

Intrahousehold Bargaining, Female Autonomy, and Labor Supply: Theory and Evidence from India

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February 7, 2019

Abstract

Standard models of labor supply predict that unearned income decreases labor supply. We propose an alternative noncooperative household model in which a woman's unearned income improves her autonomy within the household, which raises her gains from working and can increase her labor supply. We find empirical support for this model, using women's exposure to the Hindu Succession Act in India as a source of exogenous variation in their unearned income. Exposure to the Hindu Succession Act increases a woman's labor supply by between 3.8 and 6.1 percentage points, particularly into high-paying jobs. Autonomy increased by 0.17 standard deviations, suggesting that control of income is a potential channel for these effects. Thus, policies that empower women can have an additional impact on the labor market, which can further reinforce autonomy increases.

*Department of Economics, University of Washington; rmheath@uw.edu and tanxu@uw.edu. Scott Walters provided excellent research assistance. We thank Paola Giuliano and three anonymous referees for helpful suggestions, and Siwan Anderson, S Anukriti, Rosella Calvi, Jessica Hoel, Fahad Khalil, Melanie Khamis, Adriana Kugler, Jacob LaRiviere, Annemie Maertens, Tyler McCormick, Sanchari Roy, Laura Schechter, John Strauss, Shing-Yi Wang, Hendrik Wolff, and seminar participants at the Pacific Development Conference, the Northwest Development Workshop, the UW Bangladesh Development Conference, the Northeast Universities Development Consortium Conference, UC-Berkeley, the Universidad de los Andes (Bogota), the University of Houston, UC-San Diego, the Barcelona GSE Summer Forum, the Families and the Macroeconomy Conference (Edesheim), the Society for Labor Economists Annual Meetings, the University of Southern California, Wisconsin Applied and Agricultural Economics, the Cornell Population Center, Virginia Tech, UVA-Darden, Stonybrook, and Notre Dame for great feedback.

1 Introduction

Households are important economic units, but there is a large body of evidence that they do not necessarily act as unitary entities (Lundberg, Pollak and Wales 1997; Duflo 2003; Quisumbing and Maluccio 2003; Duflo and Udry 2004; Qian 2008; Luke and Munshi 2011). This phenomenon is particularly true in developing countries, where the common practice of spouses keeping their money in separate accounts provides prima facie evidence that households do not act as one unit.¹ Even if the household is not unitary, if spouses bargain collectively (Browning and Chiappori, 1998), this bargaining need not impair efficiency.² Given evidence of intra-household bargaining – which, if noncooperative, could lead to inefficient outcomes – a natural question is how household members’ bargaining power shapes household production. We provide evidence that household behavior in India is consistent with a noncooperative household model and argue that in this context, empowering women can increase women’s labor supply by increasing their gains from working.

Specifically, we examine the effects of the Hindu Succession Act (HSA), which was phased into different states in India between 1976 and 2005, on the labor supply of women exposed to it. Traditionally, inheritance in India among individuals that died without a will was given to a group of coparceners, which typically included only male relatives. However, amendments to the HSA phased in by various states (specifically, Kerala in 1976, Andhra Pradesh in 1986, Tamil Nadu in 1989, Maharashtra and Karnataka in 1994) and then ratified nationally in the remaining 24 states in 2005 explicitly made daughters coparceners.

The HSA greatly improved women’s ability to inherit property, thereby increasing their lifetime unearned income and their bargaining power. We find empirically that the

¹See Munro et al. (2014b) for a comprehensive recent summary of both the quantitative and qualitative evidence throughout the world that spouses keep income in separate accounts and frequently conceal money from each other. In India in particular, Munro et al. (2014a) found that more than half of spouses in a sample of households in rural Tamil Nadu and rural and urban Uttar Pradesh hid some money from each other.

²There is an ongoing debate on the extent to which household production and consumption outcomes are efficient. Bobonis (2009), Rangel and Thomas (2012), and Attanasio and Lechene (2014) provide evidence that consumption patterns respond to changes in household members’ bargaining power in a way that is consistent with a Pareto-efficient household allocation, though Angelucci and Garlick (2014) find that Pareto efficiency in consumption can be rejected for younger cohorts in the same Mexican setting as Bobonis (2009) and Rangel and Thomas (2012). Moreover, Duflo and Udry (2004) and Robinson (2012) provide evidence of incomplete insurance within households, which is inconsistent with Pareto efficiency, and Mazzocco (2007) provides evidence that the inability to commit hampers Pareto efficient outcomes. On the production side, Udry (1996) and Rangel and Thomas (2012) reject efficient allocation of inputs between household members in West Africa, though Akresh (2008) finds that households in other parts of the Burkina context examined by Udry (1996) exhibit behavior consistent with efficiency.

HSA increased women’s labor supply, especially into high-paying jobs. We develop a theoretical model of a noncooperative household in which a woman’s level of unearned income increases her control over her income (which we call an autonomy effect)³ and thereby her gains from working. If the autonomy effect dominates the income effect of greater unearned income, then unearned income increases a woman’s labor supply. By contrast, we show in the appendix that a standard collective household model predicts a negative correlation between a woman’s unearned income and her labor supply, as also discussed in [McElroy and Horney \(1981\)](#).⁴

Under plausible assumptions on the utility functions in our baseline noncooperative household model,⁵ empowering the woman increases efficiency: both she and her husband are better off when she has a higher bargaining power. The husband’s utility may not increase, however, if he obtains a sufficiently large disutility from his wife working or gaining autonomy, which is not reflected in our baseline model but suggested by empirical evidence in section 4 that the husband’s labor supply does not fall as the wife’s labor supply increases. While this result is consistent with the presence of a disutility to the husband, it is plausible that this utility cost will fall once more women begin working outside the home, so our baseline model would then provide a long-run benchmark on the benefits to the husbands of empowering women. If so, unlike in [Doepke and Tertilt \(2009\)](#) and [Fernández \(2014\)](#), where men want their daughters to be empowered (and would prefer that their wives remain unempowered if it were possible), men will prefer their wives to be empowered if the resulting increased financial contribution to the household public good ultimately dominates any utility cost to the men.

The HSA applied only to Hindu women who were unmarried at the time of implementation, so we identify its effects by comparing the outcomes of girls below the 10th percentile of the age at marriage distribution at the time the HSA was passed in their state to those of girls above the 90th percentile of age at marriage, and comparing this dif-

³Throughout the paper, we use the terms “bargaining power” (and corresponding verb “empower” and adjective “empowered”) to coincide with household bargaining models in which a higher outside option allows a household member to receive a higher pay-off. When we use the term “autonomy,” we are specifically referring to the way it is conceptualized in our theoretical model, as control over household income.

⁴[Schultz \(1990\)](#), [Gray \(1998\)](#), and [Rangel \(2006\)](#) present results on the effects of plausibly exogenous changes to women’s bargaining power on labor supply. While [Schultz \(1990\)](#) and [Rangel \(2006\)](#) find evidence for the collective model’s prediction that women use increased bargaining power to increase their leisure, [Gray \(1998\)](#) aligns with our finding that women with more bargaining power work more. Given the context-dependent findings from tests of efficiency ([Akresh 2008](#); [Angelucci and Garlick 2014](#)), it is not surprising that the relationship between women’s bargaining power and labor supply varies by context.

⁵In particular, if parameter values are such that both spouses contribute to the household public good in equilibrium and the wife cares relatively more about the consumption of private goods and the household public good than leisure.

ference in Hindu women to the difference in women of non-treated religions (primarily, Muslim and Christian women). We begin by using the National Family Health Survey to confirm that the HSA increased women's autonomy by 0.17 standard deviations, namely, her participation in large household decisions and her ability to go places without an escort. We proceed to find that exposure to the HSA increases a woman's probability of working by between 3.8 and 6.1 percent. The effect is driven by work for a non-family member, for cash, and that takes place away from home, confirming the model's predictions of a greater increase in the labor supply into high-paying jobs. We demonstrate the robustness of this labor supply result by turning to the National Sample Survey (NSS), which also allows us to use an additional source of variation: survey rounds conducted before versus after the passing of the HSA. We also use the NSS to provide evidence that the effect of the HSA was weaker among single women, whom we argue faced an income effect but less of an autonomy effect, and evidence against the presence of increasing the labor supply of treated women in states leading up to the reform. Our robustness checks suggest that these labor supply results are not driven primarily by changes in premarital human capital investments or marital matching. We acknowledge, however, that while we provide suggestive evidence that our model is an important mechanism linking the HSA and labor supply, we cannot entirely rule out other mechanisms.

