumption.*

Proof of proposition 3:

$$a. \quad \frac{\partial e_f^1}{\partial n_1} = \frac{\gamma_f\gamma_m^2(\beta_f+\delta_f)\left[(b-n_2)R_f+(b-n_2)w_f+R_m w_f+w_f w_m\right]}{w_f(b-n_2)\left[\left(\gamma_f+\beta_f\gamma_m-\gamma_f\gamma_m+\delta_f\gamma_m+n_1\gamma_f\gamma_m\right)^2\right]} > 0 \tag{28}$$

$$b. \quad \frac{\partial e_f^2}{\partial n_1} = -\frac{\beta_f\gamma_f\gamma_m^2}{(b-n_2)w_f}\left[\frac{(b-n_2)R_f+(b-n_2)w_f+R_m w_f+w_f w_m}{\left(\gamma_f+\beta_f\gamma_m-\gamma_f\gamma_m+\delta_f\gamma_m+n_1\gamma_f\gamma_m\right)^2}\right] < 0 \tag{29}$$

c. $\dfrac{\partial l_f}{\partial n_1} = \left(1 - \dfrac{\partial e_f^1}{\partial n_1} - \dfrac{\partial e_f^2}{\partial n_1}\right) = \left[-\dfrac{\partial e_f^1}{\partial n_1} - \dfrac{\partial e_f^2}{\partial n_1}\right]$

$$\frac{\partial l_f}{\partial n_1} = -\frac{\gamma_f \gamma_m^2 \delta_f \left[(b-n_2)R_f + (b-n_2)w_f + R_m w_f + w_f w_m\right]}{w_f(b-n_2)\left[\left(\gamma_f + \beta_f \gamma_m - \gamma_f \gamma_m + \delta_f \gamma_m + n_1 \gamma_f \gamma_m\right)^2\right]} < 0 \tag{30}$$

d. $\dfrac{\partial x_f}{\partial n_1} = -\dfrac{\beta_f \gamma_f \gamma_m^2}{(b-n_2)p_f}\left[\dfrac{(b-n_2)R_f + (b-n_2)w_f + R_m w_f + w_f w_m}{\left(\gamma_f + \beta_f \gamma_m - \gamma_f \gamma_m + \delta_f \gamma_m + n_1 \gamma_f \gamma_m\right)^2}\right] < 0 \tag{31}$

e. $\dfrac{\partial y_m}{\partial n_1} = \dfrac{\gamma_m \gamma_f \left[\begin{array}{l} w_f\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right] - \\ \left[\left[\gamma_m w_f\left[1 + (n_1 - 1)\gamma_f\right](w_m + R_m) - (b-n_2)\gamma_f(\beta_m + \delta_m)(R_f + w_f)\right]\right] \end{array}\right]}{\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]^2} > 0 \tag{32}$

As appeared in the above it is ambiguous that husband's contribution may increase (decrease) to household's public good production by increasing number of children.

f. $\dfrac{\partial e_m}{\partial n_1} = \dfrac{\left[\gamma_f \gamma_m\right]\left[\begin{array}{l} w_f w_m\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right] - \\ \left[\begin{array}{l} w_f w_m(\gamma_m + \beta_m \gamma_f) - \gamma_f \delta_m w_f((b-n_2) + R_m) - \\ (b-n_2)\gamma_f \delta_m R_f + w_f w_m(n_1 - 1)\gamma_f \gamma_m \end{array}\right] \end{array}\right]}{\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]^2} > 0 \tag{33}$

The ambiguous sign from above expression relevant to husband's time allocation is consistent with equation A27 which technically work in opposite order.

g. $\dfrac{\partial x_m}{\partial n_1} = \left[\dfrac{w_m}{p_m}\right]\dfrac{\partial e_m}{\partial n_1} - \left[\dfrac{1}{p_m}\right]\dfrac{\partial y_m}{\partial n_1}$

$$= \frac{\gamma_f \gamma_m \left[\begin{array}{l} \left[-w_f w_m(\gamma_m + \beta_m \gamma_f) + \gamma_f \delta_m w_f(b-n_2 + R_m) + (b-n_2)\gamma_f \delta_m R_f\right] + \\ \left[\gamma_m w_f R_m\left[1 + (n_1 - 1)\gamma_f\right] - \gamma_f(b-n_2)(\beta_m + \delta_m)(R_f + w_f)\right] \end{array}\right]}{\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f \gamma_m(n_1 - 1)\right]^2} \tag{34}$$

The results depict that increasing the household size (children) requires a wife's greater time allocation to produce household public good. Correspondingly it lowers the time availability to participate in the labour market to earn an independent income, and also lowers time for leisure. Further results show that by increasing the household size, a wife's private consumption is adversely affected.

Proposition 3 reveals that additional children lead the wife to devote more time to household public good production. Consequently, her leisure and private consumption may decrease. Thus, having more children, and hence a larger nuclear family, may make her worse off. On the contrary, the wife achieves psychological satisfaction and obtains greater social stature in the family by having additional children. As in the absence of children the wife may face a greater chance of divorce initiated by her husband or he can downgrade her status by taking additional wives.[18] Indeed, it is common in Pakistani society for barren wives to experience this form of family dynamic relevant to social pressure (Bhatti et al. 1999). The husband also increases his contribution to household production, at the cost of leisure and private consumption, when his nuclear family expands.[19]

Proposition 4: *An increase in size of the extended family is expected to: (a) decrease the amount of time a wife devotes to the production of the public good, (b) increase the amount of time she devotes to earning an independent income, (e) increase her private consumption, (d) increase her leisure time, (e) increase the husband's contribution to household public good production, (f) increase the amount of time the husband works in the labour market, and (g) decrease the husband's private good consumption and leisure time.*

Proof of proposition 4:

It is straight forward to show that

$$\text{a.} \quad \frac{\partial e_f^1}{\partial n_2} = -\frac{\gamma_m w_f \left(\beta_f + \delta_f\right)\left(w_m + R_m\right)}{\left(b - n_2\right)^2 w_f \left[\gamma_f + \gamma_m \left(\beta_f + \delta_f\right) + \gamma_f \gamma_m \left(n_1 - 1\right)\right]} < 0 \tag{35}$$

$$\text{b.} \quad \frac{\partial e_f^2}{\partial n_2} = \frac{\beta_f \gamma_m w_f \left(R_m + w_m\right)}{\left(b - n_2\right)^2 w_f \left[\gamma_f + \gamma_m \left(\beta_f + \delta_f\right) + \gamma_f \gamma_m \left(n_1 - 1\right)\right]} > 0 \tag{36}$$

$$\text{c.} \quad \frac{\partial x_f}{\partial n_2} = \frac{w_f}{p_f}\frac{\partial e_f^2}{\partial n_2} = \frac{\beta_f \gamma_m w_f \left(R_m + w_m\right)}{w_f p_f (b - n_2)^2 \left[\gamma_f + \gamma_m \left(\beta_f + \delta_f\right) + \gamma_f \gamma_m \left(n_1 - 1\right)\right]} > 0 \tag{37}$$

$$\text{d.} \quad \frac{\partial l_f}{\partial n_2} = \left(1 - \frac{\partial e_f^1}{\partial n_2} - \frac{\partial e_f^2}{\partial n_2}\right) = -\frac{\partial e_f^1}{\partial n_2} - \frac{\partial e_f^2}{\partial n_2}$$

$$\frac{\partial l_f}{\partial n_2} = \frac{\gamma_m \delta_f \left(R_m + w_m\right)}{\left(b - n_2\right)^2 \left[\gamma_f + \gamma_m \left(\beta_f + \delta_f\right) \gamma_f \gamma_m \left(n_1 - 1\right)\right]} > 0 \tag{38}$$

$$\text{e.} \quad \frac{\partial y_m}{\partial n_2} = \frac{\gamma_f \left(\beta_m + \delta_m\right)\left(R_f + w_f\right)}{w_f \left[\gamma_f + \gamma_m \left(\beta_f + \delta_f\right) + \gamma_f \gamma_m \left(n_1 - 1\right)\right]} > 0 \tag{39}$$

$$\text{f.} \quad \frac{\partial e_m}{\partial n_2} = \frac{\gamma_f \delta_m \left(w_f + R_f\right)}{w_f w_m \left[\gamma_f + \gamma_m \left(\beta_f + \delta_f\right) + \gamma_f \gamma_m \left(n_1 - 1\right)\right]} > 0 \tag{40}$$

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[18] In Pakistan it is customary and legal that a man may marry up to 4 wives without divorcing one or more earlier wives.

