Another Gendered Demographic Dividend? Adjusting to a Future without Sons

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Abstract

I argue that sonless families pose a gendered demographic dividend. As fertility declines, families with only daughters are likely to grow. In turn, patriarchal family systems may weaken when many families are unable to engage in patriarchal practices. I examine some of these theorized dynamics in India. Sonless families did grow as fertility declined; the percentage sonless reached 10% in India as a whole in 2015 and approached 20% in states with earlier fertility declines. I also identify a substantial influence of children's gender on mothers' expectations of old age support. Using panel data from the India Human Development Survey (IHDS), I compare women's expectations after they had children to earlier expectations when they did not yet have children. Women with sons kept or further embraced patriarchal expectations that a son would provide support. Sonless mothers largely gave up patriarchal expectations, turning to their daughters or away from children altogether.

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The global total fertility rate fell from five children per woman in the early 1950s to two and a half children in 2019 (United Nations 2019). While fertility remains high in Sub Saharan Africa, this dramatic fertility decline signals the end of the demographic transition for much of the rest of the globe. In response, demographers have turned to identifying the consequences of low fertility and the end of the demographic transition.

The concept of the demographic dividend suggests that the demographic transition benefits economic growth (Bloom et al. 2007; Bloom and Williamson 1998). When paired with an earlier mortality decline, fertility decline leads to a temporary bulge in the working age population. This shift in age structure provides an economic opportunity for countries by increasing labor supply, savings, and education (Cuaresma, Lutz, and Sanderson 2014; Lee, Mason, and Miller 2000).

The demographic transition may also erode patriarchal family systems through the growth of sonless families, a process I refer to as a gendered demographic dividend. As fertility reaches low levels, the proportion of families with children of one gender – only sons or only daughters – naturally rises. Sonless families are of special significance in patriarchal family systems. Within such contexts, sons fulfill essential responsibilities and roles that daughters do not, like continuing the family line, inheriting family wealth, and supporting parents in old age (Das Gupta et al. 2003; Das Gupta 1999; Kandiyoti 1988). Families without a son must adapt by turning to daughters, other family members, or going outside the family altogether. If numbers of sonless families become substantial, a large portion of the population would be unable to maintain patriarchal practices. In turn, patriarchal family systems may weaken as sons' and daughters' roles and responsibilities become more similar.

I examine aspects of these theorized dynamics in India, a context with a patriarchal family system and recent fertility decline. I show that sonless families did grow in India as fertility fell using trend data from the National Family Health Survey (NFHS). I also demonstrate that women changed their expectations of old age support in response to the gender of their children using panel data from the India Human Development Survey (IHDS). Old age support is one of the responsibilities that sons, but not daughters, customarily fulfill in patriarchal family systems and is related to son preference (Clark 2000; Dharmalingam 1994; Lamb 2000).

This article builds on previous work that drew attention to sonless families and theorized that the growth of such families would weaken patriarchal family systems (Allendorf 2012, 2015). In this article, I further conceptualize these dynamics as a gendered demographic dividend and contextualize sonless families within the larger demographic dividend literature. I also extend the theory by incorporating the role of joint families and earlier stages of the demographic transition.

Empirically, this article offers substantial advances beyond Allendorf (2015), in which I addressed the same questions, but was limited by cross-sectional data. To assess the link between fertility decline and sonless families, I previously showed that a low-fertility state had a larger portion of sonless families than a high-fertility state at the same point in time (Allendorf 2015). In this article, I use trend data to demonstrate that sonless families grew over time as fertility declined and assess variation across states. In the earlier article, I also demonstrated that children's gender was associated with mothers' expectations of old age support, but was not able to effectively address whether the cross-sectional association was a product of selection bias and reverse causation (Allendorf 2015). Here, I leverage new panel data to provide strong evidence that children's gender causes mothers to change their expectations of old age support.

Background and Conceptualization

Gender, the Demographic Transition, and Demographic Dividends

Gender has already received attention in literature on the consequences of the demographic transition. While the original concept of the demographic dividend focused on gender-neutral shifts in the age structure (Bloom and Williamson 1998), later versions added the importance of fertility decline for women in particular (Bloom et al. 2009, 2007). Namely, as women are increasingly able to control their fertility and give birth to fewer children, they are freer to enter the workforce (Bailey 2006; Watkins, Menken, and Bongaarts1987).

The educational expansion that drives much of the economic benefits of the demographic dividend (Cuaresma, Lutz, and Sanderson 2014) may also be larger for girls than boys. After a demographic transition, parents have small numbers of children who are likely to survive to adulthood. Parents respond by investing more in the quality of children, like sending them to school (Lee and Mason 2010). When resources are scarce, parents concentrate resources on sons (Desai 1995; Gaudin 2011). With smaller family sizes, parents have more resources to provide greater schooling and other benefits to daughters as well. Further, daughters, but not sons, are often kept at home to provide child care for younger siblings. As the number of younger siblings is reduced, daughters are freer to attend school (Bhat 2002; Chang and Li 2016; Wu, Ye, and Guangye 2014).

With the concept of the gender-equity dividend, Anderson and Kohler (2015) argue that sex ratios of marriage markets pose another pathway for gendered consequences. Men typically marry younger women. So early in a demographic transition, when the population is growing, men have ample numbers of potential wives to choose from. As the transition continues, the population begins to age and decline and the relative number of younger women shrinks.

Anderson and Kohler (2015) argue that women gain bargaining power as they become scarce, which facilitates more egalitarian gender norms (and slightly higher fertility). In China, women's bargaining power derived from masculine marriage markets is linked to greater support for women's own parents, reductions in husbands' tobacco and alcohol use, and improved health among sons (Porter 2016, 2017).

This research suggests the demographic transition largely makes women and girls' lives more similar to those of men and boys and facilitates greater gender equality overall. However, another stream of research suggests that the demographic transition magnifies existing gender inequalities and harms girls. The phenomena of missing girls is an infamous example of these harmful consequences (Bongaarts and Guilmoto 2015; Sen 1990). As fertility declines and parents have fewer births, they become less likely to have a desired son, a process known as the fertility squeeze (Guilmoto 2009). In patriarchal contexts, some parents respond by using sex-selective abortion to secure a son within a small number of births (Arnold, Kishor, and Roy 2002; Kashyap 2019). Others respond by having additional births in pursuit of a son and end up with unwanted daughters (Basu and De Jong 2010; Chaudhuri 2012). Unwanted daughters experience high levels of neglect, resulting in poor health and high mortality (Das Gupta, Chung, and Li2009; Guilmoto et al. 2018).

In turn, sex-selective abortion and heightened mortality among girls lead to masculine sex ratios (Guilmoto 2009; Guilmoto et al. 2018), which may have additional adverse impacts for women *and* men. With shortages of women, many men marry later than desired or do not marry at all (Porter 2016). Being unable to marry likely reduces the quality of men's lives, as well as those of their parents. It may also cause men to engage in violence and riskier sexual practices. Masculine sex ratios have been linked to intimate partner violence, rape, crime, and sexually

transmitted infections (Diamond-Smith and Rudolph 2018; South and Trent 2010; Trent and South 2012; South, Trent, and Bose 2014).

Sonless Families - Another Gendered Demographic Dividend

I add to this literature by examining another pathway through which the demographic transition may have important gendered consequences – the growth of sonless families. If present in substantial numbers, sonless families may weaken or even undermine patriarchal family systems, which are tightly intertwined with gender systems (Allendorf 2012, 2015). Patriarchal family systems, or contexts characterized by "classic patriarchy" (Kandiyoti 1988), are present in much of Asia, including India and China, and parts of Africa.

There are stark differences between sons' and daughters' roles and responsibilities in patriarchal family systems (Das Gupta 2010; Das Gupta et al. 2003; Karve 1965). Since the male line defines the family, sons are of profound importance to a family's existence and well-being. Sons often co-reside with parents throughout much of their lives. Even when they do not live together, the norm of patrilocal residence creates strong ties and exchanges across parents' and sons' households. Sons also inherit family wealth and support parents in old age. This material role is strengthened by cultural and religious significance of sons. For example, according to Hindu custom, only sons may light a parent's funeral pyre and perform other rituals at death. And, in China and Korea, only sons carry the responsibility of ancestor worship and the ability to ensure ancestors' afterlife (Das Gupta et al. 2003). Daughters' roles and responsibilities present the reverse of sons' in many ways. Daughters join their husband's family upon marriage, leaving their natal families physically and symbolically. Daughters customarily do not inherit family wealth, nor support their own parents in old age, instead they care for parents-in-law.