Previous literature has examined the Hindu Succession Act and other reforms to women's inheritance rights but has focused primarily on human capital and intra-household bargaining, outcomes that are consistent with either collective or non-cooperative households. Specifically, [Roy \(2015\)](#) and [Deininger, Goyal and Nagarajan \(2013\)](#) both find that the HSA increased girls' education, and [Roy \(2008\)](#) finds that it increased women's bargaining power. Its effects on women were not unambiguously positive, however. [Rosenblum \(2015\)](#) shows that the HSA increased female child mortality, arguing that it raised the cost of girls for parents who would like to bequeath property to their sons. [Anderson and Genicot \(2014\)](#) argue that the HSA has intensified intra-household conflicts, increasing both domestic violence and suicides among men and women.⁶ Other countries have conducted similar reforms to women's inheritance rights; [Carranza \(2012\)](#) finds that a reform in Indonesia decreased the use of son-biased fertility stopping rules, and [Harari \(2013\)](#) finds that a reform in Kenya increased women's education and bargaining power. Our model builds upon the relationship between inheritance law and women's bargaining power by examining whether this increased bargaining power affects labor supply

⁶By contrast, [Mathur and Slavov \(2013\)](#) use a different identification strategy and data to find that the HSA decreased domestic violence. Both papers agree, however, that the reform increased women's control of decisions within the household.

decisions, which also provides some evidence in favor of a noncooperative household model.

Our paper also contributes to the literature examining the determinants of female labor supply. Since women's labor force participation is an important outcome – it affects women's status within the household (Anderson and Eswaran 2009; Atkin 2009), their marriage and childbearing decisions (Jensen 2012; Heath and Mobarak 2015), and the productivity of the economy overall (Bloom et al., 2009) – a large literature has studied the determinants of female labor supply. These papers have highlighted the opportunity costs of working,⁷ the availability of job opportunities in industries in which women have a comparative advantage (Rendall 2010; Jensen 2012), and cultural norms (Fernández, Fogli and Olivetti, 2004). We highlight a different determinant of women's labor force participation, building on the considerable evidence refuting unitary household models. Our results thus coincide with recent evidence that policy can modify cultural norms (Bau 2016). In particular, policy changes to inheritance rights can constitute an additional determinant of women's labor force participation, above standard supply and demand factors.

The role of intrahousehold bargaining in determining female labor supply can also help explain its relationship to economic development. Goldin (1994) points out that women's labor supply is U-shaped: it first declines and then rises as countries develop. Her argument is that income effects are particularly important when women's only option to work outside the home is manual labor, against which there is strong social stigma. As a country develops, women gain access to white-collar work, which is less stigmatized, and they rejoin the labor force. We present a different (although complementary) explanation for this U-shape, based on the fact that women's legal rights to own and inherit property tend to rise as countries develop (Doepke, Tertilt and Voena, 2012). When unearned income increases in our model, income effects will dominate for women who receive low wage offers, holding constant men's unearned income (corresponding to a move from low to medium development), and women's labor supply will fall. As high wage offers become available, however, the autonomy effect will begin to dominate and labor supply will again increase.

Finally, our results provide further insight on the joint determination of female labor supply and autonomy. While previous studies have documented a causal effect of women's labor force participation on their bargaining power within the household (An-

⁷In particular, there is much research on the relationship between fertility (Goldin and Katz 2002; Bloom et al. 2009; Agüero and Marks 2011) or childcare costs (Connolly, 1992) and female labor supply. Other research in this vein has examined the time required by household production (Greenwood, Seshadri and Yorukoglu, 2005) or caretaking of elderly household members (McGarry, 2006).

Anderson and Eswaran 2009; Atkin 2009), our results suggest that causality runs in the other direction as well. Since policy-makers often seek to increase women’s labor supply as a way to improve development outcomes – see, for instance, the 2012 World Development Report – our results suggest that reforms that improve women’s standing within the household have both a direct effect on outcomes such as children’s health or education and an indirect effect through labor supply.

The rest of the paper proceeds as follows. In section 2, we develop a model of women’s autonomy and household members’ labor supply decisions that demonstrates the possibility that a woman’s unearned income can increase her labor supply. Section 3 describes the data and empirical strategy that we use to test the model’s predictions. In section 4, we provide our main results on labor supply, and in section 5, we investigate alternative channels connecting women’s autonomy and labor supply and discuss the limitations of our empirical strategy. Section 6 concludes.

2 Theoretical Model

In this section, we set up a simple model that identifies how a change in unearned income affects labor supply in a household setting. A standard *income effect* predicts that unearned income decreases labor supply. While our model incorporates this effect, we argue that a wife’s unearned income also increases her autonomy – her control of her income – which raises her effective wage and thus may increase her labor supply. We denote this as an *autonomy effect*. In accordance with evidence that production decisions between husbands and wives are not necessarily efficient (Udry 1996; Rangel and Thomas 2012), our main model is a noncooperative household model that does not impose Pareto efficiency (Anderson and Eswaran 2009). In appendix B.1, we contrast the results of the noncooperative model with a standard collective model (a cooperative setup).

We first describe our baseline model and then discuss its robustness and potential extensions. Suppose the wife’s utility has the following form:

$$u_f(x_f, z, l_f) = \beta_f \ln x_f + \gamma_f \ln z + \delta_f \ln l_f,$$

where her utility depends on her consumption x_f , the household public good z , and her leisure l_f . The wife spends a unit of time on outside work e_f and leisure l_f , so $e_f + l_f = 1$. To correspond to the data we have on labor supply on the extensive margin, we assume that e_f is a binary choice between 0 and E_f , where $E_f \in (0, 1)$ is exogenously given. For example, E_f could be $1/3$ to represent 8 hours of work.

Suppose the husband's utility has an analogous form:

$$u_m(x_m, z, l_m) = \beta_m \ln x_m + \gamma_m \ln z + \delta_m \ln l_m,$$

where his utility depends on his consumption x_m , the household public good z , and his leisure l_m . The husband spends a unit of time on outside work e_m and his leisure l_m , so $e_m + l_m = 1$. e_m is also assumed to be a binary choice between 0 and some exogenous $E_m \in (0, 1)$.

The household public good is produced using monetary contributions, y_f and y_m , from the wife and the husband, respectively. Intuitively, the monetary contributions are perfect substitutes, and we assume its production function is linear in the inputs:

$$z = f(y_m, y_f) = y_f + y_m.$$

The wife's optimization problem is

$$\max_{x_f, y_f, e_f \geq 0} \beta_f \ln x_f + \gamma_f \ln z + \delta_f \ln(1 - e_f),$$

$$s.t. e_f \in \{0, E_f\}, z = y_m + y_f, y_f + p_f x_f \leq a_f(w_f e_f + R_f),$$

where p_f is the price of the wife's private good, w_f is the wage rate for her work outside the home, and R_f is her unearned income. We model autonomy (denoted by a_f) as the fraction of her income that the wife can spend: she retains $a_f(w_f e_f + R_f)$ of her total earned and unearned income.⁸ Therefore, with higher autonomy, the wife would report a greater say in household purchases, which we confirm in section 4.

The husband's optimization problem is

$$\max_{x_m, y_m, e_m \geq 0} \beta_m \ln x_m + \gamma_m \ln z + \delta_m \ln(1 - e_m),$$

$$s.t. e_m \in \{0, E_m\}, z = y_m + y_f, y_m + p_m x_m \leq w_m e_m + R_m + (1 - a_f)(w_f e_f + R_f),$$

where p_m is the price of the husband's private good, w_m is the wage rate for his work outside the home, and R_m is his unearned income. The husband controls the remaining

⁸de Mel, McKenzie and Woodruff (2009) study investments in microfinance and also assume that the husband captures a share of the wife's earnings. While it is also possible that the wife controls a portion of the husband's earnings, incorporating this possibility would change primarily the husband's labor supply and have little effect on the wife's labor supply decision because her effective wage $a_f w_f$ remains the same. Since almost all men work in India, the effect of this modification would be negligible, and thus, for simplicity, we assume the wife cannot spend the husband's earnings.

part of his wife's income, $(1 - a_f)(w_f e_f + R_f)$.