[19] It is important to note that both spouses may face some social pressure to have children soon after their marriage. If this occurs it is possible that a new, inexperienced mother may severely cut back the time she allocates towards household public good production other than time to take care of her children. This forces the husband to make a larger financial contribution to household public goods production by working more hours, to replace the lost time of the wife. Hence, the husband's utility level may fall, due to the loss of leisure, while the wife is better off by gaining family favour and social advantage.

g. $\quad \dfrac{\partial x_m}{\partial n_2} = \dfrac{w_m}{p_m}\left[\dfrac{\partial e_m}{\partial n_2} - \dfrac{\partial y_m}{\partial n_2}\right] = -\dfrac{\gamma_f \beta_m \left(w_f + R_f\right)}{w_f\left[\gamma_f + \gamma_m\left(\beta_f + \delta_f\right) + \gamma_f \gamma_m\left(n_1 - 1\right)\right]} < 0 \qquad (41)$

h. $\quad \dfrac{\partial l_m}{\partial n_2} = -\dfrac{\gamma_f \delta_m \left(w_f + R_f\right)}{w_f w_m\left[\gamma_f + \gamma_m\left(\beta_f + \delta_f\right) + \gamma_f \gamma_m\left(n_1 - 1\right)\right]} < 0 \qquad (42)$

Before offering a proof of Corollary 1 we discuss the implications of this corollary, which is set out in the above, regarding the effects of increasing unearned income, earned income, and size of the household on spouses' threat utilities.

It is reasonable to assume that more adults in the household results in the provision of both more financial resources and labour inputs for the provision of the household public good. Proposition 4 is consistent with this conjecture since it indicates that as the extended family grows the wife devotes less time to household public good production leaving more time available for work outside of the home and/or leisure. However, the wife may face family restrictions on independent work. In this case the time she saves in public goods production as other adults substitute for her is reallocated to leisure, which ultimately may result in her having more children. A larger extended family by opening up other sources of income to be used in generating the public good may allow the husband to take more time in leisure.

Based on the four propositions we formulate a corollary regarding alterations in husband and wife's threat utilities due to changes in unearned income, earned income, and household structure via a change in household size brought about by either alteration in the size of their nuclear or extended family.

Corollary 1: under reasonable conditions; *(a) An increase in the wife's unearned income increases the threat utility of both spouses, while, (b) an increase in the wife's earned income increases her threat utility but decreases the husband's threat utility, and similarly (c) an increase in the number of biological children increases the wife's threat utility and decreases the husband's threat utility, and (d) an increase in the number of extended household members reduces the wife's threat utility and raises the husband's threat utility depending on the relative preferences of the wife for nuclear household expansion relative to extended household member expansion.*[20,21]

Proof of corollary 1:

Equation 4 can be re-written as:

$$U_f = \beta_f \ln\left(\frac{w_f e_f^2 + R_f}{p_f}\right) + \gamma_f n_1 \ln\left(\frac{y_m + (b - n_2) e_f^1}{n_1}\right) + \psi_f \ln\left(b - n_2\right) + \delta_f \ln\left(1 - e_f^1 - e_f^2\right)$$

Notice the term $\psi_f \ln\left(b - n_2\right)$ which implies that the wife derives negative utility from the drop in her ability to contribute to the public good.

whereas:

$$w_f e_f^2 + R_f = \frac{\beta_f \gamma_m\left[w_f\left(R_m + w_m + b - n_2\right) + \left(b - n_2\right)R_f\right]}{\left(b - n_2\right)\left[\gamma_f + \gamma_m\left(\beta_f + \delta_f\right) + \gamma_f \gamma_m\left(n_1 - 1\right)\right]};$$

$$y_m + (b - n_2)e_f^1 = \frac{n\gamma_f\gamma_m \left[(w_m + R_m + b - n_2) + \frac{(b - n_2)R_f}{w_f} \right]}{\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f\gamma_m(n_1 - 1) \right]};$$

$$1 - e_f^1 - e_f^2 = \frac{\gamma_m\delta_f(b - n_2 + R_m + w_m) + (b - n_2)\gamma_m\delta_f\frac{R_f}{w_f}}{(b - n_2)\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f\gamma_m(n_1 - 1) \right]}$$

Likewise Equation 5 can be re-written as,

$$U_m = \beta_m \ln\left(\frac{w_m e_m + R_m - y_m}{p_m} \right) + \gamma_m n_1 \ln\left(\frac{y_m + be_f^1}{n_1} \right) + \delta_m \ln(1 - e_m) + \psi_m \ln(n_2)$$

whereas:

$$w_m e_m - y_m + R_m = \frac{\gamma_f \left[\beta_m(w_m + b - n_2) + (1 - \delta_m + \gamma_m)R_m + \frac{(b - n_2)\beta_m R_f}{w_f} \right]}{\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f\gamma_m(n_1 - 1) \right]};$$

$$y_m + (b - n_2)e_f^1 = \frac{n_1\gamma_f\gamma_m \left[(w_m + R_m + b - n_2) + \frac{(b - n_2)R_f}{w_f} \right]}{\left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f\gamma_m(n_1 - 1) \right]};$$

$$(1 - e_m) = \frac{\delta_m\gamma_f \left[w_m + (b - n_2 + R_m) + (b - n_2)\frac{R_f}{w_f} \right]}{w_m \left[\gamma_f + \gamma_m(\beta_f + \delta_f) + \gamma_f\gamma_m(n_1 - 1) \right]}$$

a) an increase in the wife's unearned income increases the threat utility of both spouses.

$$\frac{\partial \overline{U}_f}{\partial R_f} = \frac{\gamma_m\gamma_m \left((b - n_2)\gamma_f^2 n_1 + w_f\beta_f^2 \right)}{w_f \left(\gamma_f + \beta_f\gamma_m - \gamma_f\gamma_m + \delta_f\gamma_m + n_1\gamma_f\gamma_m \right)} > 0 \qquad (43)$$

similarly,

$$\frac{\partial \overline{U}m}{\partial R_f} = \frac{(b - n_2)\gamma_f \left[\delta_m^2 + w_m \left(\beta_m^2 + n_1\gamma_m^2 \right) \right]}{w_f w_m \left(\gamma_f + \beta_f\gamma_m - \gamma_f\gamma_m + \delta_f\gamma_m + n_1\gamma_f\gamma_m \right)} > 0 \qquad (44)$$

b) increase in the wife's wage rate increases her threat utility but decreases the husband's.

$$\frac{\partial \overline{U}_f}{\partial w_f} = \frac{\beta_f w_f (R_m + w_m + b) - b(n_1\gamma_f + \delta_f)R_f}{w_f \left[w_f(R_m + w_m + b) + bR_f \right]} > 0 \qquad (45)$$

Similarly husband's reaction to increasing wife's wage rate is:

$$\frac{\partial \overline{U}_m}{\partial w_f} = -\frac{(b-n_2)\gamma_f R_f\left[\delta_m^2+w_m\left\{\beta_m-\gamma_m\left(\beta_m+n_1\gamma_m\right)\right\}\right]}{w_f^2 w_m\left(\gamma_f+\beta_f\gamma_m-\gamma_f\gamma_m+\delta_f\gamma_m+n_1\gamma_f\gamma_m\right)} < 0 \tag{46}$$

c) an increase in the household size will increase threat utility of husband and wife when the utility from one child outweighs the disutility from having an additional child and vice versa.

$$\frac{\partial \overline{U}_f}{\partial n_1} = \frac{\delta_f+\beta_f(b-n_2)}{\gamma_f\gamma_m}\left[\gamma_f+\gamma_m\left(\beta_f+\delta_f\right)+\gamma_f\gamma_m\left(n_1-1\right)\right]+$$

$$\gamma_f n_1\left[\left(w_m+R_m+b-n_2\right)+\frac{(b-n_2)R_f}{w_f}\right]+\gamma_f\ln\frac{\gamma_f\gamma_m\left[\left(w_m+R_m+b-n_2\right)+\frac{(b-n_2)R_f}{w_f}\right]}{\left[\gamma_f+\gamma_m\left(\beta_f+\delta_f\right)+\gamma_f\gamma_m\left(n_1-1\right)\right]} > 0 \tag{47}$$

The term $\gamma_f\ln\left(\frac{y_m+(b-n_2)e_f^1}{n_1}\right)$ in the utility function implies the utility from one unit of $n_1 > 0$. As all other

terms are negative and represent the disutility from increasing the size of the household (including children).