A patriarchal family system is compatible with high fertility. When parents have large numbers of children, nearly every family has a son. For example, 97% of families with five children and 99% of those with six children will have at least one son. When having a son is universal, nearly every family is able to engage in patriarchal practices. There will be small numbers of sonless families who must make other arrangements, but the practices of a small fraction of the population would not endanger the system as a whole.[1]

By contrast, a patriarchal family system is not compatible with low fertility. If parents have only one or two births, many will not have a son. Specifically, if parents do nothing to influence the gender of their children, 24% of two-child families and 49% of one-child families will be sonless. If the proportion of families unable to engage in patriarchal practices became substantial, the adaptations of sonless families may make sons and daughters more similar and interchangeable. Sonless families must adapt by turning to daughters to fulfill sons' responsibilities or turning to other family members or outside the family altogether. If parents turn to daughters for old age support, co-residence, and other functions, they are also likely to invest more in their daughters, providing higher quality education and encouraging them to work in remunerative occupations. Thus, turning to daughters would make them more like customary sons. Turning to sources other than children would include sonless parents living alone or in old age homes and supporting themselves with pensions or funds from other family members. With these adaptations, sons would lose aspects of their customary role and become more like daughters.

When present in large numbers, transformative adaptations of sonless families may spread to other families with sons. For example, if it became more common and socially acceptable, even families with sons may prefer to co-reside with or receive old age support from

a beloved daughter. Similarly, if old age homes, pensions, or other institutions grow to meet demands of sonless families, such services would be available to families with sons as well. Such dynamics may eventually weaken patriarchal family systems.

This description of a low fertility context assumes parents do not control the gender of their children. As noted above, however, parents can and do shape the gender of their children by continuing childbearing until they have a son and using sex-selective abortion (Bhat and Zavier 2003; Clark 2000). However, some parents will not engage in such behaviors even if they want to and others may try, but not succeed. For many, sex-selective abortion may be unavailable, immoral, or too expensive (Guilmoto 2009). Others who begin with one or two daughters may decide their desire to have a small family outweighs the need for a son and do not continue to try for a son. And still others may have one or two extra births, but do not obtain a son and are not willing to have even more births or run out of fecund years.

Like the original demographic dividend though, this gendered dividend is not inevitable. Growth of sonless families can be avoided if parents engage in sex selection at high and sustained levels. It is important to emphasize though that the pressure for sonless families will continue as long as fertility remains low. It is unlikely, although possible, that populations would be willing to engage in such strong sex selection for extremely long periods. Thus, unlike the original demographic dividend, this gendered dividend is not a fleeting opportunity.[2] Instead, this gendered dividend may well be delayed through sex selection, but is likely to emerge later if not sooner.

Sex selection is not the only means of avoiding sonless families though. Family structures that increase the number of childbearing women within a family unit also increase the likelihood of the family as a whole having a son. Polygyny – in which men have multiple wives – and

laterally extended families – in which multiple brothers and their wives live together and comprise a single family – increase the chances that a family has a son. Polygyny is practiced in India, but has never been widespread (Karve 1965; Kolenda 1987). Laterally extended families, on the other hand, are customary in India, as well as other patriarchal contexts. Recent estimates indicate that this family structure is present in modest, but non-trivial numbers in India. From 1983 to 2009, roughly 5% to 8% of married men aged 30-39 and just over 10% of married men aged 65 and above lived in joint families with two or more married brothers and their father (Breton 2019).[3] Thus, it is important to note that this gendered dividend can also be avoided through extended families with multiple brothers.

Securing sons through laterally extended families has important ramifications for earlier stages of the demographic transition in patriarchal family systems. Before a demographic transition begins, fertility is high, but mortality is also high, and many sons would die before reaching adulthood. Maintaining joint families would help ensure that at least one son from each generation survives to adulthood. As the demographic transition begins and mortality falls, the likelihood of sons surviving to adulthood increases and circumstances would resemble that of the high fertility context described above. A high likelihood of each woman having a son paired with a high likelihood of him surviving to adulthood would ease the pressure to maintain laterally extended families and may contribute to nuclearization. Further, in this earlier stage of the transition, when the likelihood of having a surviving son increases, patriarchal practices may grow in strength; a near absence of sonless families may make differences in sons' and daughters' roles and responsibilities even more entrenched and inflexible. Over the course of the demographic transition as a whole, differences between sons and daughters may start out large, become even larger with mortality decline, and then fall to new lows with fertility decline.

Some of these adaptations and changes have already been documented in China, where fertility fell earlier and to a lower level than that of India. Studies of Chinese one-child families find that those with a daughter engage in transformational practices (Chen and Jordan 2018; Feng, Poston, and Wang 2014). Urban, singleton daughters and their families challenged norms of patrilocality after marriage and demonstrated little valuation of patrilineality and filial piety (Eklund 2018; Fong 2002). Further, the proportion of parents who are sonless is higher among younger Chinese cohorts and these parents with only daughter(s) were just as likely, if not more likely, to receive economic support as those with son(s) (Zhou, Ferdery, and Margolis 2019). There are also indications that these transformative practices are spreading. Daughters are now as likely as sons to provide financial support to parents in China, at least in urban areas (Hu 2017; Lei 2013; Xie and Zhu 2009). Parents living with sons is still dominant, but there are signs that norms of patrilocal residence are eroding (Gruijters and Ermisch 2019; Chen 2005; Chen and Short 2008; Xie and Zhu 2009). To my knowledge though, no studies have assessed if the growth of sonless families contributed to such broader changes. Further, the Chinese literature focuses on singleton daughters in one-child families, rather than more broadly conceptualizing sonless families (with any number of children) as an important phenomena.

The Rise of Sonless Families in India

Before turning to the question of whether children's gender influences parents' expectations of old age support, I demonstrate that sonless families did rise in India as fertility fell. India has experienced a substantial fertility decline and is nearing the end of the demographic transition. The total fertility rate fell in almost linear fashion from nearly six children per woman in the early 1960s to just over two children in recent years (Guilmoto 2016). The latest estimate puts the national total fertility rate at 2.2 in 2017 (SRS 2019:78).

There is considerable variation in the timing and extent of fertility decline within India however (Guilmoto and Rajan 2001). Fertility began declining in the South and some Southern states have had sub-replacement fertility for nearly two decades. In the North, fertility decline started later and many states still have high fertility. The range of state-level variation is apparent in Figure 1, which shows total fertility rates for all India, Uttar Pradesh, and Tamil Nadu from 1971 to 2017. Throughout this period, Tamil Nadu was consistently one of the lowest fertility states and had a total fertility rate of 1.6 in 2017 (SRS 2017:78). Uttar Pradesh represents the high end of the spectrum with a total fertility rate of 3.0 in 2017.[4]

[Figure 1 about here]

I assessed whether sonless families grew as fertility declined using data from the National Family Health Survey (NFHS) (Heger Boyle, King and Sobek 2018). The NFHS is a trend study with four waves, the first was collected in 1992-93 and the last 23 years later in 2015-16. Sonless families are only apparent when women have completed childbearing; while women continue to have births there is still a possibility of having a son. So, I limited the NFHS samples of ever married women of reproductive age to an analytical sample of women who have largely completed childbearing, those aged 40-49 with at least one child. I used this sample of mothers aged 40-49 to calculate the mean number of children and proportions with only daughter(s), only son(s), and both son(s) and daughter(s) for each survey wave.

This approach equates one mother with one family. Thus, proportions of families that are sonless are over estimated if some mothers were living in laterally extended families with sister(s)-in-law. Such bias appears minimal though. Across all waves, less than 2% of these mothers aged 40-49 were sisters-in-law of the household head, the only relationship consistent with a laterally extended family. The vast majority held positions consistent with nuclear or

vertically extended households, including head or wife of the head (90%), daughter-in-law (5%), and mother (3%). The remaining 1% were daughters or unrelated.[5]

[Figure 2 about here]

In India as a whole, there was modest growth in sonless families (Figure 2). In 1992, 7.7% of mothers 40-49 had only daughter(s). This proportion held nearly steady at 7.6% in 1998 and then crept up to 8.9% in 2005 and finally to 9.8% in 2015. This increase of 2.1 percentage points is statistically significant and represents a relative change of 31%. In absolute terms though, this change is small and the proportion sonless remained low, but not trivial. This modest trend is likely due to still sizeable numbers of children among mothers aged 40-49 in 2015, most of whom were born many years before 2015 when fertility was higher. The mean number of children for mothers 40-49 fell by just over one child, but it declined from 4.1 to a still sizeable 3.1. Signs of sex selection are also apparent; the proportion with only son(s) rose markedly from 13.2% to 22.3%.