Benchmark: the role of the household public good

To examine how household interactions respond to our main mechanism – an autonomy effect – in this noncooperative household model, we begin with the case without the autonomy effect. In particular, suppose that a_f is fixed and examine the effect of a transfer from the husband to the wife. That is, the wife's unearned income R_f increases, holding the household's total unearned income $R_f + R_m$ constant. We study both *interior* equilibria, in which both spouses contribute positive amounts to the household public good, and *wife-solo-contributing* equilibria, in which only the wife contributes to the public good.⁹

Remark 2.1. *Suppose that autonomy a_f is constant. Keeping the total unearned income constant, an increase in the wife's unearned income will:*

- *In interior equilibria, keep all outcomes constant, including both spouses' labor supply (e_f and e_m), the household public good (z), and both spouses' utilities (u_f and u_m).*
- *In wife-solo-contributing equilibria, weakly decrease the wife's labor supply and weakly increase the husband's labor supply (e_f and e_m), increase the public good (z) except if the wife stops working, increase the wife's utility and decrease the husband's utility (u_f and u_m).*

This remark highlights two features of the noncooperative household model. (All proofs are in appendix A.) First, when both spouses contribute to the household public good, the equality of marginal utilities that holds at an interior solution (both before and after a transfer from the husband to the wife) dictates that this transfer does not affect consumption and the level of the household public good. To illustrate this, consider the first-order conditions for both spouses' spending:

$$\frac{\beta_f}{p_f x_f} = \frac{\gamma_f}{z}, \text{ and } \frac{\beta_m}{p_m x_m} = \frac{\gamma_m}{z}.$$

That is, each spouse needs to obtain the same marginal utility from spending the last dollar on his/her own consumption and spending it on the household public good. This observation implies that the household public good changes in the same direction as both spouses' consumption, and with a fixed household budget, it must remain the same. Thus, because of the household public good, a transfer to the wife will not make her truly

⁹The third type of equilibria, in which only the husband contributes to the household public good, is similar to the wife-solo-contributing equilibria, as shown in appendix B.7.

wealthier, as her own consumption and the level of the household public good remain constant.

Second, when only the wife contributes to the household public good, the linkage it creates between the actions of both spouses is shut down, and the problem becomes two separate utility maximizations. With a transfer from the husband to the wife, the wife faces a positive income shock, so she works less and obtains a higher utility, and the husband receives exactly the opposite effect.¹⁰

Because the household public good provides a linkage between the behaviors of both spouses that allows for their strategic interaction, we examine interior equilibria to provide our main set of results. More importantly, doing so removes any income effect from an internal transfer of unearned incomes and allows us to cleanly isolate the effect of an autonomy increase. Intuitively, the parameters that generate interior equilibria imply that both spouses care relatively enough about the household public good (including household purchases and their children), and the income each of them controls is high enough to allow them to provide for at least some positive fraction of the household public good. Specifically, the proof of remark 2.1 reveals the condition to ensure interior equilibria:¹¹ for both $e_f \in \{0, E_f\}$,

$$\frac{\beta_f/\gamma_f}{\beta_f/\gamma_f + \beta_m/\gamma_m + 1} < \frac{a_f(e_f w_f + R_f)}{w_m E_m + w_f e_f + R_m + R_f} < \frac{\beta_f/\gamma_f + 1}{\beta_f/\gamma_f + \beta_m/\gamma_m + 1}. \quad (1)$$

For instance, when both spouses value the household public good the same as their private consumption, $\beta_f = \gamma_f$ and $\beta_m = \gamma_m$. Then, condition (1) requires that the income the wife controls falls in the range of one-third to two-thirds of the household's total income. After providing our main results based on interior equilibria, we discuss the predictions in the wife-solo-contributing equilibria.

Female labor supply and autonomy effect

To add the autonomy effect, suppose there are two stages: first, the spouses bargain about the wife's autonomy, and then, they maximize their utilities. In the first bargaining stage, where unearned incomes affect outside options, the wife can obtain a higher autonomy when her unearned income is higher. We focus on the utility maximization stage, and

¹⁰The positive income effect on the wife and the negative one on the husband also appear when the equilibria change types, i.e., from an interior equilibrium to a wife-solo-contributing one as a result of a transfer from the husband to the wife.

¹¹That is, in the proof of remark 2.1, equation (10) and (11) are both positive when the husband works ($e_m = E_m$, which holds based on Assumption 1 discussed below).

make a reduced-form assumption that the autonomy is an increasing function of the wife's share of the unearned incomes (also an increasing function of her unearned income):¹²

$$a_f = \alpha_f \frac{R_f}{R_f + R_m},$$

where $\alpha_f \in (0, 1]$, which gives an upper bound on autonomy. We model autonomy as a function of unearned income to correspond to our empirical strategy that uses exogenous variation in unearned income. Finally, to sidestep the distracting possibility of zero total unearned income, we assume that $R_f + R_m$ is positive.¹³

While we consider the above noncooperative household model for simplicity of presentation, a series of appendices show that it can be extended to accommodate a number of realistic extensions and generalizations. In particular,

- In appendix B.2, we show that our main results are robust to a general set of utility functions.
- In appendix B.3, we derive a similar set of results when the time on outside work (e_f and e_m) is a continuous variable.
- In appendix B.4, we consider the possibility that the wife can also contribute time to produce the household public good. As long as time is a close enough substitute to money in the production of the household public good, the main results persist.
- In appendix B.5, we model the possibility that the husband dislikes his wife spending time on outside work. Specifically, we enrich the first bargaining stage: they bargain over the female labor supply, and the husband can veto the decision. We discuss the possibility that this can be an alternate mechanism, which predicts a similar link between an increase in the wife's outside option and her labor supply.
- In appendix B.6, we show that our theoretical results persist if we assume that autonomy depends on both unearned incomes and wages.

Furthermore, one additional extension that does not affect the main mechanism in our model is if the wife gains utility and autonomy directly from working. As this effect

¹²This assumption is supported by studies that find that unearned income accrued by women is spent differently than men's unearned income, presumably on goods women care about, such as their daughters or granddaughters (Thomas 1990; Duflo 2003), women's clothing (Lundberg, Pollak and Wales 1997; Phipps and Burton 1998) or decreased spending on items consumed only by males, such as alcohol and tobacco (Hoddinott and Haddad 1995; Wang 2014).

¹³Appendix B.6 considers a_f to be determined by both the unearned incomes and wages, which allows $R_f + R_m = 0$.

exists with or without the HSA, it motivates women to work more in both cases but does not interfere with the main channel in our model: the HSA increases women's autonomy and thus their effective wages.

To simplify the model, we introduce the following assumption to ensure that the husband always works, so we can focus on studying the wife's labor supply.

Assumption 1 (A1): parameters β_m and δ_m satisfy

$$\frac{\beta_m}{\delta_m} > \frac{w_m E_m + R_m + w_f E_f + R_f}{w_m(1 - E_m)}.$$

Notice that to accommodate wife-solo-contributing equilibria, in which the husband does not decide the household public good, γ_m does not show up in (A1). The following lemma shows that (A1) ensures the husband always prefers to work. This assumption corresponds to the Indian context; as we explain in section 4, 96 percent of married men in the National Family Health Survey work outside the home.

Lemma 2.2. *In any equilibrium, if (A1) holds, the husband always works ($e_m = E_m$).*

Besides an increase in the wife's unearned income, another impact of the HSA is a potential decrease in the unearned income of men whose sisters are subject to the HSA. While this aspect of his exposure to the HSA depends on his sister's marriage timing (which does not necessarily coincide with his wife's exposure), on average men's unearned income still has decreased as a result of the HSA. Thus we consider theoretically two possible impacts of the HSA on a household: Proposition 2.3 considers an increase in the wife's unearned income with an equivalent decrease in the husband's unearned income, so that the household's total unearned income remains the same. This is consistent with the impact of the HSA on the society overall, where the total amount of inherited money remains the same and the HSA changes the allocation rule. Proposition 2.4 considers an increase in the wife's unearned income when the husband's unearned income remains constant, which is consistent with the impact of the HSA on households whose treatment status is defined by the wife's exposure. Broadly speaking, most treated households fall between these two propositions, which could be viewed as upper and lower bounds.¹⁴

Proposition 2.3. *Suppose that the Nash equilibrium is interior and (A1) holds. In equilibrium, keeping the total unearned income constant, an increase in the wife's unearned income will:*

¹⁴In theory, information on the sex composition of the siblings of the husband and wife could be used to test the heterogeneity of response based on the effective change in inheritance as a result of the HSA. However, we know of no data from India that has information on the sex composition of the siblings of married adults.

- Weakly increase her labor supply (e_f).
- Weakly increase the household public good (z).

An increase in the wife’s ability to inherit property, together with an equivalent decrease in the husband’s inheritance, increases the likelihood that she works outside the home. This is because her effective wage $a_f w_f$ increases.¹⁵ The wife (weakly) increases her expenditure on consumption and increases her contribution to the household public good. Overall, when the wife begins to work outside the home, the household total income increases, so the total contribution to the household public good increases.