Therefore, $\frac{\partial U_f}{\partial n_1} > 0$ reflects when the utility from a unit of 'n_1' outweighs the disutility from adding an extra child

and vice versa.
Further;

$$\frac{\partial \overline{U}_f}{\partial n_1} = \gamma_f\ln\left(\frac{y_m+(b-n_2)e_f^1}{n_1}\right)-\frac{\gamma_f\gamma_m\left(\beta_f+\delta_f+\gamma_f n_1\right)}{\left[\gamma_f+\gamma_m\left(\beta_f+\delta_f\right)+\gamma_f\gamma_m\left(n_1-1\right)\right]} \tag{48}$$

$$\frac{\partial \overline{U}_f}{\partial n_1} > 0 \text{ when } \ln\left(\frac{y_m+(b-n_2)e_f^1}{n_1}\right) > \frac{1}{\left[1+\frac{\gamma_f(1-\gamma_m)}{\gamma_m\left(\beta_f+\delta_f+\gamma_f n_1\right)}\right]} \tag{49}$$

$$\frac{\partial \overline{U}_f}{\partial n_1} < 0 \text{ when } \ln\left(\frac{y_m+(b-n_2)e_f^1}{n_1}\right) < \frac{1}{\left[1+\frac{\gamma_f(1-\gamma_m)}{\gamma_m\left(\beta_f+\delta_f+\gamma_f n_1\right)}\right]} \tag{50}$$

$$\frac{\partial \overline{U}_f}{\partial n_1} = 0 \text{ when } \ln\left(\frac{y_m+(b-n_2)e_f^1}{n_1}\right) = \frac{1}{\left[1+\frac{\gamma_f(1-\gamma_m)}{\gamma_m\left(\beta_f+\delta_f+\gamma_f n_1\right)}\right]} \tag{51}$$

Similarly,

$$\frac{\partial \overline{U}_m}{\partial n_1} = \frac{\beta_m + \delta_m w_m}{\gamma_f \gamma_m}\left[\gamma_f + \gamma_m\left(\beta_f + \delta_f\right) + \gamma_f \gamma_m\left(n_1 - 1\right)\right]+$$

$$\gamma_m n_1\left[\left(w_m + R_m + b - n_2\right) + \frac{\left(b - n_2\right)R_f}{w_f}\right] + \gamma_m \ln \frac{\gamma_f \gamma_m\left[\left(w_m + R_m + b - n_2\right) + \frac{\left(b - n_2\right)R_f}{w_f}\right]}{\left[\gamma_f + \gamma_m\left(\beta_f + \delta_f\right) + \gamma_f \gamma_m\left(n_1 - 1\right)\right]} > 0 \qquad (52)$$

Further,

$$\frac{\partial \overline{U}_m}{\partial n_1} = \gamma_m \ln\left(\frac{y_m + \left(b - n_2\right)e_f^1}{n_1}\right) - \frac{\gamma_m}{1 + \frac{\gamma_m\left(1 + \gamma_f\right)}{\gamma_f\left(\beta_m + \delta_m + n_1\gamma_m\right)}} \qquad (53)$$

$$\text{a.} \quad \frac{\partial \overline{U}_m}{\partial n_1} > 0 \text{ when } \ln\left(\frac{y_m + \left(b - n_2\right)e_f^1}{n_1}\right) > \frac{1}{1 + \frac{\gamma_m\left(1 + \gamma_f\right)}{\gamma_f\left(\beta_m + \delta_m + n_1\gamma_m\right)}}$$

$$\text{b.} \quad \frac{\partial \overline{U}_m}{\partial n_1} < 0 \text{ when } \ln\left(\frac{y_m + \left(b - n_2\right)e_f^1}{n_1}\right) < \frac{1}{1 + \frac{\gamma_m\left(1 + \gamma_f\right)}{\gamma_f\left(\beta_m + \delta_m + n_1\gamma_m\right)}}$$

$$\text{c.} \quad \frac{\partial \overline{U}_m}{\partial n_1} = 0 \text{ when } \ln\left(\frac{y_m + \left(b - n_2\right)e_f^1}{n_1}\right) = \frac{1}{1 + \frac{\gamma_m\left(1 + \gamma_f\right)}{\gamma_f\left(\beta_m + \delta_m + n_1\gamma_m\right)}}$$

This gives the same interpretation as we have observed in the above. Moreover, the above expression has an ambiguous sign, it is reasonable to assume that it will be positive as a negative sign would mean that the size of the public good is insignificant as the second term is less than 1. Assuming $\ln(z/n_1) \geq 1$, which is not unreasonable as it requires the joint contribution of husband and wife to public good to be non-negligible.

Given the increased earned income of a wife, it increases her private consumption thereby lowering the contribution towards household public good production. Consequently, the increased earned income of a wife increases her threat utility. However, this lowers the husband's private consumption and leisure thereby increasing his financial contribution in household public good production. As a result, the increased earned income of a wife decreases her husband's threat utility. Further results depict that increasing the size of the household demands a greater input from the wife to contribute in the household public good production at the expense of working for an independent income. However, depending on her preferences, she may still be better off by having greater leisure time by not working outside of the household. Similarly, increasing the size of the household requires greater financial input from the husband to the production of household public good. Consequently the above effect decreases a husband's leisure and private consumption. Therefore, in the non-cooperative scenario, increasing the household size may lead to a lower contribution by the wife to the household public good production, yet increase her earned income by working for an independent income without decreasing her leisure. The time taken off from the household public good production is offset by spending more time earning an independent income. Conversely, greater time and financial input is required from the husband towards household good production by lowering his

leisure. Therefore, in this particular context, a wife is better off and a husband is worse off hence the wife may have a greater threat utility over her husband. Therefore, in the following we present the proof of last part of the corollary.

d) an increase in the non-children household size (n_2) increase wife's threat utility when she has strongly negative preference for joint family system and decreases the husband's threat utility when his preference for joint family system is negative or not strongly positive.

$$\frac{\partial U_f}{\partial n_2} = \frac{(1-\psi_f)w_f(R_m + w_m)}{(b-n_2)\left[w_f(R_m + w_m) + (b-n_2)(w_f + R_f)\right]} -$$

$$\frac{\left[(1-\beta_f - \delta_f)w_f(R_m + w_m) + (\psi_f + n\gamma_f)(b-n_2)(w_f + R_f)\right]}{(b-n_2)\left[w_f(R_m + w_m) + (b-n_2)(w_f + R_f)\right]} \tag{54}$$

As n_2 increases the contribution of wife to public good decreases, outside labour and leisure increases and so the threat utility increases given the woman's negative preferences to live in the joint family system which is common in the society under investigation. On the same token threat utility may decrease mainly because an increase in n_2 decreases the value of here contribution to the public good which also result in a psychological cost captured by ψ_f. In other words $\frac{\partial U_f}{\partial n_2} < 0$ when $\psi_f = 1$ (negative preference for joint family is strong), and may be positive when preference are weak. i.e. $\frac{\partial U_f}{\partial n_2} > 0$ when

$$\psi_f < \frac{(\beta_f + \delta_f)w_f(R_m + w_m) - n\gamma_f(b-n_2)(w_f + R_f)}{\left[w_f(R_m + w_m) - (b-n_2)(w_f + R_f)\right]}$$

Analogously,

$$\frac{\partial U_m}{\partial n_2} = -\left[\frac{\dfrac{(\beta_m{}^2 + n_1\gamma_m + \delta_m)(w_f + R_f)}{\left[w_f\beta_m(w_m + b - n_2) + (1-\delta_m + \gamma_m)R_m + \dfrac{(b-n_2)\beta_m R_f}{w_f}\right]} +}{\dfrac{1}{w_f\left[(w_m + R_m + b - n_2) + \dfrac{(b-n_2)R_f}{w_f}\right]}}\right] - \frac{\psi_m}{n_2{}^2} < 0 \tag{55}$$

Since all terms on the right hand side of $\frac{\partial U_m}{\partial n_2} < 0$ are negative except $\frac{\psi_m}{n_2}$, the husband threat utility is decreasing in non-children household size unless the husband has strong positive preference for joint family system. The

husband utility is therefore decreasing in n_2 when his preference for joint family system is negative or positive but weak.