In Tamil Nadu, where mothers aged 40-49 had small numbers of children by 2015, there was sizeable growth in sonless families (Figure 2). In 1992, mothers aged 40-49 had 3.6 children on average and 11.9% had only daughter(s). As the mean number of children fell to 3.1, 2.6, and then to a low of 2.2, the proportion sonless rose to 13.3%, 17.4%, and finally to 17.8%. In just over two decades, sonless families rose by nearly half in relative terms and comprised nearly a fifth of families in absolute terms. Like all India, the hallmarks of sex selection are seen in Tamil Nadu; the proportion with only son(s) doubled from 14.6% to 29.9%.

[Table 1 about here]

To assess trends across India, I present these figures for 1992 and 2015 for 15 of the largest states (Table 1).[6] In 2015, ten of these states had mean numbers of children below 3.0,

representing declines of 1.0 to 1.5 children since 1992. Of these ten states, six experienced statistically significant increases in the proportion with only daughter(s). And, in the four states with the lowest means of 2.2 to 2.5, the proportion with only daughter(s) was sizeable, ranging from 13.5% to 20.6%. The relatively high numbers of children among mothers 40-49 in 2015 reinforce that the fertility decline is recent (and ongoing) and it is still early for the theorized changes in family composition. Yet, even at this early stage, nascent growth in sonless families is apparent.

These trends also show the sex-selective forces arrayed against the rise of sonless families. The proportion with only son(s) rose significantly in all 15 states and these increases were larger than those for only daughter(s). This pattern points to sex-selective behavior across states, even in Kerala, which has a reputation as the most gender egalitarian state. Further, Punjab and neighboring Haryana demonstrate how the pressure of low fertility for sonless families can be evaded entirely (at least for a time). The mean number of children fell from 3.9 to 2.6 in Punjab, yet the proportion with only daughter(s) held steady at 5% (while the proportion with only son(s) ballooned from 13.7% to 27.4%). Similarly, Haryana's mean fell from 4.4 to 2.9, but the proportion with only daughter(s) held at 3%. These two states are well-known for masculine sex ratios and high levels of sex selection (Das Gupta 2010; Guilmoto et al. 2018).

Methods

Data

To examine the influence of children's gender on parents' expectations of old age support, I use data from the India Human Development Survey (IHDS). The IHDS is a nationally representative panel study with two waves (Desai et al. 2007; Desai and Vanneman 2015). The first wave was collected in 2004-05 (IHDS-I) and the second wave seven years later in 2011-12

(IHDS-II). The IHDS-I sample comprised 41,554 households, 83% of which were re-interviewed in IHDS-II. Household heads were administered a questionnaire on income and social capital, while ever married women aged 15-49 were administered a questionnaire focused on education and health.

[Figure 3 about here]

Drawing on the panel of women interviewed in both waves, I created two analytical samples of mothers, a one-child sample and a two-to-four child sample. These samples do not include fathers because questions on old age support were administered in the women's questionnaire. My identification strategy relies on comparing responses to these questions before women had children to responses after they had child(ren). So the analytical sample approximates a marriage cohort, comprising the women who were married, childless, and ages 15-34 at wave 1 and then had children seven years later in wave 2 (Figure 3). Specifically, beginning with the panel of women interviewed in both waves, I limited the sample to the 1,195 women who were married, childless, aged 15-34, and not missing data on expectations of old age support in wave 1. Of these 1,195 women, 198 were still childless seven years later at wave 2 and 997 had at least one child.[7] I dropped the 198 still childless women and divided the 997 mothers into two groups: 275 with one child and 722 with two to four children. I divided mothers into two analytical samples because my analytical strategy differs by the number of children.

Measures

Independent variables. For the one-child sample, child's gender is a dummy denoting daughter or son. For the multiple children sample, children's gender has three categories: both daughter(s) and son(s), sons only, and daughters only.

Dependent variables. Women were asked two questions about their expectations of old age support: "Who do you expect to live with when you get old?" and "Who do you expect will support you financially when you get older?" Both questions had identical response options at both waves: 1) son, 2) daughter, 3) both son and daughter, and 4) other or no one. In wave 2, 183 responses about residential support and 16 responses about financial support were volunteered as "don't know." I recoded "don't know" responses as "other or no one." Further, at wave 2, 8 women were missing a response to residential support and 60 were missing financial support. I also recoded these missing responses as "other or no one." Results are substantively identical if the women with these missing and don't know responses at wave 2 are dropped from the sample.

It is important to emphasize that these questions directly referenced women's beliefs about their future source of old age support. I use them to assess whether these beliefs were consistent with patriarchal custom (expecting a son) or demonstrated an openness to or even preference for transformative behavior (expecting a daughter, both a son and daughter, or other or no one). Such openness may well be reluctant. Sonless mothers can understand their demographic reality and believe that a daughter or some other source besides a son will provide support, while disliking their predicament.

There are indications that women's patriarchal attitudes may have shaped responses though. In the earlier cross-sectional study, about 15% of sterilized women with only daughters said they expected a son to provide old age support (Allendorf 2015: 525). In other words, a sizeable portion of sonless women, who could not give birth to a son in the future, still expected support from a son. It is likely that many of them expected (or hoped for) support from a non-biological son. They may have referred to a nephew or son-in-law as a son or expected to adopt a son from another part of their husband's family. Social desirability may also have played a role.

Some women may have said they expected a son because they did not want to admit to the interviewer that they would rely on a daughter. It is also possible that some women unthinkingly voiced the social norm or were motivated by patriarchal attitudes to say a son would support them, even if it was not possible.

Thus, on one hand, I assess only if (potentially temporary) sonlessness caused women to give up patriarchal beliefs about their future behavior, not whether they gave up patriarchal attitudes (or actually engaged in transformative behavior). On the other hand, patriarchal attitudes may shape those beliefs (or what women reported as their beliefs). If so, the effects on beliefs identified here may be indicative of changes in attitudes as well. Further, these ideational effects likely underestimate eventual behavior. Young women may persist in believing a son will support them even if it is not possible, but they will eventually be forced to find another source if they survive to old age and have no son.

Controls. I included controls for socio-economic status, as well as gender ideology and practices. Controls that varied across waves include household income (logged) and dummies denoting if the woman worked for pay, practiced purdah (or *ghunghat*), and if men and women in the household ate together. Controls fixed at wave 1 include state, urban residence, religion/caste, education, age, and ideal gender composition of children. Based on their ideal number of boys, girls, and children of either gender at wave 1, I coded women into one of four categories: 1) prefers equal number of son(s) and daughter(s), 2) prefers more sons, 3) indifferent, and 4) missing data.[8] I used ideal gender composition at wave 1 only, the time before they had children, so that responses were unaffected by their children's gender.

Analytical Strategy

I used a differences-in-differences approach to identify the influence of children's gender on mothers' expectations of old age support using the one-child sample. The treatment is the gender of the child (1 = daughter, 0 = son) and the outcome is expecting a son to provide old age support (100 = son, 0 = daughter, both, or other/no one). Descriptively, I first assessed the difference in expecting a son to provide support between wave 1 – before women have a child and the child's gender is unknown – and wave 2 – when they have a child and know the gender. I calculated this first difference separately for those with daughters ($\bar{Y}_2^d - \bar{Y}_1^d$) and those with sons ($\bar{Y}_2^s - \bar{Y}_1^s$). To identify the treatment effect, I then calculated the difference in these differences between mothers of daughters and mothers of sons [($\bar{Y}_2^d - \bar{Y}_1^d$) – ($\bar{Y}_2^s - \bar{Y}_1^s$)].

Since the data comprise a panel with two periods the outcome can be modeled as:

$$Y_{it} = \beta_0 + \beta_w W_t + \beta_g G_{it} + \beta_c X_{it} + \mu_i + \epsilon_{it,}\ t = 1, 2$$

Where Y denotes expecting support from a son for woman i at time t, W is a dummy denoting wave 2, G is gender of the child, X is a vector of time-varying control variables, μ_i captures all fixed characteristics of the woman, and ϵ_{it} captures time-varying error. β_w captures the common time trend and β_g denotes the difference for women who have a daughter from those who have a son at a particular time.