The key mechanism is the increase in female autonomy, as a result of the increase in R_f . While the model is static, in the empirical context, women exposed to the HSA receive greater unearned income when their father dies. In this case, we would still expect a link between a future increase in R_f and the wife’s current autonomy if the wife can borrow against future income or reduce her savings accordingly. Alternatively, even in an extreme case with severe credit constraints – such that the wife’s current unearned income remains the same – her autonomy still plausibly increases because her lifetime unearned income increases due to the HSA, increasing her outside option.¹⁶ Recall from remark 2.1 that when both spouses contribute to the household public good, a transfer from the husband to the wife itself has no effect on the household’s outcomes. Thus, the effect in proposition 2.3 is due to the increase in autonomy. Consequently, the effect of an increase in autonomy, even if it is due to a future unearned income increase while holding constant current unearned income, is exactly the same as that in proposition 2.3.

A woman’s gains from working and, thus, the effects of the HSA, depend on her wage w_f , which likely varies across women. This heterogeneity helps provide additional testable implications of the model, and to characterize it, we aggregate the individual-level results in proposition 2.3 to the society level. Specifically, we consider a society in which the wife’s baseline unearned income (before the HSA) is a random variable. We maintain the assumption that it follows a truncated normal distribution with a mean μ , $R_f \sim N(\mu, \sigma^2)$ restricted in $[0, \infty]$, for expositional clarity.¹⁷ According to table 2, only

¹⁵While we do not employ a principal-agent set-up, this result is similar to a classic moral hazard problem: because the wife receives only a fraction of her income, she has less incentive to work. As the fraction she receives increases, her incentive to work increases, as discussed (though not formally modeled) by Geddes and Lueck (2002).

¹⁶Roy (2015) further argues that parents increase dowries rather than give inheritances to daughters in response to the HSA. In either case, the result of the HSA is an increase in unearned income to the daughter, which we interpret as an increase in R_f in the context of our model. A further concern might be that parents reduce inter-vivos transfers in anticipation of inheritances, leaving daughters less wealthy in the short run. However, Roy (2015) finds no evidence that parents reduce gifts to their daughters after the HSA.

¹⁷The two claims hold for any distribution with a mean μ and a density $f(x)$, as long as the right-hand

36% of women work, so we assume that μ is low such that less than one-half of women work even after the increase in their unearned income.

Claim. *In Proposition 2.3, the aggregate increase in female labor supply is higher for high-paying jobs.*

The equilibrium in proposition 2.3 has the following patterns. If the wife's unearned income is lower than some threshold (t_0), there is an equilibrium in which she doesn't work, and if it is higher than some other threshold (t_E), there is an equilibrium in which she works. These two thresholds are not necessarily the same, so we may have multiple equilibria or no equilibrium. Because of this non-uniqueness of the equilibria, we maintain the assumption that women work only if it is the unique equilibrium, i.e., the threshold we care about is $t = \max(t_0, t_E)$. If her unearned income increases passing the threshold t , her labor supply increases, and otherwise, her labor supply remains constant.

If the wife's unearned income increases by Δ , the women who begin to work outside are those with $R_f \in [t - \Delta, t)$. Its probability is $F(t) - F(t - \Delta)$, where $F(x)$ is the cumulative distribution function of the truncated normal distribution. Since less than half of women work, $[t - \Delta, t)$ is on the right-hand side of the mean, and then, lower t implies that the probability $F(t) - F(t - \Delta)$ is higher. The threshold (t) decreases with the wife's wage, as illustrated in the proof of proposition 2.3. Thus, a higher wage leads to a lower threshold and a correspondingly higher increase in female labor supply (see appendix B.8 for a graphical illustration). Intuitively, the higher a woman's wage, the greater is the increase in the effective wage $a_f w_f$ from a gain in her autonomy.¹⁸

On the other hand, suppose that the wife is subject to the HSA, but the husband has no sisters subject to the HSA. Then, the household unearned income increases, and our predictions on female labor supply change:

Proposition 2.4. *Suppose that the Nash equilibrium is interior and (A1) holds. In equilibrium, keeping the husband's unearned income constant, an increase in the wife's unearned income will:*

- *Increase her labor supply (e_f) if her unearned income increases from low to mid-level, and decrease it if her unearned income increases from mid-level to high, i.e., an inverse U shape.¹⁹*
- *Otherwise, keep her labor supply constant.*

side of the density is monotone, i.e., if $\mu < x < y$, $f(x) > f(y)$.

¹⁸Note that if the increase in women's unearned income is positively correlated with their wages, i.e., $\Delta(w_f)$ increases in w_f , which would happen if wealthy women who stand to receive more inheritance also have more human capital; then, the positive correlation of women's wage and their increase in the labor supply would be even stronger.

¹⁹While in theory, this prediction could be tested at the individual level, in practice, it would require very specifically controlled random variation since the prediction is generated holding constant the change

- Increase the household public good (z) if e_f weakly increases.

A pure increase in the wife's ability to inherit property has two effects on her labor supply – an income effect and an autonomy effect – and they move the wife's labor supply in opposite directions. With an income effect, an increase in her unearned income decreases her labor supply because she would like to spend more time on leisure. With an autonomy effect, an increase in her autonomy would increase her labor supply because her effective wage is higher. The overall change in the wife's labor supply depends on which effect dominates. If the wife's unearned income is low, her gain from working is low; if the wife is sufficiently wealthy, the income effect dominates increases in the effective wage. In both cases, the wife prefers not to work outside the home. Thus, the wife goes out to work only if her unearned income is mid-level. Furthermore, a pure increase in the wife's ability to inherit property would increase the household's total income, while the husband's unearned income would remain the same. As long as the wife does not decrease her labor supply (as supported by our empirical results), the total contribution to the household public good increases.

With the heterogeneity in the decrease of the husband's unearned income (depending on his sisters' exposure to the HSA), the income effect could be weaker than that in proposition 2.4, which assumes no decrease in the husband's unearned income. Therefore, the wife's labor supply is more likely to increase due to a relatively stronger autonomy effect.

Claim. *In Proposition 2.4, the aggregate change in female labor supply is always non-negative and higher for high-paying jobs.*

The equilibrium in proposition 2.4 has the following patterns. Her labor supply exhibits an inverse U shape: She does not work when her unearned income is low or high ($R_f < t_{0L}$ or $R_f > t_{0H}$), and she works when it is mid-level ($R_f \in (t_{EL}, t_{EH})$). As before, we assume that women work only if it is the unique equilibrium, such that $t_L = \max(t_{0L}, t_{EL})$ and $t_H = \min(t_{0H}, t_{EH})$. If her unearned income increases passing the lower threshold t_L , her labor supply increases; if it does so passing the higher threshold t_H , her labor supply decreases, and otherwise, her labor supply remains constant. The aggregate change in female labor supply is

$$(F(t_L) - F(t_L - \Delta)) - (F(t_H) - F(t_H - \Delta)), \quad (2)$$

in unearned income across the distribution of the woman's relative unearned income. This empirical test would then require both data on relative assets belonging to each spouse and experimental variation to insure that the change in unearned income is the same across the distribution. Since we do not have information on sex-specific assets and the amount by which the HSA changes unearned income, we instead test the aggregate prediction in the claim below.

where $F(t_L) - F(t_L - \Delta)$ is the fraction of women who start working due to an increase in R_f , and $F(t_H) - F(t_H - \Delta)$ is the fraction of women who stop working. Since $t_H \geq t_L$ and they are on the right-hand side of the mean, $F(t_L) - F(t_L - \Delta) \geq F(t_H) - F(t_H - \Delta)$, so the aggregate change in (2) is non-negative. We show in the proof of proposition 2.4 that t_L decreases with her wage and t_H increases with her wage. When her wage is higher, t_L is lower implying that $F(t_L) - F(t_L - \Delta)$ is higher, and t_H is higher implying that $F(t_H) - F(t_H - \Delta)$ is lower; thus, the overall increase in (2) is higher.

We make three additional remarks here. First, if only one spouse contributes to the household public good (likely the wife), then the problem becomes two separate utility maximizations. Regardless of whether holding $R_f + R_m$ or R_m constant, the wife faces both an autonomy effect – a higher effective wage – and an income effect, and they move her labor supply in opposite directions. We show in appendix B.7 that which effect dominates depends on the concavity of her utility function.

Second, while husbands (almost) always work, we consider continuous labor supply in appendix B.3 and find that men’s labor supply on the intensive margin drops. Empirically, we find in section 4 that the change in men’s labor supply is ambiguous, i.e., positive but not statistically significant. Therefore, if our model is correct, there must be a countervailing force that is otherwise increasing men’s labor supply. One possibility, which we explore in appendix B.5, is that the husband obtains disutility from his wife’s working. His increase in working and earnings could reduce the social pressure he would face (the pressure that he does not provide for the family) when his wife begins working outside the home.