The insights gained from propositions 1- 4 and the associated corollary can provide guidance in identifying the factors that contribute to a wife's autonomy – empowerment – in the family. To see this let U_f and U_m denote respectively utilities of wife and husband in the non-cooperative settings of the model outlined above. Anderson and Eswaran (2009) note these threat utilities will influence the cooperative outcome that characterizes a marriage. Thus, it is plausible to assume that husband and wife maximize their joint utility $(\alpha U_f + (1 - \alpha)U_m)$ from the cooperative outcome, where α (with $0 \le \alpha \le 1$) the weight on wife's utility measures her bargaining power in the household.

Finally, we presume α to be increasing in her threat utility and decreasing in her husband's threat utility. However, we do not solve for the cooperative situation because α is determined by the non-cooperative outcome. Thus, we expect α to depend on the wife's unearned income, if she works for independent income outside of the home, and the size and composition of her household (i.e., family structure) – whether it is an extended family or solely nuclear – and the total number of family members. This leads to the following conjectures: under likely conditions a married women's autonomy or empowerment advances if; she is employed, has more children, and if there are fewer adult extended family members of her family.

We now turn to the task of estimating the impact of threat utilities, and other factors, on female autonomy in the household while accounting for the potential endogeneity of employment for pay and fertility.[22]

3. Sources

To estimate the determinants of female autonomy – empowerment – in family decision-making we use data from the Pakistan Social and Living Standards Measurement Survey: 2005-2006 conducted by the Federal Bureau of Statistics. The PSLM was implemented to assess progress toward realization of the Millennium Development Goals. Therefore, it contains detailed information on economic and social factors related to the well-being of the household including educational attainment, labor force status, family consumption, and the health of children in the home. For each household taking part in the PSLM, two separate surveys are conducted. One survey is completed by the male who is the direct head of the household (i.e., the husband, not an extended family member such as his father). The second survey is completed by the wife considered the direct female head of the family (i.e., not the wife of the family patriarch). There are many identical questions embedded in both the male and female surveys, but the surveys are not identical. For instance, the Female Survey contains sections covering; pre and post-natal care of the most recent child born, family planning, household food expenditures, the health of young children, and decision making – family rules from the perspective of the women – in various spheres which are not included in the Male Survey.

The PSLM is based on a two-stage stratified sampling design in which 5,204 villages and enumeration blocks in urban and rural areas – located in each of the four provinces of Pakistan – are the Primary Sampling Units (PSU). A random set of households within each of the PSU's are selected for inclusion in the Survey. There were 15,453 households chosen to participate in the PSLM: 2005-2006. In these households, there were 25,651 women age 15-49.[23] We further restricted our analysis to married women in this age bracket, which reduces the data set we utilize

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[22] For a discussion the latent assumptions that underlie empirical work on female empowerment that is guided by a non-cooperative husband-wife bargaining framework see Anderson and Eswaran (2009, pp. 183). For instance, in our empirical work the threat utility for a wife of working for pay, the number of own children, and the size of her adult extended family all operate as leverage linked factors in cooperative and conflicting situations.

[23] 1047 women in this group were not present at home at the time of interview therefore they are excluded from the sample of

to 15,524 women.[24]

The PSLM: 2005-2006 is well suited for examining the determinants of female empowerment in the household for four reasons. First, it furnishes information on a wife's level of decision-making authority in four different spheres of family life – family expenditures on clothing, food, medical treatment, and recreation. Essentially, what is provided is who has the authority to make decisions over various family activities – the family's rules or culture – which in Pakistani families is typically put in place by the family patriarch (i.e., senior male in the household).

Second, the PSLM provides information on a wife's employment status, as well as the size and composition of both her nuclear and extended family – information on family structure. This data allows us to test whether her level of empowerment over family spending is influenced by whether she works outside the home, if she has children, and the size of her family – whether nuclear or extended – as predicted by the husband-wife bargaining model we advanced.

A third desirable feature of these data is that the survey provides direct information on the decision-making culture of the family prescribed by the family patriarch regarding who establishes a wife's prospects for employment outside the home and her fertility goals. We use this information on family rules to help predict the number of biological children a wife has and her employment status – outcomes expected to influence a wife's level of empowerment in making decisions about family spending patterns. Thus, a family's rules over who makes decisions about a wife's life, while not expected to directly impact her authority to take actions affecting family expenditures – her level of empowerment or autonomy – is presumed to have an indirect impact. The logic here is that family rules directly impact how many children she has and if she works for pay which in turn are likely to play a role in her freedom to control family spending.

Finally, the PSLM provides rich demographic and family information, along with information on characteristics of the husband and wife. Thus, a wide array of factors expected to shape a wife's empowerment can be accounted for in our empirical analysis. Consequently, we are able to disentangle the influence of a wife's work status, and family make-up – both size and composition – on her capacity to make family expenditure decisions from other factors likely to influence her level of spending empowerment.

4. Estimation Strategy

Our empirical work explores the determinants of household spending autonomy experienced by married women, guided by the theoretical model of husbands-wife bargaining we advanced. Of particular interest is the influence of being employed and having children on a woman's level of autonomy, since these were identified as important "threat options" in the bargaining process. Let a married woman's autonomy – Empowerment – function, A_i, be represented by the following expression:

$$A_i = X_i\beta + \lambda(Employed_i) + \gamma(Number \; of \; Children_i) + \varepsilon_i \qquad (56)$$

where *i* refers to the married women's spending empowerment (i.e., the aggregate of food or clothing and footwear). X_i is a vector of controls – other variables also expected to influence a married woman's level of empowerment – including household structure, characteristics of the wife and her husband, household status and locational fixed effects (i.e., province of residence, and urban or rural setting), while ε_i is a random normally distributed error.

The fundamental challenge in estimating female empowerment, equation (56), is that in Pakistan a married

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women 15-49 years of age reducing this group to 24,604.

[24] To promote accuracy of the data collected the Federal Bureau of Statistics (FBS) used a system where the household surveys conducted by interviewers were checked by supervisors in the field, after which these surveys were further reviewed at Regional Field Offices. At the Regional Field Offices minor edits were conducted if necessary before the household surveys were sent to FBS headquarters in Islamabad for entry into the PSLM.

woman's level of authority over important household spending decisions may also influence her prospect for working outside of the home and her fertility status – reverse causality leading to endogeneity bias. Thus, we adopt a two-stage estimation process. In the first-stage we separately estimate whether a married woman is *Employed*, and the *Number of* (her) *Children*, using the *Family Rule* – for each of these – as an instrumental variable.[25] The fundamental idea is that a household's rules – traditions and norms regarding female fertility and work outside the home – which are governed by the family patriarch and are thus exogenous to her – directly impact these outcomes. However, the family's cultural orientation or rules towards female employment and fertility are presumed to only indirectly impact a wife's level of empowerment over family spending – through their effects on employment and fertility. As part of our empirical work, we assess the validity of this assertion.

Fortunately, the PSLM provides information on a family's rules – cultural orientation or norms regarding female employment and female fertility goals – allowing us to construct the relevant instruments that arguably only impact female spending empowerment indirectly, through their impact on working and having children. Married female survey respondents reported, from a range of options the rule in their household – who has been granted authority over their opportunity to work.[26] We use this information to construct a series of binary indicators, which together reflect an array of family cultures regarding women in their household working outside of the home for pay.

In our view, when a married woman reports that the family's rule is that she has sole authority over whether she works or seeks to have children it simply reflects a situation where the family patriarch makes his preferences on these issues known to her, she makes clear that she has internalized his perspective, and in return he does not explicitly grant others authority over these decisions.[27] Thus, it appears she has control over these features of her life, but if she behaved in ways inimical to the family patriarch, she would face costs – social and otherwise. These costs would likely be severe enough to inspire her to alter her behaviour to coincide with the wishes of the family patriarch.

Similarly, the PSLM survey included another question asking female respondents who make decisions over whether they should have more children.[28] Again, using these responses we develop a series of binary indicators – reflecting different family rules – to capture a range of family cultures regarding a female household member's fertility.