If this model for time 1 is subtracted from this model for time 2, the result is a first-difference equation that captures change over time within women:

$$\Delta Y_{it} = \beta_w + \beta_g \Delta G_i + \beta_c \Delta X_i + \Delta \epsilon_{it}$$

The dependent variable is now change in expecting a son to provide support, which is a function of change in gender of the child and changes in time-varying control variables. β_w becomes the intercept and captures the common time trend, while β_g now captures the additional change for

mothers of daughters or the difference-in-differences. This estimate of the treatment effect is adjusted for all characteristics of the women that are constant over time, as well as time-varying characteristics included in the model. This first-difference model is equivalent to using the typical differences-in-differences model with fixed effects in which the treatment effect is the coefficient for the interaction of period and treatment (Wooldridge 2010, 321). This first-difference model takes advantage of the panel data and resulting opportunity to estimate changes *within* women, while the typical differences-in-differences model draws on repeated cross-sections for which it is not possible to estimate within-unit change.

I used a linear probability model because the outcome, change in expecting a son to provide support, is dichotomous. I did not use a non-linear model because it would violate the common trends assumption. I coded expecting a son as 100, rather than 1, so the coefficients can be interpreted in percentage points. I present two versions of these first-difference, linear probability models, one with the time-varying controls and one without.

A causal interpretation relies on the common trends assumption that any important unmeasured variables either vary across groups, but not over time or, conversely, vary over time, but not across groups (Wing, Simon, and Bello-Gomez 2018). Such differences in unmeasured confounders can be eliminated if the treatment is random. In India, gender of the first child, but not subsequent children, appears to be random (Bhalotra and Cochrane 2010). After one child, some parents begin using sex selection. I use the sample of mothers with only one child for this analysis because children's gender is (nearly) random only for the first child.

The seven year gap between survey waves prevents the gender from being entirely random. It is likely that women whose first birth was a daughter were more likely than those with a son to progress to another birth by wave 2 and select out of the one-child sample. The

percentage of mothers in the one-child sample who have a daughter is 44.4%. This percentage is lower than the expected 48.8% if the gender of the first child did not influence progression to a second birth. A one-tailed hypothesis test of whether the proportion with a daughter is less than this biological norm has a p-value of 0.07. So, this difference is not quite statistically significant at conventional levels, but is consistent with women with first-born daughters being slightly more likely to select out of the one-child sample. However, as discussed below, expectations of old age support did not differ between those with sons and those with daughters at wave 1. Further, all control variables are balanced between the two groups at waves 1 and 2 (Appendix Table A).

My analysis for the two-to-four children sample begins with a similar descriptive approach. I compare expectations of old age support between waves 1 and 2 among mothers with both son(s) and daughter(s), only sons, and only daughters. As expected, there are clear signs of selection bias; women's expectations already differed at wave 1 by their children's eventual gender. Since children's gender is endogenous for those with multiple children, I do not use differences-in-differences in the multivariate analysis.

For women with multiple children, I used a logit model to examine whether women who began with patriarchal expectations (at wave 1) gave up those patriarchal expectations if they had only daughters (by wave 2). So, for the multivariate analysis, I further limited the sample of mothers with multiple children to those who expected a son to provide support at wave 1. This approach discarded women who were already more open to support from sources other than a son at wave 1 and who went on to disproportionately have only daughters. Responses to the old age support questions differed slightly at wave 1, resulting in different sample sizes. Of the 722 women with multiple children, 446 (62%) expected a son to provide *residential* support at wave

1 and 435 (60%) expected a son to provide *financial* support at wave 1. I used a logit model because the dependent variable is dichotomous. It is coded 1 if women adjusted their expectations and expected support from a daughter, both a son and daughter, or other or no one at wave 2 and coded 0 if they still expected a son to provide support at wave 2. I present two sets of predicted probabilities of adjustment, one from a bivariate model without controls and one from a multivariate model that includes all controls described above. These predicted probabilities are calculated with controls held at their means.

Results

Difference-in-differences with the one-child sample

There was a dramatic rise in patriarchal expectations of old age support among mothers of sons across waves (Figure 4). Before they had a son in wave 1, these women were divided between expecting residential support from a son (46%) and expecting it from some other source or no one (42%). The remaining tenth expected support from both a son or daughter (9%) or a daughter specifically (3%). After they had a son in wave 2, virtually all of them, 93%, expected residential support from a son. So, the difference across waves in expecting a son to provide residential support is 47 percentage points for mothers of sons (93 – 46). The results for financial support are nearly identical; the percentage expecting a son to provide financial support rose by 46 percentage points from 47% in wave 1 to 93% in wave 2.

[Figure 4 about here]

Conversely, mothers of daughters show a substantial decline in patriarchal expectations (Figure 4). In wave 1, before they have a daughter, these women do not differ significantly from those who went on to have a son. They are largely divided between expecting a son to provide residential support (49%) and expecting it from some other source or no one (43%). The

remaining 8% expected support from both a daughter and son and none expected support from a daughter. In wave 2, after they have a daughter, their expectations were more varied. The largest number, 36%, expected residential support from some other source or no one, but nearly as many, 32%, expected support from a daughter. A few, 6%, expected support from a son or daughter and the remaining quarter, 26%, expected support from a son. Thus, among mothers of daughters, the percentage with patriarchal expectations of residential support fell 23 percentage points between waves (26 – 49). The results for financial support are nearly identical. The percentage of mothers of daughters who expect financial support from a son declined 20 percentage points from 45% to 25%. Further, the percentage expecting a daughter to provide financial support rose from zero to over a third.

[Table 2 about here]

The difference between mothers of daughters and mothers of sons in these differences between waves are enormous. The descriptive treatment effect is -70 percentage points for residential support [(26 – 49) – (93 – 46)] and -65 percentage points for financial support [(25 – 45) – (93 – 47)]. These substantial effects remain when looking at changes within women and adjusting for all characteristics of the women that were constant across waves, as well as time-varying controls. Point estimates of the treatment effect, or effect of change in daughter, from the first-difference models is -71 percentage points for residential support and -67 for financial support (Models 2, Table 2).

Predicting adjustment with the two-to-four children sample

Mothers' expectations of old age support by survey wave and children's gender are shown in Figure 5 for the sample with multiple children. The changes between waves depicted in this figure echo those shown in Figure 4 for the one-child sample. Like mothers of singleton

sons, mothers of multiple children with a son show sizeable increases in patriarchal expectations across waves. For mothers of *only* sons the percentage expecting a son to provide residential support rose from 63% to 94%. For mothers of both son(s) *and* daughter(s) – the percentage expecting residential support from a son rose from 65% to 88%. This increase is not as dramatic as that for mothers of only sons, but the vast majority of these mothers with children of both genders still expected a son to provide residential support at wave 2. There were comparable increases in patriarchal expectations of financial support among mothers of at least one son.

[Figure 5 about here]

Mothers of only daughters show a markedly differently pattern of substantial decline in patriarchal expectations (Figure 5). The percentage expecting residential support from a son fell from 52% to 23% among mothers of only daughters. At wave 2, the largest number of mothers of daughters only, 41%, expected a daughter to provide residential support. Nearly a third, 30%, expected residential support from some other source or no one and the remaining 6% expected support from both a son and daughter. The changes across waves were nearly identical for financial support.

Unlike the one-child sample, this multiple children sample also has differences in expectations by children's (eventual) gender before the women had children at wave 1 (Figure 5). Notably, the percentage expecting a son to provide support is significantly smaller among women who went on to have only daughters. At wave 1, 52% of mothers of daughters only expected residential support from a son compared to 63% of mothers of sons only and 65% of mothers of both son(s) and daughter(s). These percentages are similar at 52%, 59%, and 64% respectively for financial support. Instead of expecting support from a son at wave 1, the eventual mothers of only daughters were more likely to expect support from some other source

or no one at wave 1 (38% vs. 27% and 32%). Eventual mothers of daughters only were also significantly more likely to expect support from both a son and daughter at wave 1 (10%) compared to mothers of both son(s) and daughter(s) (3%), but not compared to mothers of sons only (11%). These differences at wave 1 indicate selection bias; women who did not voice patriarchal expectations in the beginning, before they had children, were more likely to go on to have only daughters.

The last comparison also indicates that selection bias is not just affecting mothers of only daughters. There were differences at wave 1 between women who eventually had sons only and those who had both son(s) and daughter(s). The percentage expecting support from a son at wave 1 was slightly lower for mothers of both son(s) and daughter(s), but, more importantly, the percentage expecting support from both a son or daughter was significantly higher for those with sons only. As noted above, at wave 1, 11% of those with only sons expected residential support from both a son and daughter versus 3% of those who had both son(s) and daughter(s). [9]

Given this selection bias, I limited the multiple children sample to women who expected support from a son at wave 1 and examined if these patriarchal women gave up their patriarchal expectations if they had only daughters (compared to those with a son). The predicted probabilities of women giving up their patriarchal expectations from these logit models are shown in Figure 6. The predicted probabilities from the model without controls indicate how likely women are to adjust their expectations without taking into account any other observed characteristics.