Third, we remark on households in which the wife is not subject to the HSA, but the husband’s unearned income decreases when his sister is qualified. In this case, the wife is more likely to work outside the home due to both an increase in her autonomy and a decrease in the husband’s wealth, while the supply of the household public good may decrease.

Welfare of the household

We now turn to the question how the HSA affects the household’s welfare. We introduce the following assumption in order to clarify the circumstances under which the wife’s utility increases after she begins working outside the home.

Assumption 2 (A2): parameters β_f, γ_f , and δ_f satisfy

$$(\beta_f + \gamma_f) \ln \frac{w_f E_f + w_m E_m + R_m + R_f}{w_m E_m + R_m + R_f} + \delta_f \ln(1 - E_f) \geq 0.$$

This assumption guarantees that the wife’s utility change when she works outside the home is positive. The first term is the benefit from increasing private consumption and household public good, and the second one is the loss of leisure. (A2) can be easily satisfied when the wife cares relatively little about her leisure, say, if δ_f is small enough relative to $\beta_f + \gamma_f$.²⁰

Remark 2.5. *Suppose that (A1) holds. Keeping the total unearned income constant, an increase in the wife’s unearned income will:*

- *In interior equilibria, weakly increase the wife’s utility if (A2) holds but otherwise weakly decrease the wife’s utility (u_f) and weakly increase the husband’s utility (u_m).*
- *In wife-solo-contributing equilibria, increase the wife’s utility (u_f) and decrease the husband’s utility (u_m).*

In interior equilibria, both spouses respond to the wife’s increased autonomy. First, holding the husband’s strategy constant, an increase in autonomy increases the wife’s effective wage, which then could prompt her to start working outside the home. Continue holding the husband’s strategy constant; the wife must obtain a strictly higher utility if she decides to start working. She then raises the household public good by contributing part of her earned income to it, which causes the husband to reduce his contribution. The decrease in the husband’s contribution both increases his utility (as his private consumption increases) and decreases the wife’s utility. Overall, the husband obtains more household public good and more private consumption, so his utility weakly increases.

The fact that the husband’s utility increases – in our baseline model – raises the question of why he had not empowered his wife on his own, before the HSA did so legislatively. If this model is accurate and the husband is better off after the HSA, one possibility is that the HSA allows him to commit to a level of a_f that would increase his utility. Absent the HSA, this promise may not be credible because while the husband likes the additional earning from the wife, he also wants a higher share of that income once it comes into the house. However, another possibility is that there is some cost to the husband that is not captured in our baseline model. For instance, suppose he obtains disutility from his wife working outside the home and/or from granting her higher autonomy, as we explore further in appendix B.5. If this disutility outweighs the increase in his utility from private consumption and public good, the husband’s utility could fall when his wife’s autonomy increases (as under the HSA), explaining why he did not grant her autonomy even before the HSA. However, we still remark on the efficiency implications of the baseline model

²⁰In a model where the wife also contributes time to the household public good (in appendix B.4), the prediction on the wife’s utility does not depend on (A2).

as a benchmark for the scenario in which there is minimal stigma to women working or having autonomy and, thus, relatively low utility cost to the husband.

Interestingly, it is actually the wife who may not necessarily be better off due to the decrease in the husband's contribution to the household public good. The direct effects to her utility include an increase in her earning and a decrease in her leisure. If (A2) holds, she values the increase in (private and public) consumption enough to dominate the loss of leisure, so she is also better off. Thus, while it is not automatic, there are a range of parameter values for which empowering the woman is a Pareto-improvement. Of course, she also may face direct utility gains or costs from working outside the home or having autonomy, which would then affect her overall wellbeing under the HSA.

In the other scenario, when only the wife contributes to the household public good, the welfare analysis is straightforward: the wife faces a positive income shock, so she obtains a higher utility, and the husband suffers a negative income shock, so he obtains a lower utility. The difference compared to the interior equilibria is that the husband cannot keep or increase his private consumption by reducing his contribution to the household public good, so he cannot keep the same level of utility and cannot reduce the wife's utility.

Next, if the overall household experiences a positive income shock, i.e., R_f increases and R_m is constant, both spouses are likely to be better off. While proposition 2.4 predicts that female labor supply may increase or decrease, to keep the remark succinct, we focus on when e_f does not decrease, which is supported by our empirical findings.

Remark 2.6. *Suppose that (A1) holds. Keeping the husband's unearned income constant, an increase in the wife's unearned income will:*

- *In interior equilibria, increase both spouses' utilities (u_f and u_m), if (A2) holds and e_f does not decrease.*
- *In wife-solo-contributing equilibria, increase the wife's utility (u_f), and also increase the husband's utilities (u_m) if e_f does not decrease.*

It is worth noting that even when the husband's unearned income does not decrease, in interior equilibria, the increase in the wife's utility still depends on assumption (A2). This is for the case when the increase in R_f is very small yet enough to make the wife start working (she would be very close to prefer working without the increase in R_f). As the increase in R_f is very small, the case is still similar to that in remark 2.5 in which $R_f + R_m$ is constant. In particular, the husband may decrease his contribution to the household public good, which may then decrease the wife's utility.

Summary of testable implications

The table below summarizes our model’s testable implications of an increase in the wife’s unearned income (R_f):

	Proposition 2.3 ($R_m + R_f$ constant)	Proposition 2.4 (R_m constant)
Wife’s labor supply (e_f)	Constant or Up (Up, likely if w_f high)	Constant, Up or Down (Up, likely if w_f high)
Household public good (z)	Same as e_f	Up, unless e_f decreases

3 Empirical Strategy

3.1 Background on the Hindu Succession Act

Here, we give a brief overview of the legal reforms that we use for identification. For more detail comparing gender-specific property rights before and after the reform, see [Deininger, Goyal and Nagarajan \(2013\)](#) or [Roy \(2015\)](#). Succession in India was traditionally governed by the *Mitakshara* system, which made a distinction between individual property (also called separate or private property) and joint property, which included land and other ancestral assets. Individual property could be bequeathed at will, but joint property was doled out among a group of coparceners, which typically included only male relatives. Daughters or widows were allowed to inherit ancestral property from their fathers or late husbands only in the absence of male heirs. Since joint family property is the vast majority (97 percent) of total property ([Roy, 2015](#)), laws governing its succession are extremely important determinants of asset ownership.

While the Hindu Succession Act of 1956 unified different traditional schemes and clarified women’s rights to inherit private property, it continued to exclude women from the inheritance of joint property.²¹ Sons, by contrast, were given a direct right by birth to belong to the coparcenary and thus to inherit joint property. Membership in the coparcenary granted other benefits, such as the ability to demand the partition of joint property

²¹The inheritance rights of Muslim women, who form the majority (78 percent) of women in the non-treated religions, are governed by the the Muslim Personal Law (Shariat) Application Act of 1937, which also strongly favors male heirs. Among other discriminatory aspects, women can inherit land only if no male heirs are available. The inheritance of Indian Christians (who represent 14 percent of women whose religions were not covered by the HSA) has traditionally been governed by either local customary law or English law ([Khan, 2000](#)).

State	Year Passed	NFHS estimation sample		NSS estimation sample	
		Treated Cohort	Control Cohort	Treated Cohort	Control Cohort
Kerala	1976	2,214	120	9,252	12,976
Andhra Pradesh	1986	2,994	800	7,698	28,465
Tamil Nadu	1989	1,780	1,055	3,048	29,459
Maharashtra and Karnataka	1994	3,264	4,066	3,227	69,678
Remaining 24 states of India	2005	1,130	45,078	0	452,372

Table 1: Timing of passage of the HSA and identifying variation, by state

(e.g., a house) (Roy, 2015). These rules applied to men dying intestate (without a will), which occurs in 65 percent of deaths in India (Agarwal, 1994).

However, the Indian constitution grants both the federal and state governments legislative authority over inheritance, and in subsequent years, various states (as listed in table 1) enacted amendments that explicitly made daughters coparceners. These reforms applied only to women who are Hindu, Buddhist, Sikh or Jain, and only to women who were not yet married at the time of the reform. These amendments indeed had large effects on women’s ability to inherit land: they caused the proportion of eligible women who have inherited land to increase by 15 percentage points, a very large increase, relative to the baseline level of 6 percent in non-reform states (Deininger, Goyal and Nagarajan, 2013).

3.2 Data and outcome measures

We use two datasets: the 2005-2006 National Family Health Survey (NFHS) and the National Sample Survey (NSS) Employment and Unemployment modules (rounds 1983, 1987, 1993, 1999, and 2004).