Our estimation strategy entails the estimation of the following system of simultaneous equations in two first-stage regressions, using two stage least square (2SLS) respectively *Employed* (*Employed* = 1 if the wife works for pay outside the home, 0 otherwise) and the *Number of Kids* variable that ranges from 0 to 14.

$$Employed_i = \psi(X_i) + \phi\left(FamilyRule_{ij}^{Working}\right) + \eta_i \qquad (57)$$

$$Number\ of\ Kids_i = \varphi(X_i) + \pi\left(FamilyRule_{ij}^{Fertility}\right) + \tau_i \qquad (58)$$

Many scholars (Orloff 2002; Stier et al. 2001; Sörensen and Bergqvist 2002; Hilgeman and Butts 2009) have pointed

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[25] Essentially, we assert that a family's rules (cultural practice and beliefs) over her fertility and capacity to work for pay are different. We offer evidence consistent with this presumption in the results section of the paper.

[26] The options included; woman alone, head/father in law of the household decides alone, head/father in law consultation with his spouse, head/father and other male members decide, head/father in law and spouse of the head/father in law in consultation with the woman concerned, head/father in *consultation* with the woman concerned, and other combination of persons decides. There are two additional options that a woman could select, "woman concerned is too old to work" and "woman concerned has no interest in work." We include indicator variables for these options, but do not consider them ways to measure family norms toward female employment.

[27] This is consistent with Dyson and Moore (1983) who assert that in patriarchal societies "females are socialized to believe that their own interests and wishes are subordinate to those of the family group."

[28] The options included; woman alone, husband alone, mother of woman or husband, husband and women jointly, woman herself, nobody, in the hands of God, other, and menopausal/infertile. Again, we construct indicator variables for the final two options, but do not regard them as measures of family orientation toward married female fertility.

out that the social-democratic welfare regime has been successful in removing barriers in combining childbearing and employment of working women. Likewise, progressive governments also encourage and promote fertility and high rates of female employment. Hence several researchers (Bernhardt, 1993; Engelhardt et al., 2004; Kögel, 2004; Oshio 2019) have empirically established feedback connections between employment and fertility. Therefore, we write Equations (57)-(58) as

$$Employed_i = \psi(X_i) + \phi\left(FamilyRule_{ij}^{Working}\right) + \theta(Number\ of\ Kids_i) + \eta_i \qquad (59)$$

$$Number\ of\ Kids_i = \varphi(X_i) + \pi\left(FamilyRule_{ij}^{Fertility}\right) + \gamma(Employed_i) + \tau_i \qquad (60)$$

$$A_{ij} = \beta(X_i) + \lambda(P\text{-}Employment_i) + \gamma(P\text{-}Number\ of\ Kids_i) + \varepsilon_i \qquad (61)$$

The first-stage equations, (9) and (10), are identified by the relevant vector of instrumental variables $FamilyRule_{ij}^{Working}$ and $FamilyRule_{ij}^{Fertility}$ respectively. Using the coefficient estimates from equations (59) and (60) we generate predictions (*P*) for these variables denoted as *P-Employment* and *P-Number of Kids*. Then, we estimate the endogenous variable of interest, empowerment of the wife over spending, A_i, in the second-stage.

This procedure produces consistent parameter estimates for equation (61), which can be interpreted as causal determinants of women's empowerment in the household. Later, when we report our first-stage findings, we offer evidence that our first-stage estimates are over identified – a number of the bivariate instruments are statistically significant. Moreover, when reporting our estimates of female empowerment we offer evidence that our overidentification restrictions are valid based on the Sargan test, (i.e., cannot reject the hypothesis that the instruments are uncorrelated with the residuals of equation (61)).[29] In estimating equations (59 - 61) we use the corrected standard errors.[30]

Most marriages in Pakistan are arranged (Kurian 1991). As a result, our identification strategy would be undermined if the parents learned their daughter's preferences regarding work and fertility and then arranged for them to marry into a family whose culture over both of these matched her desire. In this case, the indicators of family culture regarding employment and fertility would be endogenous to the married woman. However, this is unlikely to be the case since so many marriages are consanguineous and these are often arranged at birth[31] – long before the girl's attitudes about working for pay outside the home and childbearing are known.

5. Variable Measurement and Descriptive Analysis

5.1. Descriptive statistics

Our empirical work is conducted on a sample of 15,524 married women, and all of our estimates are generated using population weights to maintain the national representative nature of the data. Of particular interest is how we measure women's decision-making authority over household spending, our dependent variable in for equation (61).

5.1.1. Female Empowerment

Married women respondents in the PSLM reported their level of authority when selecting and purchasing

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[29] Thus our instruments satisfy the exclusion restriction.
[30] This takes care of heteroscedasticity an issue that commonly arises in the cross-sectional estimation. It is also relevant to note that we utilize weighted survey data (based on stratified sampling) so the estimation procedure is svyset (linearized) in STATA, which produces robust standard errors in all our estimations. For further discussion see Lohr, S. L. (1999).
[31] For a journalistic discussion of this situation, based on interviews with young women in Pakistan, see Ladly (2012).

essential household goods, not only for themselves, but also for children and other family members living in the same house – in four spheres: food, clothing and footwear, medical treatment, and recreation and travel. In each of the four spheres of spending she identified, from a list of 7 options, who in the family had the authority to make expenditure decisions. The convention in the literature, which we also follow, is to gauge female spending empowerment using a binary indicator – Female Empowerment – which takes on a value of 1 if a woman has At Least Some Empowerment and a value of 0 (i.e., No Empowerment) otherwise. A woman was classified as having No Empowerment if she indicated having no voice (response category 2 or 6) in making spending decisions in that realm. If a woman reported that she was the sole decision maker over spending in a particular sphere (response category 1) or she reports playing a role, along with some grouping of others in the family, in making spending decisions (i.e., she selects response category; 3, 4, 5, or 7) – she is designated as having *At Least Some Empowermen*t in that sphere.

We then develop a binary Aggregate Empowerment – decision-making – indicator, which is our dependent variable, to reflect her decision-making status collectively across the four spheres of spending. *Aggregate Empowerment* takes on a value of 1 if a woman is empowered to make family spending decisions in at least 1 of the four spending spheres, and 0 otherwise (i.e., she has no empowerment in each of the four spending realms).

Table 1 provides information on the level of aggregate empowerment. For our entire analysis sample of 15,524 married women, 17% of married women have *No Aggregate Empowerment*, and 83% have *At Least Some Aggregate Empowerment*.

Table 1. Married Female Empowerment

Autonomy Level	Subsamples					
	Employed	*Not Working*	*Nuclear*	*Extended*	*Children*	*No Children*
Aggregate						
No Empowerment	17	35	22	35	32	44
At Least Some Empowerment	83	65	78	65	68	56
Number of Observations	1,460	14,064	2,027	13,497	13,482	2,042

Notes: Data source; Pakistan Social and Living Standards Measurement Survey (PSLM): 2005-2006.

Table 2 presents a detailed explanation of how we measure all of the variables used to estimate the determinants of aggregate female empowerment, and Table 3 presents descriptive statistics for these variables.

In our analysis sample, 13% of married women live in a nuclear family while 87% reside in an extended family. The average extended family contains 9 adults aside from the wife and her husband and eighty-seven percent of married women who live in an extended family report that their mother in law lives with them in the household. Only 13% of married women are childless. Married women with children, across both household types (nuclear and extended), have 4 offspring living with them on average. The average age of our sample of married women is 32, and over 9% are employed for pay. Seventy-one percent of the married women reported that they never attended formal school, while 15% completed *some schooling* and 14% accumulated more than 8 years of formal education. Their husbands were 38 years old on average, and far fewer of them – 38% – had no education. Twenty-nine percent of the husbands have some education and a third completed more than 8 years of formal schooling.

Punjab is the most common province of residence for the respondents in our sample (37%) and a quarter live in Sindh, while the smallest share of our sample lived in Baluchistan (15%). Most of the women in our sample lived in a rural area – only 38% lived in an urban locale.