[Figure 6 about here]

As expected, mothers of daughters only are substantially more likely than those with sons to adjust their expectations. The predicted probability of adjusting residential expectations is .73

among mothers of daughters only compared to .05 for mothers of sons only and .12 for mothers of both son(s) and daughter(s). When controls are added to the model, these differences appear even starker, with the probabilities of adjustment rising to .79 for mothers of daughters only and falling to .03 and .07 respectively for mothers of sons only and mothers of both son(s) and daughter(s). Once again, the results for financial support are nearly identical. For financial support, the predicted probability of adjustment in the fully controlled model is .74 for mothers of daughters only, .02 for mothers of sons only, and .09 for mothers of both son(s) and daughter(s).

Discussion and Conclusion

Children's gender had a substantial influence on mothers' expectations of old age support. Mothers of sons stood firm in or further embraced patriarchal expectations that a son would provide old age support. Expectations of mothers of only daughters differed profoundly. These sonless mothers gave up patriarchal expectations with roughly equal numbers turning to daughters and the rest turning away from children altogether as a source of old age support. Many of these women had not completed childbearing and may have gone on to have a son later. Yet, even with the possibility of still having a son, mothers of only daughters showed high levels of adaptability. The large numbers of women who expected support from some other source or no one before they had children further reinforces the adaptability of women's expectations. Before they secured a son (or daughter) many women did not (yet) expect support from a son (or child of either gender).

This adaptability may seem unremarkable when viewed in isolation – of course mothers with only daughters are forced to adjust to the demographic reality of not having a son. And, when such mothers are rare, such adaptability is indeed of little consequence. However, sonless

families are growing. India as a whole experienced a modest increase in sonless families. The percentage of mothers aged 40-49 without a son grew from 8% in 1992 to 10% in 2015. In southern states with earlier, more substantial fertility declines, there was sizeable growth in the proportion sonless, reaching a fifth of mothers aged 40-49 in 2015. When considered alongside this growth in sonless families, mothers' adaptability to their children's gender has profound implications. It suggests that, as sonless families grow further, parents will increasingly expect old age support from daughters and other sources, as well as sons. If parents enact those expectations, turning to daughters may well serve to make daughters more like sons and turning away from children altogether may strip sons of their customary role, making them more like daughters.

There are already hints of such transformative changes in India. In Darjeeling, a district with long-standing low fertility, people thought daughters without brothers were starting to provide old age support for parents and that this was increasingly viewed as acceptable (Allendorf 2012). In her study of elderly living in nursing homes, Lamb (2009) found that many were sonless, which suggests sonless families may already be creating demand for nursing homes in urban areas. Further, a few women, including the daughter of a former prime minister, recently received media attention for taking on a son's role by lighting their fathers' funeral pyres (Agha 2018; Lall 2017; Times of India 2014).

This gendered demographic dividend is likely farther along in other patriarchal contexts with earlier fertility declines. As described above, studies of singleton daughters in one-child families already document such adaptations in China. Further, South Korea received attention as the first country with abnormally masculine sex ratios at birth that subsequently returned to normal levels, indicating a rise and then fall in use of sex-selective abortion (Chung and Das

Gupta 2007). Industrialization, urbanization, and educational expansion explain some of these changes, but much of the return to normal sex ratios at birth remains unexplained (Das Gupta 2010; Yoo, Hayford, and Agadjanian 2017). The growth of sonless families may be another factor that helps explain the normalization of sex ratios in South Korea. Sex ratios at birth are normalizing in China as well (Sobotka and Zhang 2019) and the growth of sonless families may play a role there too.

It is important to note that the gendered demographic dividend is not the only force providing pressure for similarities between sons and daughters in patriarchal family systems. Demographic pressure is complemented by ideational, economic, and other structural forces. Western, and increasingly global, values and beliefs about the desirability of gender equality and the value of daughters are spreading in India and other non-Western contexts through educational expansion, foreign aid, mass media, and other mechanisms (Allendorf 2017; Jensen and Oster 2009; Thornton 2005; Uberoi 2006). Income growth, poverty reduction, and increases in women's paid employment and wages may create additional pressure for valuations and investment in daughters. Localities with smaller gender pay gaps have lower levels of son preference (Craigie and Dasgupta 2017) and women who work for pay report less son preference (Behrman and Duvisac 2017). [10] Migration may also provide additional demographic pressure. Migration not only spreads new values and beliefs, but provides another way in which sons are absent from families. One of the women that received media attention for lighting her father's funeral pyre did have a brother, but he had migrated "thousands of miles away" and was not able to attend the funeral (Times of India 2014).

Finally, additional research is needed to more comprehensively assess this theorized gendered demographic dividend. Documenting growth in sonless families in India and

demonstrating that mothers adapt expectations of old age support to children's gender comprise important steps, but this analysis still has limitations. As noted above, the seven year gap between survey waves prevents children's gender from being completely random and only mothers' expectations are measured. Ideally, fathers' expectations should also be measured and the second measure should be collected soon after the birth. Even with perfect measurement, this analysis only documents a small part of the theorized dynamics. Future research should examine whether children's gender influence patriarchal attitudes and behavior and leads to ideational and behavioral changes over time. Ideational outcomes should include, for example, declines in son preference (or increases in indifference towards children's gender) and growth in beliefs that married daughters remain members of their natal families as much as married sons. Behavioral outcomes should include old age support, but also other theorized adaptations, like investment in high quality education and remunerative occupations for daughters in sonless families. Qualitative studies in which families are observed and interviewed over time and comparisons made across families with and without sons would also be useful for inductively building a richer understanding of how these dynamics play out. It is also crucial to assess this gendered demographic dividend in contexts beyond India. As indicated above, patriarchal contexts with earlier fertility declines, like South Korea and China, are particularly important sites for future research.

Notes

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1. In India, sonless families customarily solve their dilemma with a *ghar jamai*, literally a house son-in-law. A daughter's husband leaves his own family to join his wife's family and take on the role of a son for his parents-in-law. The *ghar jamai* is stigmatized since such men are seen as taking on a woman's role by joining another family (Jeffery and Jeffery 1997; Lamb 2000). Another option is to adopt another male family member as a son. However, the adoption of a boy not from the same patrilineal line is customarily not an acceptable alternative (Bharadwaj 2003).
2. The demographic dividend presents a limited window of opportunity because the bulge of working age adults disappears as those cohorts age and are replaced by smaller cohorts (Bloom and Williamson 1998). In fact, India may not benefit from the demographic dividend because low levels of education and an inability of the labor market to absorb more workers may prevent it from capitalizing on the temporary working age bulge (James 2011).
3. Breton (2019) likely slightly underestimates the prevalence of laterally extended families since he classified two or more married brothers living together without their father as a residual, rather than joint, family structure. However, this possibility of underestimation may be balanced out by his choosing ages of his younger target population (30-39) to maximize the possibility that a father was still alive and able to co-reside with his sons (while the sons were also old enough to have married).

4. Along with Tamil Nadu, Andhra Pradesh, Himachal Pradesh, Jammu & Kashmir, Punjab, and West Bengal also had total fertility rates of 1.6 in 2017 (SRS 2019:78). I highlight Tamil Nadu because its fertility decline began earlier than these other states. Delhi also had a slightly lower fertility rate of 1.5 in 2017, but Delhi is a small union territory with a largely urban population. Also, Bihar had the highest total fertility rate of 3.2 in 2017. I highlight Uttar Pradesh, which had the second highest rate in 2017, because Bihar's available time trend starts in 1981, rather than 1971 (SRS 2015).
5. These percentages refer to the sample of mothers aged 40-49 who were usual members of the household, not visitors. Also, sibling-in-law was not a response option in 1992 or 1998. In these early waves, siblings-in-law were put into the "other relative" category. So, the 2% figure for sisters-in-law combines the siblings-in-law and other relative categories.
6. A few states divided between 1992 and 2015. So, states are defined according to 1992 borders to provide consistency. For example, Telangana is combined with Andhra Pradesh.
7. There were 1,407 married, childless women aged 15-34 at wave 1, but 201 (14%) were missing one or both responses to the old age support questions at wave 1 (and an additional 11 women were missing information on their children's gender at wave 2). I also completed the analysis with the 201 women missing expectations at wave 1 recoded into the other/no one category and the results were substantively identical. The number of women that were still childless at wave 2 is large (n = 198) because limiting the sample to married, childless women at wave 1 yields the target population of recently married women who have not *yet* had a child, but also women who never have children because

they or their husbands are infecund. The latter are rare among all married women, but common among *childless* married women.