The NFHS provides information about both labor supply and a woman’s bargaining power within a household, which we use to bolster our argument that autonomy is the mechanism relating the inheritance reform to women’s labor supply. It also provides information on women’s health, which we use to provide context on other potential channels linking the HSA and female labor supply. The data is nationally representative and has a relatively large sample size (87,857 currently married women), allowing us to flexibly control for effects of religion that may vary by state and age. A downside to these data is that we do not have information on whether the father is still living in either dataset, so we cannot test whether the estimated treatment effect is driven by Hindu girls in treated cohorts whose fathers were still living when the HSA was passed, as in Deininger, Goyal and Nagarajan (2013).

Our main outcome variable of interest is a binary variable for whether a woman has worked in the past seven days. This variable was defined based on a very broad definition of work that includes any income-generating activity done in the past seven days. Specifically, it asked: “As you know, some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business or work on the family farm or in the family business. In the last seven days, have you done any of these things or any other work?” We also examine specific types of labor supply, namely:

- Whether the woman works for herself, a family member, or someone else. These categories are mutually exclusive.
- Whether the woman works for cash.
- Whether the woman works all year.
- Whether the woman works away from home.
- Whether the woman works in several mutually exclusive job categories: professional/technical/managerial; clerical/sales/service; manual (skilled or unskilled); and agriculture.

While we do not observe earnings directly in the NFHS, we argue that existing evidence from India and elsewhere in the developing world suggests that several of these jobs are likely to be high-paying: working for someone other than herself or a family member, working for cash, working all year, and working away from home. These attributes correlate with work done in the formal sector (El Badaoui, Strobl and Walsh, 2010), which has been found to pay a wage premium in a variety of developing country settings (Mazumdar 1982; Heckman and Hotz 1986; Pradhan and Van Soest 1995; Meghir, Narita and Robin 2015). We prefer to use these labor outcomes directly to examine the model’s predictions on heterogeneous effects based on the women’s potential wage w_f – rather than human capital characteristics that represent potential wage – since, as we discuss in section 5.1, there is some evidence that human capital investments in girls responded to the HSA.

We also use respondents’ reports of who makes the decisions in the household and whether the woman can go to certain places to construct a measure of her autonomy. Specifically, we assess a woman’s participation in household decisions using her answers to the question, “Who makes decisions about [X] in your household?” The decisions asked about were: the woman’s own health care, large household purchases, visits to

family or relatives, purchases for daily needs, and spending a husband's earnings.²² We construct variables that capture whether the wife has some say in each decision. Another important dimension of autonomy is whether the woman can go to certain places without needing an escort. Accordingly, we use the woman's self-reported answers regarding whether she can go to the market, a health facility and leave the village alone. Since all these locations present opportunities to spend money, the fact that a woman can go there alone reflects her ability to control household purchases (the a_f parameter in the theoretical model). We normalize each variable to have mean zero and standard deviation of one and sum the standardized measures and then re-standardize so the final index has standard deviation of one.²³ While our main autonomy outcome is this summary measure, which also assuages concerns about multiple testing, appendix table A2 also provides results about individual measures, since some measures might more directly relate to financial autonomy than others (say, the control over household decisions is a closer proxy of a_f than her say in visits to her family). We also reconstruct the measure of autonomy using the husband's reports about the wife's autonomy and find similar results.

There are some important limitations to the approach of using the woman's reports of household decision-making and mobility to construct an index to measure women's autonomy. The maintained assumption that participation in a decision is just as empowering as being the solo decision-maker may not always hold (Kishor and Subaiya, 2008), and simply having a say in decisions may not always be empowering to women (Heckert and Fabric 2013; Peterman et al. 2015). Moreover, some domains of decision-making may be more desirable – and thus, realized decision-making reflective of higher autonomy – than others (Alkire, 2007). While we allow readers to draw their own conclusions about whether the HSA changed outcomes desirable to women by displaying the effects of the HSA on individual components of the index in the table A2, the broader caveat remains that there is no clearly established standard for measuring women's autonomy.

While the use of the NFHS allows us to examine labor supply and autonomy in the

²²While our theoretical model assumes that the husband takes money from the wife but not vice versa, we do not believe that this variable necessarily contradicts that assumption: the wife's say in spending the husband's earnings could be in the choice of household public good, conditional on his contribution. While this is not directly reflected in a_f as modeled theoretically, we nonetheless believe that this variable is probably correlated with the a_f in the theoretical model. Note also that table A2 indicates that our autonomy results are not driven by the wife's control over the husband's income. Thus, while we display results on the wife's say in spending husband's earning for completeness and to avoid concerns about specification search – we show all decision-making variables in the survey and include all in the index – we are reassured by the fact that our autonomy results are driven by variables with a clearer connection to autonomy, as modeled theoretically.

²³Results are almost identical if we use the first dimension from multiple correspondence analysis.

same sample of women, a weakness of this data is that it was collected after the nationwide passage of the HSA. While we can still estimate treatment effects by comparing cohorts of women likely to be married before versus after the HSA, pre-program data allows us to test our main labor supply results using an additional source of variation: years before versus after the HSA was passed in a state. Therefore, we also use the National Sample Survey (NSS) Employment and Unemployment modules to reassess our main estimating equation and to test for differential trends in the labor supply among Hindu women leading up to the passage of the HSA in their state, as described in more detail in section 3.3. We also use the questions they ask on a woman's income and whether she does full-time work as additional measures of her labor supply into high-paying jobs.

Table 2 presents summary statistics for women in the estimation samples from the NFHS and the NSS, broken down by women in treated religions (which, together, we call Hindu) and non-treated religions.²⁴ Among women in treated religions in the NFHS, 97 percent are Hindu; the rest are Sikh (2.0 percent), Buddhist (0.9 percent), and Jain (0.4 percent). Among non-treated women in the NFHS, 82 percent are Muslim, 15 percent are Christian, and 3 percent list other religions. The distribution of religions is very similar in the NSS data.

Many women report having no say in household decisions in the NFHS, particularly important decisions: only 57 percent of married women of both Hindu and non-Hindu religions report having a say in large household purchases. More women report having a say in their own health care (65 percent of Hindu women and 67 percent of non-Hindu women), in determining visits to family (64 percent of Hindu women and 65 percent of non-Hindu women), or in making purchases for daily needs (65 percent of Hindu women and 62 percent of non-Hindu women).²⁵ Interestingly, women have the most say in decisions of how to spend their husbands' income: 71 percent of Hindu women and 69 percent of non-Hindu women have a say in how that income is spent. Many women also report an inability to go places alone, especially to places outside the village (only 44 percent of Hindu women and 40 percent of non-Hindu women can leave the village alone). Approximately half of the women surveyed report that they are not allowed to go to the market or to a health facility alone.

Only 40 percent of Hindu women and 28 percent of non-Hindu women report having

²⁴Table A1 gives summary statistics for the full sample of women (that is, including the women defined as neither a treated cohort nor a control cohort in equation 3) in each survey. The results are almost identical, providing reassurance that the cohort strategy does not compromise the representativeness of the sample.

²⁵While there is undoubtedly correlation in these measures, the overlap is far from complete. For instance, of the women who report having no say in visits to family, 28 percent indicate that they *do* have some say in purchases for daily needs.

worked in the last seven days. Those who do work are more likely to work for a family member (47 percent of Hindu women and 43 percent of non-Hindu women) than for themselves (16 percent of Hindu women and 14 percent of non-Hindu women) or a non-family member (38 percent of Hindu women and 43 percent of non-Hindu women). Most work all year (66 percent of Hindu women and 67 percent of non-Hindu women) and for cash (66 percent of Hindu women and 73 percent of non-Hindu women). The most common profession is agriculture (62 percent of Hindu women and 44 percent of non-Hindu women), followed by manual work (19 percent of Hindu women and 32 percent of non-Hindu women), clerical/sales/service (13 percent of Hindu women and 15 percent of non-Hindu women) and professional (6 percent of Hindu women and 8 percent of non-Hindu women).

A similar picture emerges using the NSS data. Pooled across the survey waves, 36 percent of Hindu women work, versus 23 percent of non-Hindu women. We also use this data to examine the labor supply of never-married women before versus after the passage of the HSA in their state; 11 percent of Hindu women and 14 percent of non-Hindu women between the ages of 15 and 65 were never married.²⁶

3.3 Identification strategy

Treatment effects for a program that is rolled out over space and time (such as the HSA) are typically estimated by regressing an outcome variable on a dummy variable capturing exposure to the program, conditioning on location and time fixed effects. However, in this case, exposure to the program is determined by year of marriage, which is an endogenous choice. Then, if the timing of marriage responded to the HSA, our estimates of treatment effects would capture this selection.²⁷ This issue would be a particular concern if there were anticipation of the reform (a possibility given the long lag between the first states to pass the amendment and the nationwide passage in 2005), and families who did not want their daughters to be eligible married them just before the law passed. Accordingly, we consider a treated cohort as women who were younger than the 10th percentile of age at marriage during the year the HSA was passed in their state. Similarly, a control cohort consists of women who were older than the 90th percentile of age at marriage

²⁶While we use data on respondents up to age 65 to make full use of the data, the results are very similar if we use data on respondents between the ages of 15 and 49 to maximize comparability to the results using the NFHS data, which surveys only women between these ages.