Table 2. Variable Definitions

Variable Name	Definition
At Least Some Aggregate Empowerment	1 if married women has *At Least Some Empowerment in one of the 4 spending spheres*, 0 otherwise
Employed	1 if married women works outside of the home for pay, 0 otherwise
Number of (her) *Children*[Π]	Number of married women's biological offspring living with her
Extended Family	1 if married women lives in an extended family, 0 otherwise
# Adult Extended Family Members	Total number of adult non-nuclear family members living in the household
Mother in Law Present	1 if the wife's mother in law living with the wife and her family, 0 otherwise
W-Age	Age of the married women in years
W-Some Education	1 if married women attended & completed ≤ 8 years of school, 0 otherwise
W-Well Educated	1 if married women attended & completed > 8 years of school, 0 otherwise
H-Age	Age of the married women's husband
H-Some Education	1 if her husband attended & completed ≤ 8 years of school, 0 otherwise
H-Well educated	1 if her husband attended & completed > 8 years of school, 0 otherwise
SES–Medium	1 if household socio-economic status lies in quantile 2-4, 0 otherwise
SES–High (quantile 5)	1 if household socio-economic status lies in quantile 5, 0 otherwise
Punjab	1 if household resides in Punjab, 0 otherwise
Sindh	1 if household resides in Sindh, 0 otherwise
Khyber Pakhtunkhwa	1 if household resides in Khyber Pakhtunkhwa, 0 otherwise
Baluchistan	1 if household resides in Punjab, 0 otherwise
Urban	1 if household resides in Punjab, 0 otherwise

Table 3. Variable Means for Determinants of Female Empowerment

Variable	Full Sample (mean)
Household Structure	
Nuclear Family	13%
# Adult Extended Family Members	9
Mother in Law Present [τ]	87%
No Children	13%
Number of (her) Children [Π]	4
Female Respondent	
Employed	9%
W-Age	32
W-No Education	71%
W-Some Education (1-8 years)	15%
W-Well Educated (above 8years)	14%

Husband	
H-Age	38
H-No Education	38%
H-Some Education (1-8 years)	29%
H-Well educated (above 8years)	33%
Household Socioeconomic Status	
SES–Low (quantile 1)	20%
SES–Medium (quantile 2-4)	59%
SES–High (quantile 5)	21%
Residential Location	
Punjab	37%
Sindh	25%
Khyber Pakhtoonkhwa (KPK)	23%
Baluchistan	15%
Urban	38%
# of Observations	15,524

Notes: Data source; Pakistan Social and Living Standards Measurement Survey (PSLM): 2005-2006. τ applies only to extended families. ᴨ applies only to families with children.

5.2. Family Rules Regarding Employment and Fertility

Table 4 and Table 5 provide information on the distribution of family rules – based on the family's decision-making structure as perceived by married female respondents in our analysis sample – regarding their employment and fertility respectively. Inspection of column 2 of Table 4 reveals that 50% of the married women in our sample live in a household where the family rule is that the family patriarch alone makes the decision, concerning whether she can work outside of the home. Moreover, another 24% of married women reside in a household where the family patriarch and his spouse (i.e., the family matriarch) together make decisions about married female employment. In only 4% of households does the family patriarch or the patriarch and his spouse consult with the married woman concerned in establishing the family's rule or orientation toward female household members working outside of the home for pay. Finally, in 9% of families, the family rule is for the woman concerned to have a sense that she can decide on whether to work outside the home for pay, but of course this is clearly subject to the approval of the household head – who is the actual decision maker.

Examination of Table 5 reveals that for the full sample of married women, 61% of families have a rule in which the husband of the women and the woman jointly make fertility decisions. While 14% of household are ones where the husband alone is perceived to make this decision. Married women in another 14% of families reported that God is responsible for whether they have children.[32] Interestingly, the pattern of family types, based on culture toward fertility, is very similar amongst families without children and those where there are children.

6. Empirical Results and Discussion

The theoretical framework advanced in this paper suggests that female employment and fertility (having more children) are factors that influence empowerment, but these are conceivably endogenous. For instance, a woman who makes decisions on household spending may be given more latitude to work outside the home and face less

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[32] Seven percent of married women report that "nobody" influences her decision about fertility. We interpret this to mean that in these households the underlying presumption is that married women are aware of the expectation for them to have children and there is no need for the family patriarch or anyone else to remind her of this goal.

pressure to have additional children. To address this form of endogeneity we posit that family rules regarding work for pay outside of the home and family orientation toward female fertility – both of which are determined by the family patriarch – are exogenous to the married women. Moreover, we argue it is plausible that these forms of family rules do not directly affect a married women's level of empowerment; their influence on female autonomy is indirectly operating through their impact on paid employment prospects and childbearing. Moreover, we assert that a family's rules regarding the employment of married women in the household is different from its orientation toward married female fertility.

Table 4. Family Rules towards Married Female Employment, Full Sample and by Labor Force Status

Family Rules	Proportions		
	Full Sample	**Employed**	**Not Working**
Head/Father of the household decides alone	50	27	50
Head/Father in consultation with his/her spouse	24	36	23
Head/Father in consultation with the woman concerned	2	3	2
Head/Father and spouse of the head in consultation with the woman concerned	2	2	2
Head/Father and other male members decide	4	1	4
Other combination of persons decides	1	1	1
Woman herself	9	26	7
Too old to work	2	1	2
Woman concerned has no interest in work	10	5	10
Number of Observations	15,524	14,064	1460

Notes: Data source; Pakistan Social and Living Standards Measurement Survey (PSLM): 2005-2006. The numbers reported are rounded off, therefore columns may not sum exactly to 100.

Table 5. Family Rules towards Married Female Fertility, Full Sample and by Children

Family Culture	Proportions		
	Full Sample	Have Children	No Children
Husband alone	14	14	13
Woman herself	4	4	3
Husband & woman jointly	61	61	55

Mother of woman or husband	0	0	1
Nobody	7	7	8
Other	0	0	0
It is in the hands of God	14	14	18
Number of Observations	15,523	13,481	2042

Notes: Data source; Pakistan Social and Living Standards Measurement Survey (PSLM): 2005-2006. We do not report the mean for the option "Menopausal/infertile." The numbers reported are rounded off, therefore columns may not sum exactly to 100.

6.1. First-Stage Estimates

In Table 6a and Table 6b we provide evidence on the impact of measures of family rules regarding work outside of the home for pay and fertility – the proposed instruments – on employment and the number of children a woman has brought into the world who live with her.

6.1.1. Female Employment

Table 6a presents our first stage estimates of female employment. The key variables of interest are the six binary indicators used to capture alternative types of family culture – rules – toward female employment for pay. In this regression, the reference category is a family environment where the female senses that she has the license to make this decision. All six of the indicators are negatively related to the likelihood of working and significant at the 99% level of confidence.[33] Our findings suggest that family rules are the major impediments to women's employment outside of the household. For instance, women in families where the family patriarch alone makes this decision are 20 percentage points less likely to be working than a woman in a family where she believes that the family rule is one where she – alone – can decide to work outside of the home for pay. This is followed by all other combinations of family rules which also diminish the chances of females working outside of the household. Moreover, an F test with the null that all of the instruments together have no impact on the probability of employment – a standard means of evaluating the empirical validity of the set of instruments – is rejected at the 99% level of confidence. Thus, our findings suggest that household traditions or family culture – family rules – are an important determinant of women's employment outside of the household.

Regarding childbearing and employment, the literature indicates a diverse range of results between the two. We incorporate quadratics of childbearing to capture the influence of the number of children on female employment. We find that more children initially increase the chances of women's employment, however, this effect diminishes after a certain level of childbearing. This is plausible since having more children requires more effort to earn income to meet the increasing household expenditures – particularly when the male partner has less than the required amount of financial input. Further, we find in a separate analysis that the turning point comes at 6th child where the relationship turns into a negative effect of total childbearing on employment.[34] So the results reveal a complex interplay between childbearing and women's employment – initially, an additional child increases employment which ultimately diminishes with an additional child.

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[33] Binary indicators for two additional situations that were presented as "family types " in the survey "too old to work" and "woman concerned has no interest in work" were negative and statistically significant.

[34] We have estimated a set of threshold regressions to find a cut-off point where the relationship of childbearing turns into negative.