8. Nine women who wanted zero children were grouped with the 66 women missing data. There were only seven women who wanted more daughters than sons. These seven women were included in the indifferent category.
9. The expectations of the one-child sample (including mothers of a son and mothers of a daughter) also differ significantly from mothers with multiple children at wave 1. Compared to the mothers of multiple children (Figure 5), mothers of one child were less likely to expect support from a son and more likely to expect support from both a son and daughter or from some other source or no one (Figure 4).
10. Although in India, unlike much of the rest of the world, women's labor force participation has declined since the late 1980s (Afridi, Dinkelman, and Mahajan 2018).

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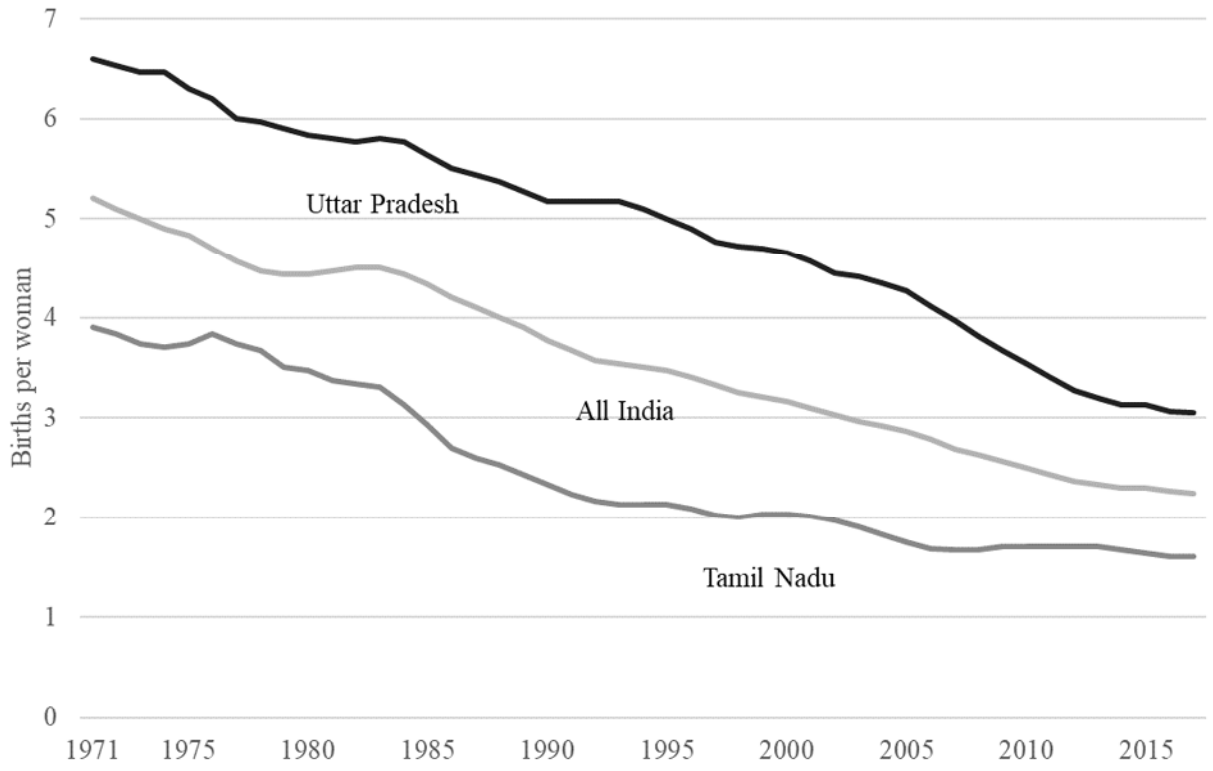
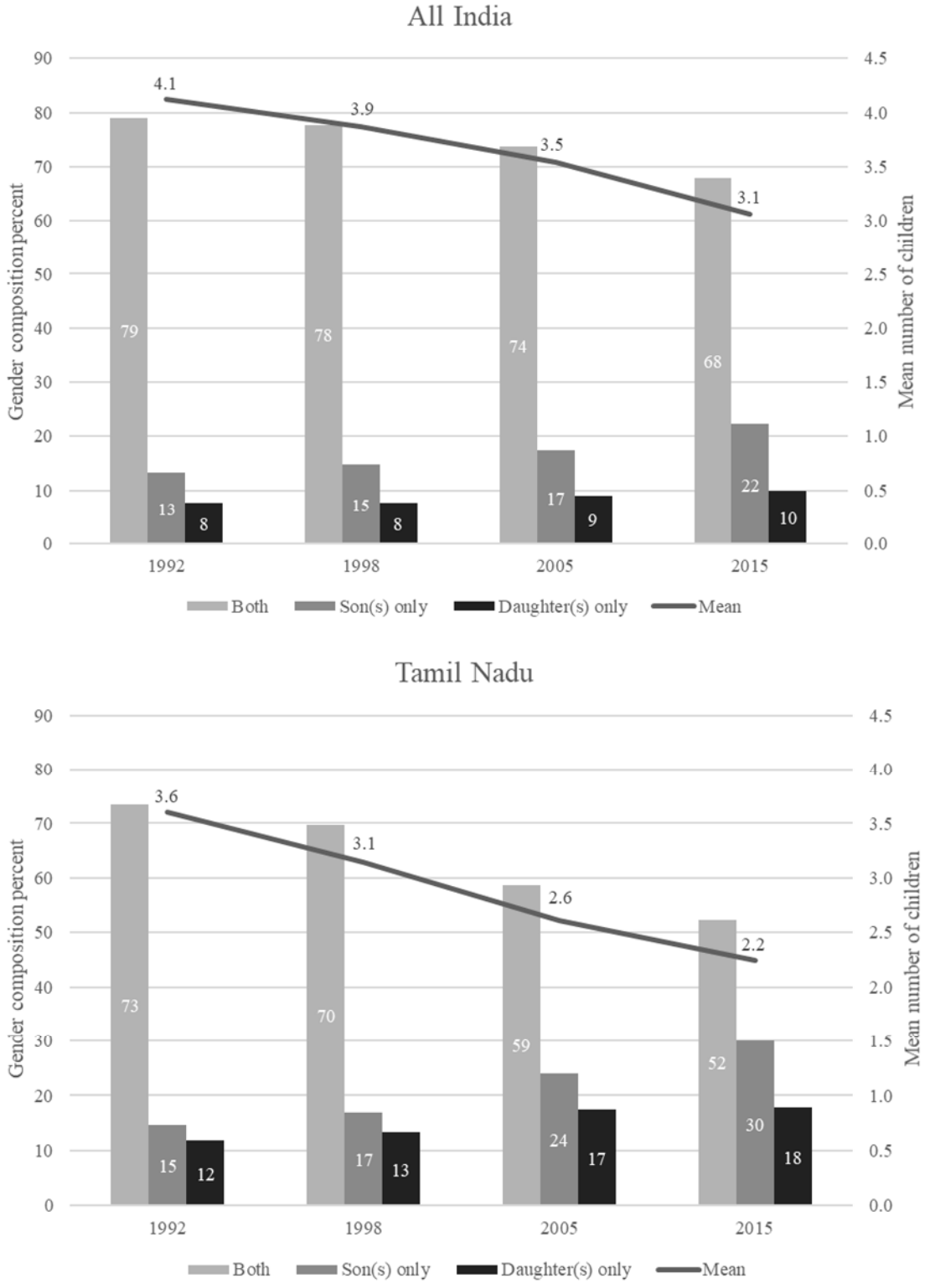
FIGURE 1 Three-year moving averages of total fertility rates for Tamil Nadu, Uttar Pradesh, and all India, 1971-2017



Source: Author's calculations using total fertility rates from the Sample Registration System (SRS 2013, 2015, 2016a, 2016b, 2017, 2019).

FIGURE 2 Mean number of children for mothers aged 40-49 and percentages with only daughter(s), only son(s), and both son(s) and daughter(s) by survey wave for all India and Tamil Nadu



Source: Author's calculations using National Family Health Survey (NFHS).