²⁷Indeed, section 5 and [Deininger, Goyal and Nagarajan \(2013\)](#) find effects of the HSA on marriage timing. While a mean shift in the age of marriage would not necessarily bias the estimates of the HSA on labor supply, if there is differential change based on individual or household-level characteristics that also affect labor force participation, the OLS estimates of treatment effects would be biased.

	Treated religions	Non-Treated religions
Panel A: National Family Health Survey (Currently married women ages 15-49)		
Autonomy measures:		
Has say in own health care	0.650	0.668
Has say in large household purchases	0.571	0.568
Has say in visits to family	0.644	0.652
Has say in purchases for daily needs	0.650	0.624
Has say in spending husband's earnings	0.712	0.693
Can go to market alone	0.587	0.520
Can go to health facility alone	0.555	0.521
Can leave village alone	0.440	0.401
Religion:		
Hindu	0.965	0.000
Muslim	0.000	0.821
Christian	0.000	0.149
Sikh	0.022	0.000
Buddhist	0.009	0.000
Jain	0.004	0.000
Other religion	0.000	0.030
Other Characteristics		
Scheduled caste/scheduled tribe	0.293	0.119
Rural	0.691	0.620
Age at marriage	17.198	17.307
Education (years)	4.306	3.778
Children	3.165	3.761
Height (cm)	1.519	1.521
Bmi	20.989	21.471
Anemia: mild or worse	0.555	0.541
Anemia: moderate or worse	0.162	0.167
Anemia: severe	0.017	0.015
Labor Supply		
Worked in last seven days	0.401	0.277
<i>conditional on having worked in last seven days...</i>		
Work for self	0.155	0.140
Work for family member	0.466	0.430
Work for another person	0.379	0.429
Work for cash	0.664	0.728
Work all year	0.662	0.667

Work in management/technical/professional	0.058	0.084
Work in clerical/sales/service	0.131	0.149
Work in manual (skilled or unskilled)	0.191	0.322
Work in agriculture	0.617	0.439
N	48,792	13,709
Panel B: National Sample Survey (Women ages 15 to 65)		
Year = 1983	0.180	0.173
Year = 1987	0.185	0.187
Year = 1993	0.205	0.194
Year = 1999	0.214	0.221
Year = 2004	0.215	0.224
Never Married	0.106	0.141
Rural	0.764	0.678
Religion		
Hindu	0.967	0.000
Muslim	0.000	0.790
Christian	0.000	0.179
Sikh	0.022	0.000
Buddhist	0.007	0.000
Jain	0.004	0.000
Other religion	0.000	0.031
Labor Supply		
Work (defined as currently employed)	0.361	0.232
Log(income)	0.825	0.767
Professional Job	0.065	0.120
N	662,034	152,257

Means are calculated using sampling weights. Sample includes women in either treatment or control cohorts.

Table 2: Summary Statistics of the Estimation Sample

during the year the HSA was passed in their state. A similar strategy has been used in previous studies of education reforms to compare children of school age at the time of reform to older children who would have completed their schooling decision at the time of the reform (Duflo 2001; Osili and Long 2008).

Specifically, in the NFHS, where all women were surveyed after the nationwide passage of the HSA, we consider an outcome Y for woman i of religion r born in year τ living in state j . We consider religion to be a binary variable equal to 1 if the woman is a treated religion (Hindu, Buddhist, Sikh, or Jain) and 0 if the woman is not treated (Muslim, Christian, or other). That is,

$$Y_{ijr\tau} = \beta_1 TreatedCohort_{ijr\tau} + \beta_2 TreatedCohort_{ijr\tau} \times Hindu_{ijr\tau} + \delta_j + Hindu_{ijr\tau} \times \delta_j + \gamma_\tau + Hindu_{ijr\tau} \times \gamma_\tau + \varepsilon_{ijr\tau}. \quad (3)$$

β_2 is an unbiased estimator of the true treatment effect on female labor supply if there are no unobserved factors that differentially affect the labor supply of Hindu women in treated cohorts, conditional on fixed effects for state and year of birth that are allowed to vary by religion. That is, we are ruling out factors that increase Hindu women's labor supply in areas that just recently received the treatment among women who were below usual marriage age when the HSA was passed.

This assumption seems plausible. It is true that some states within India have recently promoted policies that directly affect women, such as political reservations, or policies that indirectly affect women, such as trade reforms (Menon and Rodgers, 2009), and this liberalization could be correlated with the passage of the HSA. While it is possible that these policies may have religion or age-specific effects, we have no reason to believe that they would have differential effects on young Hindu women specifically. Similarly, while other family laws are religion-specific – for instance, the 1978 Child Marriage Restraint Act raised the legal age of marriage for Hindu girls from age 15 to 18 but continued to leave the legal age at marriage for Muslim girls to their parents – we do not know of any such laws that are state specific (and even if national laws had state-specific effects on young women because of differential enforcement, these effects would be accounted for by the main effect of *TreatedCohort* in equation 3). Finally, in table 5, we test for evidence of pre-trends but find no evidence that the labor supply of treated women was rising in states about to adopt the Hindu Succession Act.

While the HSA may have spillover effects on the labor supply of the control groups (namely, married Hindu women or non-Hindu women), it is unlikely that these effects by themselves could generate a positive estimated treatment effect. Some of these spillovers

would increase the labor supply of all Hindu women and thus cause our estimated treatment effect to be an underestimate of the true effects of the HSA. For instance, our theoretical model predicts that untreated women whose husbands lose unearned income when their sisters gain eligibility would increase their labor supply (see our discussion at the end of the subsection titled “female labor supply and autonomy effect” in section 2).²⁸ On the other hand, it is possible that increased labor force participation of treated women may depress female wages (especially if the demand for female labor is relatively inelastic) and therefore decrease the labor supply of non-treated women and cause us to overestimate the effects on Hindu women. These effects would be present only if there is indeed a true effect of the treatment on women who are subject to it. Therefore, even if these wage spillovers affect the magnitude of the estimated coefficient, they cannot singlehandedly explain the positive effect of the HSA on female labor supply outcomes. We also provide additional suggestive evidence that negative effects of the HSA on non-Hindu women do not drive the entire estimated treatment effect in section 4, when we explore the estimated negative main effect of being in a treated cohort in our labor supply regressions.

To estimate treatment effects with the NSS, we can use an additional source of variation: survey years before versus after the treatment. Then, for woman i of religion r of age a in state j surveyed during year t , we estimate:

$$\begin{aligned}
Y_{ijrat} = & \beta_1 TreatedCohort_{ijra} \times PostHSA_{jt} \\
& + \beta_2 TreatedCohort_{ijra} \times Hindu_{ijra} \times PostHSA_{jt} \\
& + \delta_j + Hindu_{ijra} \times \delta_j + \mu_a + \mu_a \times \delta_j + \mu_a \times Hindu_{ijra} + \lambda_t + \varepsilon_{ijrat}.
\end{aligned} \tag{4}$$

Note that because the $TreatedCohort_{ijra}$ variable is defined by a woman’s age in relation to the passage of the HSA in a state, it doesn’t make sense to include the main effect of $TreatedCohort_{ijra}$ uninteracted with the $PostHSA_{jt}$ variable. We do, however, account for potential time-invariant determinants of labor supply that vary by age and state by including fixed effects for state interacted with age ($\mu_a \times \delta_j$). Given that this regression also considers variation over time, and it is possible that labor supply differentially changes over time among women in treated religions or of different ages, we also consider an additional specification that adds controls for year fixed effects interacted with a Hindu

²⁸There are other potential effects on married Hindu women: they may choose to work more so that their daughters can inherit property in the future, which could be represented in the context of our model as a link between the HSA and all Hindu women’s gains from private consumption β_f . Alternatively, changes in inter-vivos transfers due to the eligibility of a married woman’s sisters or sisters-in-law could affect labor supply through income effects.

dummy and an age dummy.