Table 6a. Determinants of Female Employment (Stage-I estimates)

	Coefficients	Std. Err.
Family Rules (Reference category – woman herself)		
Head/Father-in-law of the household decides alone	-0.190***	0.012
Head/Father in law in consultation with his/her spouse	-0.127***	0.012
Head/Father in law consultation with the woman concerned	-0.141***	0.023
Head/Father in law and spouse of the head/Father in law in consultation	-0.152***	0.023
Head/Father and other male members decide	-0.184***	0.021
Other combination of persons decide	-0.098***	0.035
Too old to work	-0.216***	0.035
Woman concerned has no interest in work	-0.220***	0.019
Household structure		
Number of children	0.084*	0.048
Number of children squared	-0.008*	0.005
Adult extended family members	-0.0004	0.005
Extended family	-0.080*	0.045
Mother in law (present)	0.015	0.039
Female respondent (Reference category – No education)		
Schooling (up to 8 years)	-0.024***	0.009
Schooling (above 8 years)	0.070***	0.011
Age in years¥	.007**	.003
Age in years squared¥	-.00007***	.00003
Husband (Reference category – No education)		
Schooling (up to 8 years)	-0.021***	0.007
Schooling (above 8 years)	-0.031***	0.007
Age in years	-0.001	0.001
Age in years squared	0.00001	0.00002
Household socioeconomic standing (Reference category – low Quantile-1)		
Middle (Quantile-2-4)	-0.003	0.007
High (Quantile-5)	-0.028***	0.011
Residential location (Reference category – Punjab)		
Sindh	0.002	0.009
Khyber Pakhtunkhwa (KPK)	-0.047***	0.007
Baluchistan	-0.064***	0.008
Rural (Reference category – Urban)	0.021**	0.007
Constant	0.293***	0.056

Notes: Reference categories for the binary indicator variables are: not employed, nuclear family, mother in law not residing in the family. Regarding the strength of instruments we test as; F-Test: Null, all of the instruments – family culture variables = 0, F (7, 32488) = 40.05; Prob > F = 0.0000. Overall model fit; F (26, 32488) = 118.54; Prob > F = 0.0000. Population size & Number of observations; 15,755,355 & 15,524. ***, **and '*' respectively significant at 1%, 5% and 10 %. We find that 'Age' is significantly correlated with the number of children. Therefore, we skip Age from our estimations when the number of children included in the

model and vice versa hence we report results accordingly. In this situation, the remaining results remain perfectly stable in terms of sign and significance.

Our findings also reveal that married women living in extended families are significantly less likely to be working for pay as the number of adult relatives of the family patriarch rises. This makes sense because a larger household requires more time to provide labor at home which discourages work outside of the home. Also, we find that married women are more likely to be working relative to older women. Moreover, the probability of a woman working for pay is significantly greater if they live in a family with high socioeconomic standing. Women with more than 8 years of formal education are significantly more likely to work for pay outside of the home than women with no formal education. Our estimates also reveal that women with some formal education, but less than 8 years, are less likely to be employed than women who never attended school. One possible explanation for this finding is that women with a modest amount of formal education see themselves as similar to women with no education, but choose not to work for pay outside of the home to display a difference that also signifies – in their mind – higher social status. Inspection of Table 6a also reveals that wives are significantly less likely to be employed if their husbands are formally educated, but a husband's age is unrelated to her being employed. Moreover, women who live in Punjab are more likely to be employed than women who reside in KPK or Baluchistan.

6.1.2. Female Fertility

Table 6b presents estimates of the number of biological children a married woman has living with her in the household. Although the average married woman has 4 of her children living with her, there is great variation across families with as many as 14 children living in a family with their mother while 13% of mothers have no biological children living with them. The estimation equation contains six binary indicators used to reflect various family rules – orientation – toward female fertility. The family culture reference category is one where the family rule is that the *Woman Herself* has the freedom to make this decision. Five of the six indicators are negatively, and significantly, related to the likelihood of her having more children. For instance, our estimates reveal that the probability that a woman will have another child is reasonably high even in circumstances where she is constrained by a family rule that empowers other decision makers in the family to weigh in on this aspect of her life. This implies that Pakistani women have significant power (a strong voice) in determining if they should have an additional child – consistent with the overall convention of having more children (the societal orientation towards large families). An F test of the null hypothesis that all of the instruments (i.e., indicators of family rules regarding fertility) together have no impact on the probability of her having more children is rejected. One way to interpret these findings is that when a family patriarch makes clear his desire for a large household, if married women in the family understand this cultural tradition and adhere to this perspective, then they are led to believe the relevant family rule is one that permits them alone to control their fertility.

Furthermore, the results show that there is a significantly greater chance that married women have more children when they are employed as compared with married women who are jobless. This may be the result of support offered by other family members. Highly educated women and those living in families in the highest social-economic group have significantly fewer children. Finally, women have substantially more children when they are older, live in a rural area and when they reside in the province of Khyber Pakhtunkhwa or Baluchistan relative to Punjab.

In the next section, we present and discuss our estimates of the determinants of female empowerment, including the effect of employment outside the home and fertility – by using predicted values of these variables identified by family rules as instruments capturing the family's orientation toward these aspects of female life.

Table 6B. Determinants of Number of Children (Stage-I estimates)

	Coefficients	Std. Err.
Family Rules (Reference category – woman herself)		
Husband alone	0.079	0.161
Husband and woman jointly	-0.367**	0.147
Mother of woman or husband	-1.584***	0.493
Nobody	-0.313*	0.189
Other	-0.552	0.963
It is in the hands of god	-0.526***	0.163
Household structure		
# Adult Extended Family Members	-0.121***	0.012
Extended Family	2.637***	0.095
Mother in Law Present	1.367***	0.411
Female respondent		
Employment	7.782***	0.564
W-Some Education (up to 8 years)	-0.409***	0.090
W-Well educated (above 8 years)	-1.659***	0.112
W-Age	0.364***	0.015
W-Age Squared	-0.003***	0.000
Husband		
H-Some Education (up to 8 years)	0.027	0.076
H-Well educated (above 8 years)	0.082	0.082
H-Age	0.006	0.021
H-Age Squared	0.0001	0.0003
Household Socioeconomic standing		
Middle (Quantile-2-4)	-0.458***	0.077
Bottom (Quantile-5)	-0.493***	0.112
Residential Location		
Sindh	-0.212***	0.077
Khyber Pakhtunkhwa (KPK)	0.598***	0.094
Baluchistan	0.341***	0.108
Rural (Reference category – Urban)	0.524***	0.065
Constant	-0.170	0.490

Notes: Reference categories for the binary indicator variables are: not employed, nuclear family, mother in law not residing in the family. Regarding the strength of instruments we test as; F-Test: Null, all of the instruments – family rules variables = 0—$F(6, 10829) = 8.10$; Prob > F = 0.0000. Overall model fit; $F(22, 10829) = 127.54$; Prob > F = 0.0000. Population size & Number of observations; 15,755,355 & 15524. ***, **and '*' respectively significant at 1%, 5% and 10 %.

6.2. Second Stage Estimates: Determinants of Female Empowerment

In this section we present our empirical evidence on the determinants of married female empowerment regarding household spending using a two-stage least squares estimation procedure, where family rules (i.e., reflecting family culture) serve as instruments in the first-stage estimates of female fertility and employment for pay – potentially endogenous factors expected to influence autonomy. We present our findings for *Aggregate*

Empowerment computed from the four specific spending spheres, using a bivariate indicator of female empowerment (*No Empowerment* relative to, *At Least Some Empowerment*) – the conventional approach in the literature. Our focus is on the effect of female employment and family structure (including the number of children, nuclear versus extended family systems, as well as the size and composition of extended families including mother in law presence) on empowerment since our theoretical model and associated corollary predicts that these key variables are likely determinants of female autonomy.

Table 7 presents our findings on how female autonomy – in the aggregate spending – is affected by Predicted Employment, Predicted Number of biological children, and a set of other important determinants. In our discussion, we give special attention to identifying the validity of threat options highlighted in our theoretical model.