TABLE 1 Mean number of children for mothers aged 40-49 and percentages with only daughter(s) and only son(s) in 1992 and 2015 for large states and all India

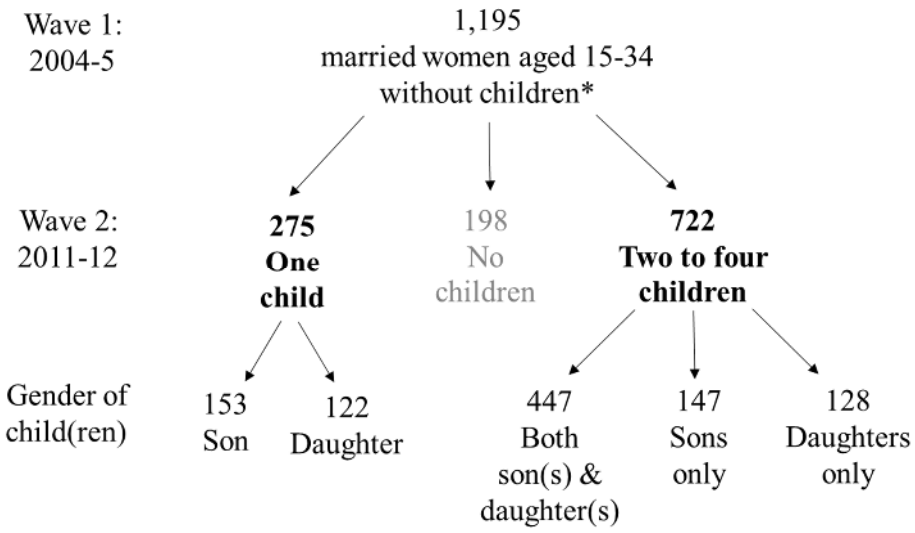
	Mean number of children ($\bar{x}$)			Percentage with daughter(s) only (%)			Percentage with son(s) only (%)		
	1992	2015	Absolute change	1992	2015	Absolute change	1992	2015	Absolute change
Kerala	3.5	2.2	-1.4**	13.5	20.6	7.1**	13.5	30.6	17.0**
Tamil Nadu	3.6	2.2	-1.4**	11.9	17.8	5.8**	14.6	29.9	15.3**
Andhra Pradesh & Telangana	3.6	2.5	-1.0**	12.0	15.8	3.8**	16.1	23.4	7.3**
Karnataka	4.0	2.5	-1.5**	9.5	13.5	4.0**	13.0	29.0	16.0**
Punjab	3.9	2.6	-1.3**	5.0	5.0	-0.1	13.7	27.4	13.8**
Maharashtra	3.7	2.7	-1.0**	8.5	10.2	1.7	17.0	26.3	9.3**
West Bengal	4.1	2.7	-1.4**	8.6	13.8	5.3**	15.5	25.4	9.9**
Gujarat	3.9	2.8	-1.1**	5.9	7.3	1.4	14.7	24.2	9.4**
Orissa	4.0	2.9	-1.2**	6.5	11.1	4.5**	15.5	24.0	8.5**
Haryana	4.4	2.9	-1.5**	2.7	3.0	0.4	10.6	26.9	16.3**
All India	4.1	3.1	-1.1**	7.7	9.8	2.1**	13.2	22.3	9.1**
Assam	4.8	3.2	-1.6**	6.9	11.9	5.0**	8.5	19.5	11.0**
Madhya Pradesh & Chhattisgar	4.3	3.3	-0.9**	8.4	6.5	-2.0*	10.8	19.9	9.1**
Rajasthan	4.5	3.5	-1.0**	3.4	3.8	0.4	12.7	19.9	7.2**
Bihar & Jharkand	4.5	4.0	-0.5**	5.1	5.1	-0.1	11.2	14.2	3.0**
Uttar Pradesh & Uttaranchal	4.6	4.0	-0.5**	5.9	4.5	-1.4*	11.0	13.7	2.7**

*p<.05, **p<.01

Note: Due to rounding error, absolute changes are not always exactly equal to the 2015 value minus the 1992 value.

Source: Author's calculations using National Family Health Survey (NFHS).

FIGURE 3 Analytical samples and sample sizes from the IHDS



*Also limited to women that were interviewed in wave 2 and not missing data for expectations of old age support at wave 1.

FIGURE 4 Expectations of old age support by survey wave and child's gender (one-child sample, n = 275)

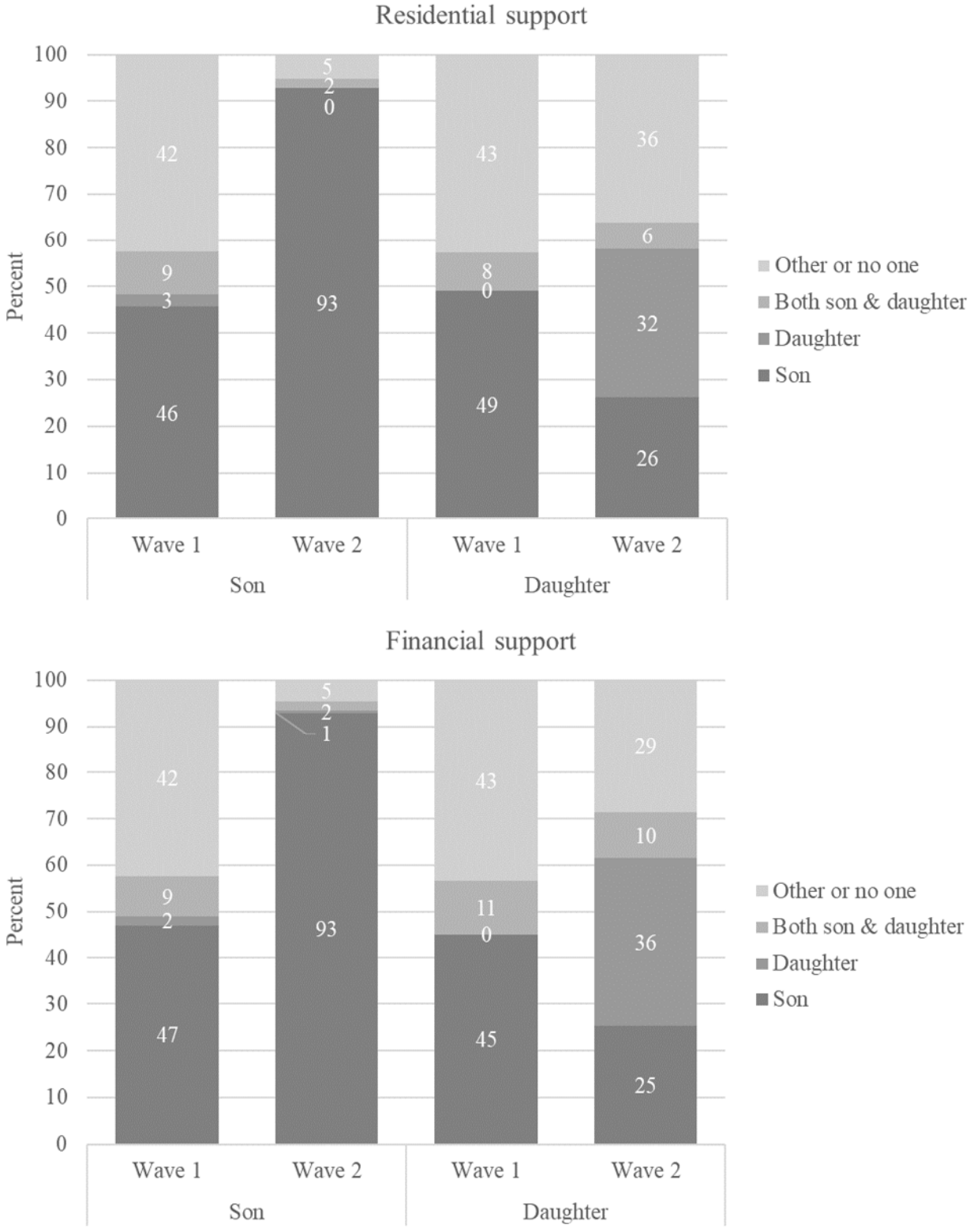


TABLE 2 First-difference analysis of expecting a son to provide old age support (one-child sample, n = 275)

	Residential Support		Financial Support	
	Model 1	Model 2	Model 1	Model 2
Change in daughter	-70.0**	-71.1**	-65.4**	-66.9**
	(7.62)	(7.74)	(7.32)	(7.43)
Change in wave	47.1**	44.5**	45.8**	44.1**
	(5.08)	(5.46)	(4.87)	(5.24)
Change in purdah		6.60		9.5
		(8.38)		(8.04)
Change in men and & women eating together		0.4		1.1
		(5.54)		(5.32)
Change in working for pay		10.7		8.3
		(7.80)		(7.49)
Change in household income (log)		1.34		-0.66
		(2.73)		(2.62)
R^2	.272	.280	.270	.278

*p<.05, **p<.01

Note: Coefficients and standard errors from linear probability models in which change in expecting support from a son is the dependent variable.

FIGURE 5 Expectations of old age support by survey wave and children's gender (two-to-four children sample, n = 722)

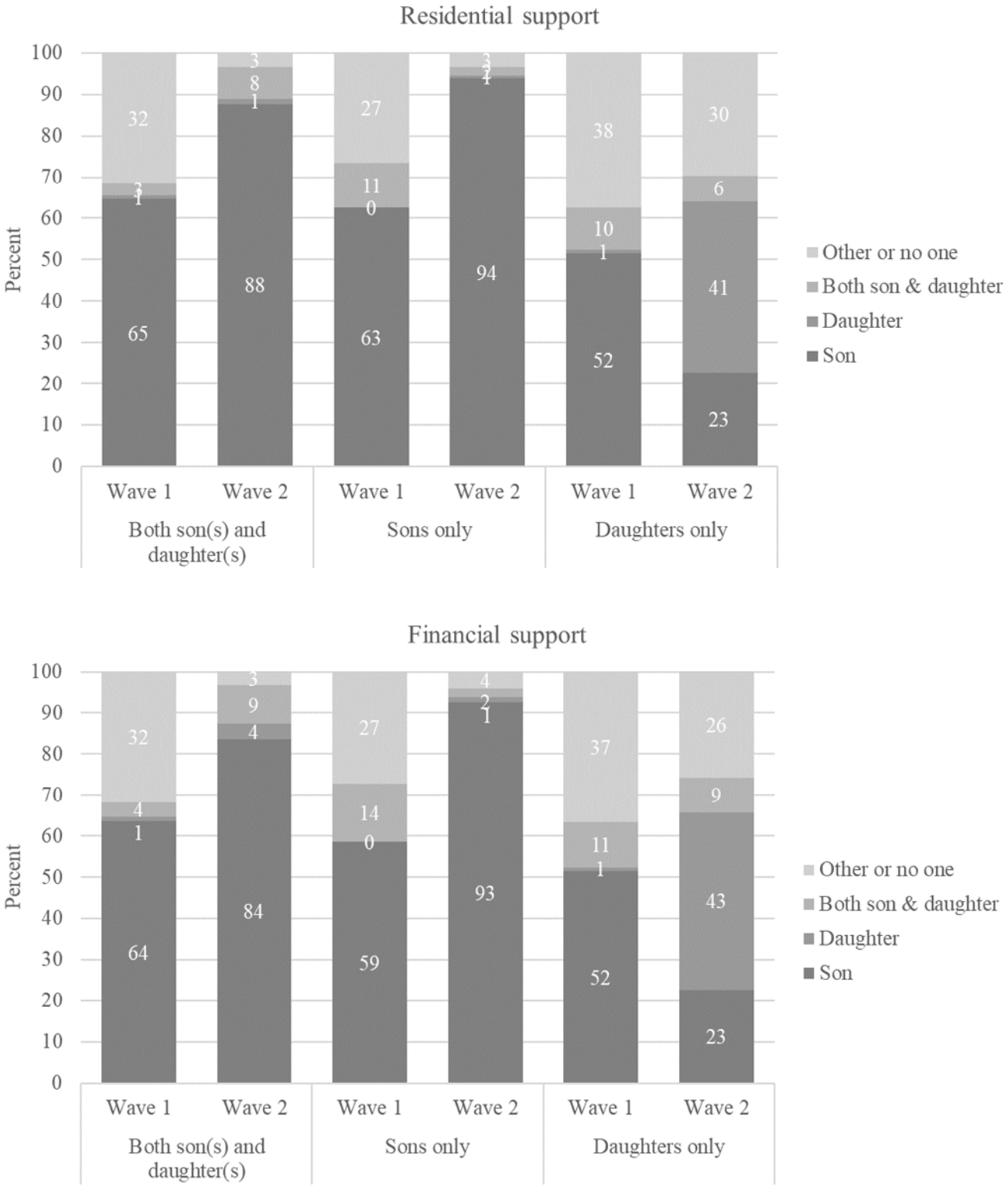
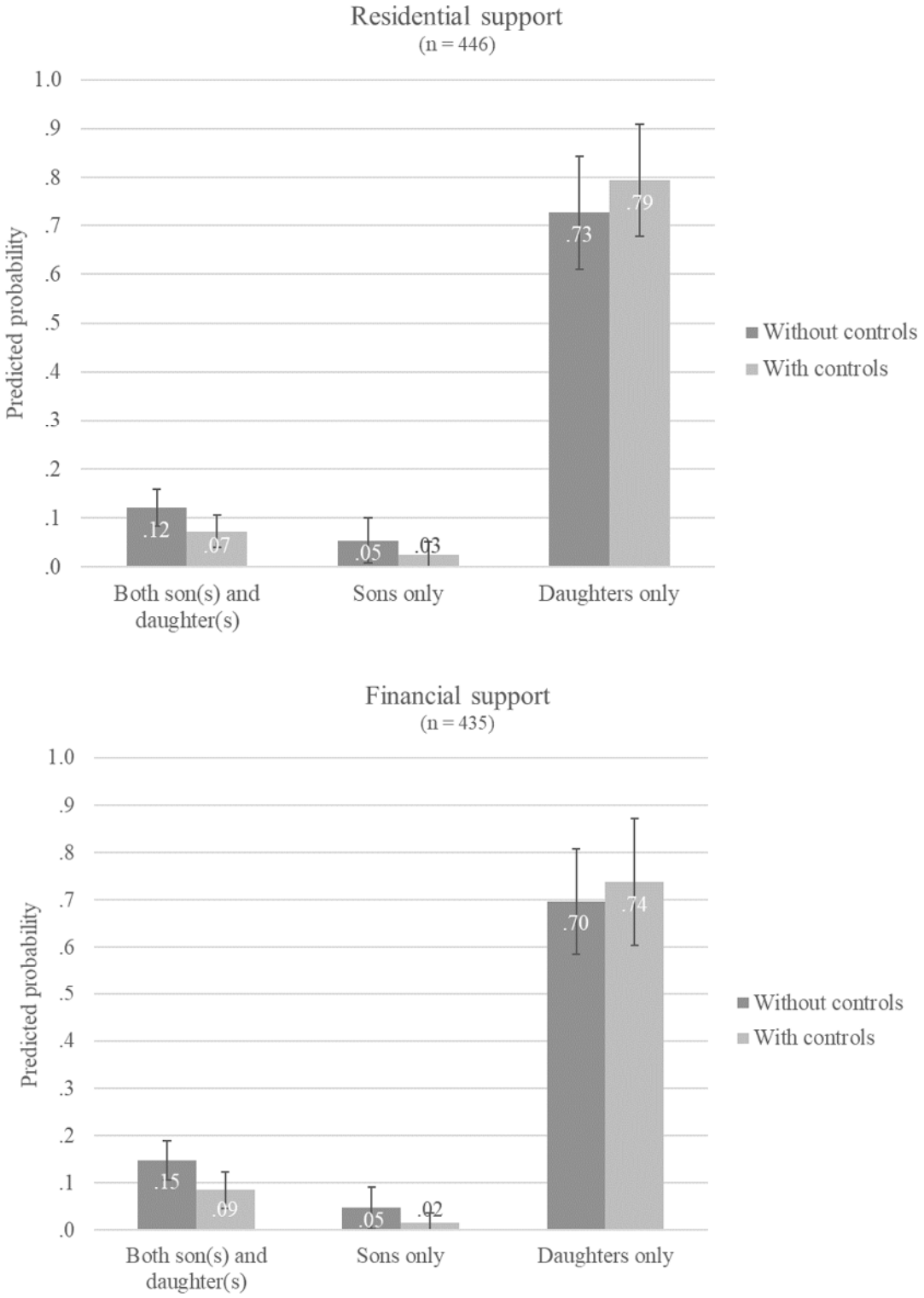


FIGURE 6 Predicted probabilities of adjusting expectations at wave 2 for women who expected a son to provide support in wave 1 (from the two-to-four children sample)



Note: The predicted probabilities are based on logistic regression models shown in Appendix Table B and are calculated with control variables held at their means. Controls included for wave 1 only include state, urban residence, religion/caste, age, education, and ideal gender composition of children. Controls included for both waves 1 and 2 include log of household income and dummies for practicing purdah, men and women in the household eat together, and working for pay.