Table 7. Employment Status and Family Structure–on Women's Empowerment

	Coefficients	Std. Err.
Threat options (Female respondent)		
Employment (predicted)	1.220***	0.104
# children (predicted)	0.124*	0.075
# children_squared (predicted)	-0.012	0.008
Household structure		
# Adult Extended Family Members	0.005	0.007
Extended Family	-0.165**	0.071
Mother in Law Present	-0.336***	0.074
Female respondent		
W-Some Education (up to 8 years)	0.069***	0.016
W-Well educated (above 8 years)	-0.014	0.023
W-Age	0.013**	0.005
W-Age Squared	0.0001*	0.00004
Husband		
H-Some Education (up to 8 years)	0.026*	0.014
H-Well educated (above 8 years)	0.025*	0.015
H-Age	0.002	0.004
H-Age Squared	0.00002	0.00004
Household Socioeconomic standing		
Middle (Quantile-2-4)	0.039**	0.014
Top (Quantile-5)	0.107***	0.020
Residential Location		
Sindh	-0.081***	0.017
KPK	-0.002	0.017
Baluchistan	-0.403***	0.018
Rural	-0.067***	0.014
Constant	0.692***	0.095

*Notes: Reference categories for the binary indicator variables are: not employed, nuclear family, mother in law not residing in the family. Regarding the strength of threat options we test as; F-Test: Null, all of the threat options – employment & children variables = 0—$F(3, 10834) = 49.81$; Prob > F = 0.0000. Overall model fit; $F(18, 10834) = 178.60$; Prob > F = 0.0000. Population size & Number of observations; 15,755,355 & 15524. ***, **and '*' respectively significant at 1% , 5% and 10%.*

Before turning to a presentation of our second stage results it is important to comment on a feature of our estimation process that should promote confidence in the validity of our estimates. We report the Sargan test for our estimates of the determinants of female autonomy – we are unable to reject the null (Sargan test) hypothesis confirming the overidentifying restrictions are valid. This suggests that the instruments we use to identify married female employment and having another child – measures of family rules towards work and fertility – are each valid.

Inspection of the *Threat Options* in Table 7 reveals that our second stage results suggest that employment (i.e., *P-Employment*) significantly increases the probability of a married woman having *At Least Some Empowerment* – relative to women who are not working.[35] Our second stage estimates indicate that employed married women are significantly more likely to have *At Least Some Aggregate Empowerment*, than married women who are not working for pay outside the home. These findings indicate that employment, for married women, is a consistent and powerful avenue to greater Empowerment as predicted. Our results are consistent with the previous literature, for example, Anderson and Eswaran (2009) for Bangladesh (rural district) finds that female's earned income increases empowerment, and hence is a valid threat option to leverage women's empowerment. Our findings for the impact of the *Predicted Number of Children* on female empowerment are virtually identical to those of predicted employment, except the squared term turns statistically insignificant. Having another child significantly increases the likelihood of having: *At Least Some Empowerment.*

Married women living in an *Extended Family* were significantly less likely to have *At Least Some Aggregate Empowerment* than married women residing in a nuclear household. In addition, married females living in an extended family, but with their mother in law in the household (i.e., *Mother in Law Present*) – relative to comparable married women who do not reside with their mother in law – are significantly less likely to have *At Least Some Aggregate Empowerment* over household spending. This set of findings, fit with the prediction from our bargaining model accounting for threat utilities of husbands and wives, which points towards women in an extended family – especially if their mother in law makes family life for her less pleasant. Interestingly, living with more adult extended family members does not significantly influence a married women's level of spending autonomy. Nevertheless, in totality, our findings reveal that family structure – family type (i.e., nuclear or extended) and composition (i.e., the share of household members who are children, and the share who are adults, as well as a married woman's mother-in-law living with the family) – has a significant impact on the capacity for married women to make household spending decisions.

In discussing the effect of the controls, women are significantly more likely to have *At Least Some Empowerment* than comparable women who are a year younger. However, the impact of additional aging on the empowerment of married women, while still positively associated with empowerment over spending, becomes smaller and is insignificant. Married women who lack any formal education are significantly less likely to have *At Least Some Autonomy* relative to both those who have up to 8 years of formal school and those with more than 8 years of formal schooling. The age of a wife's husband is unrelated to her level of empowerment in the models we estimate. Husband's level of education plays a significant role in determining the extent of her empowerment.

The empirical model also included indicator variables that allowed us to evaluate if a household's socio-economic standing and its geographical location impact a wife's level of empowerment. The evidence also reveals that women have greater expenditure empowerment when they reside in a middle or top socioeconomic household compared to a household in the lowest socioeconomic quintile.

Married women living in families located in rural parts of Pakistan are significantly less likely to have *At Least Some Autonomy* relative to *No Autonomy* than women who do not reside in rural areas. Moreover, married women who reside in a region of Pakistan other than Punjab tend to have significantly less autonomy.

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[35] This result is in line with findings of Anderson and Eswaran (2009) and Rahman Rao (2004) from Bangladesh data.

7.   Conclusion

Scholars and policy makers have championed the idea for the past two decades that advances in female empowerment can be the source of economic progress in the developing world by promoting private sector production on the part of women and children's growth through better health and greater educational attainment. This spurred literature seeking to identify – conceptually and empirically – the determinants of female empowerment. The conventional explanation for the sources of female empowerment comes from a bargaining framework – between husbands and wives – in which relative leverage arises from their social and economic capacities or strengths. The primary insight from this literature is that working for pay outside the home provides women with greater authority over spending – denoted as female autonomy or empowerment. There is substantial empirical literature showing an association between female employment and spending empowerment, in a host of developing nations. Some recent papers that account for the endogeneity of female employment in these empirical models continue to support this notion. Unfortunately, little is known with confidence about female empowerment in Pakistan, one of the largest and poorest nations in the world, because there are no studies of female empowerment that address the endogeneity of female employment, no less the endogeneity of female fertility.

In this paper, we expand the theoretical literature on female empowerment by explicitly accounting for the role of family structure (i.e., family type, size, and composition). This model predicts that women realize less autonomy when they reside in an extended family, when there are more adult members in this type of family and when the wife's mother in law resides in the home. In this model, a larger family arrived at by a wife having more of her own children in the household is also expected to be a source of greater leverage in bargaining and hence empowerment.

We also extend the empirical literature on female empowerment by accounting for the simultaneity of both female employment and fertility – using data on families in Pakistan, derived from 15,254 surveys of wives and husbands, randomly selected to represent the nation's characteristics, provided by the PSLM.   In our empirical work we introduce a new means of accounting for the endogeneity of female employment and female fertility – family rules regarding these features of a married women's life course – in our two-stage, instrumental variable, estimation process. The conventional diagnostics of the viability of this instrumental variable estimation approach are conducted and support the interpretation of the coefficient we estimate and report as causal determinants of female empowerment.

In our analysis sample about half of all married females report having no spending empowerment. Eighty-seven percent of married women live in an extended family, on average these families have almost 9 adult relatives of their husband, and 87% of these families include the wife's mother in law. Our empirical work reveals that each of these features of their environment is negatively and significantly related to female empowerment, and the effect of the presence of a mother in law is particularly strong. In addition, 7 out of 10 married women in Pakistan have completed no years of formal education and 60% live in rural communities – which our empirical work also reveals contributes to poor levels of empowerment. Thus, it is not surprising that married women tend to have such low levels of spending autonomy in Pakistan.

Since Pakistan is a historically Muslim nation with a long history of extended families and a population that is predominantly rural, is there a realistic pathway forward for advances in female empowerment? If so, can women – and policymakers – play an active role in promoting female autonomy in Pakistan?

There is some room for optimism. Our findings reveal that employment is a powerful determinant of female autonomy – working married women are about 20% more likely to have *At Least Some Aggregate Empowerment* than comparable women who do not work for pay outside of the home. Since only 9% of married women are employed there is great room for advances in female employment – and our evidence suggests that if this development were realized it would lead to a substantive rise in female empowerment. In addition, our findings reveal that formal education, both modest (less than 8 years) and loftier (more than 8 years) amounts, lead to

significantly greater levels of empowerment for married women. Because so few women have any formal education, the possibility of substantial advances in the level of schooling completed by females seems realistic and this will lead to greater empowerment. Moreover, the benefits of greater employment will likely promote a desire of the part of mothers and girls for female youths to acquire more education.

Thus, the prospect of advances in female empowerment in Pakistan, arising through education and employment, without altering the general landscape of society, seems likely over time. The unresolved question, is to what extent does mother's empowerment, determined in a manner that accounts for the endogeneity of both employment and fertility, contribute to advances in the health and educational well-being of boys and girls? This is a topic in need of further research.

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Conflict of interest

The authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

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