4 Results

We begin by confirming that the reform indeed increased a woman’s autonomy – as captured by the index described in section 3.2 that summarizes a woman’s say in household decision-making and freedom of movement – thereby strengthening our argument that autonomy is the channel through which the reform affected labor supply. The first column of table 3 reports results from equation 3 that the HSA increased women’s autonomy by 0.17 standard deviations. This result coincides with other studies of the effects of the HSA on women’s autonomy (Roy 2008; Calvi 2016; Mookerjee 2017) and estimates from other settings of the effects of women’s property rights (Field 2003; Wang 2014) or inheritance rights (Harari 2013) on her autonomy.

Table A2 examines individual components of the index and suggests that it is indeed driven by large changes in outcomes likely to reflect a woman’s financial autonomy, namely, a 9.5-percentage-point increase in the probability that a woman has say in large household purchases. To address the concern that women’s strategic visits to family to seek inheritance²⁹ drive the autonomy results, we also recreate the autonomy measure using only the household bargaining measures. The result is almost identical to the original result (0.18 standard deviations), providing reassurance that the autonomy result is not driven entirely by the freedom of mobility measures, which are more likely to respond to the husband’s willingness to allow the wife to visit her family and take other actions that increase the probability of receiving inheritance. Finally, we construct a measure of autonomy using men’s reports of their wives’ autonomy and find a similar pattern of increases across different decision-making measures (men did not report their wives’ freedom of mobility), and while the estimate is more noisy due to the considerably smaller sample size of men, we find an almost identical point estimate of 0.18 standard deviations of autonomy ($P = 0.194$). Similarly, if we combine men’s and women’s reports, we find a positive and statistically significant effect of 0.27 standard deviations.

Table 3 then proceeds to examine the effects of the Hindu Succession Act on women’s

²⁹While such strategic responses could take place before or after the law – given that parents in both cases had the option to write a will – it is possible that changing the default inheritance could also affect parents’ decision to write a will and their children’s subsequent strategic responses. If so, the net effect on the wife’s labor supply is not obvious: on one hand, the income from her work could be used to give transfers to her parents that increase the chance of being given inheritances in the future. On the other hand, if parents also internalize the norm that women should not work and thus obtain disutility from their daughter working, the daughter may be less likely to work as a result of the HSA (given that in her household, the disutility from working is balanced by her earnings, while her parents face primarily the disutility of her working).

DEPENDENT VARIABLE	Autonomy		Work for...				Work away from home	
	index	Work	self	family	another	Work all year		Work for cash
Treated cohort X Hindu	0.169** [0.062]	0.061*** [0.017]	-0.022** [0.008]	0.014 [0.014]	0.068** [0.026]	0.055** [0.022]	0.063** [0.027]	0.049** [0.018]
Treated cohort	-0.072 [0.061]	-0.034 [0.022]	0.025** [0.010]	0.000 [0.013]	-0.067** [0.031]	-0.023 [0.021]	-0.043 [0.031]	-0.040* [0.021]
Mean Dep Var	-0.0564	0.3816	0.068	0.2094	0.1704	0.2666	0.2892	0.3587
Observations	62,501	62,501	62,501	62,501	62,501	62,501	62,501	62,501
R-squared	0.141	0.067	0.032	0.079	0.046	0.047	0.049	0.087

DEPENDENT VARIABLE	Work in...		manual		agri	
	professional / managerial / technical	clerical / sales / service	manual	agri	agri	agri
Treated cohort X Hindu	0.031** [0.012]	-0.003 [0.019]	0.036 [0.027]	-0.001 [0.011]		
Treated cohort	-0.027** [0.012]	-0.005 [0.021]	-0.010 [0.018]	-0.002 [0.019]		
Mean Dep Var	0.0247	0.054	0.0879	0.2803		
Observations	62,501	62,501	62,501	62,501		
R-squared	0.012	0.014	0.027	0.087		

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. Sample includes married women ages 15 to 49. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Effects of the Hindu Succession Act on Women's Autonomy and Labor Supply (in NFHS data)

labor force participation, using the NFHS sample upon whom we just demonstrated autonomy effects. The second column indicates that the HSA increased the probability that a woman has worked in the last seven days by 6.1 percentage points. The next three columns show that the increase came from women working not for themselves or for family members but for other people (an increase of 6.8 percentage points). The fact that self-employment did not increase provides evidence against credit constraints (either faced by the household overall or faced differentially by the woman) as the mechanism linking the HSA and women's labor supply.³⁰ This result then argues against a model in which the HSA increased women's labor supply directly, which then caused the observed increase in autonomy.

Other results confirm the pattern that the HSA increased women's labor supply into high-paying jobs. In particular, a woman is more likely to work all year (an increase of 5.5 percentage points), for cash (an increase of 6.3 percentage points), and away from home (an increase of 4.9 percentage points). We find a positive (although statistically insignificant) effect of 3.6 percentage points on manual (skilled or unskilled) work and a statistically significant increase of 3.1 percentage points on professional/managerial/technical employment.

While the main effect of the treated cohort is negative, Figure 1 provides reassurance that the estimated treatment effect given by Treated Cohort \times Hindu is not driven entirely by a drop among the non-Hindus in their cohort. It graphs labor supply conditional on age by cohort and religion. While it indeed confirms that non-Hindu women in treated cohorts have a lower labor supply than other women of the same age, Hindu women in treated cohorts do have a higher labor supply (3.6 percentage points) compared to other women their age – a pattern no longer obtained by comparing them to the non-Hindu women in their cohort – and does not hold for Hindu women in non-treated cohorts.

We conduct two robustness checks on the NFHS results. To make sure our results are not driven by women far away from marriage age at the time of the reform, we rerun our results with 10-year-long cohorts in both the treatment and control cohorts (see table A3). They are less precisely estimated (given the approximately 33-percent reduction in sample size) but similar in magnitude to the main results, although not statistically significant at traditional levels. Table A4 further shows that our results persist when we do not use variation in the nationwide implementation (i.e., we consider only treated cohorts in states who passed the HSA before 2005), where couples may not have heard

³⁰Nutrition-based efficiency wage models may also predict that an infusion of capital would allow workers to eat enough calories to enter the labor force. However, these effects would be concentrated in activity-intensive work, such as agriculture, and we do not see effects in the agricultural sector.

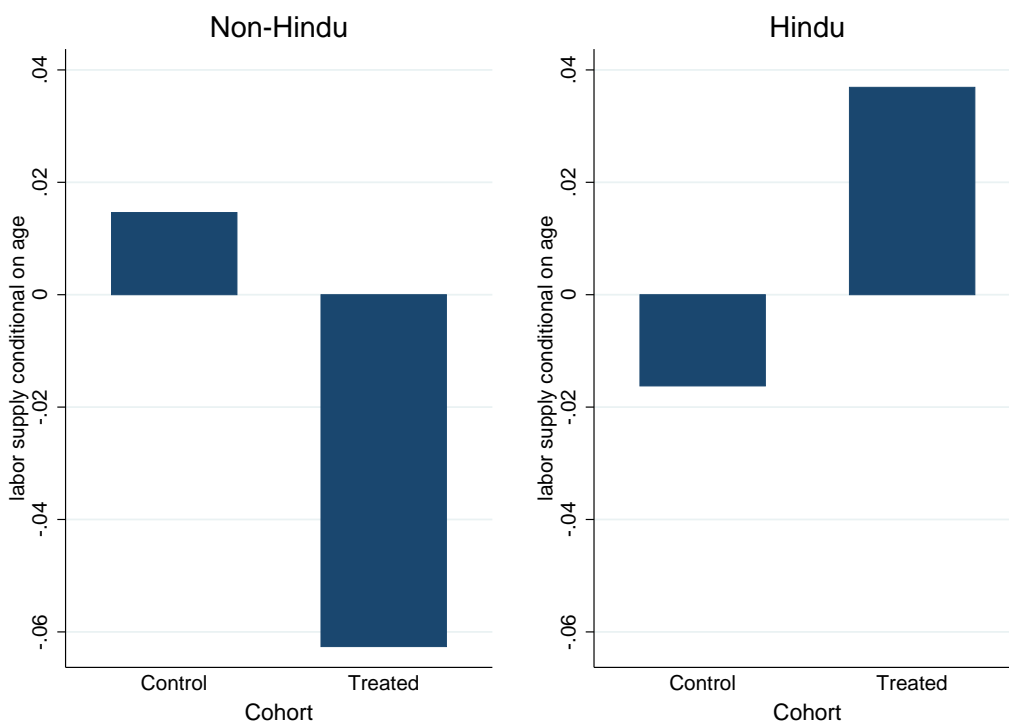


Figure 1: Female labor supply by cohort and religion

about the reform or responded to it, given that the NFHS survey took place shortly after the reform.

Further evidence that supports the link between the HSA and women’s labor supply is given in table 4, which uses the National Sample Survey data to examine the effects of the HSA on women’s labor supply. This dataset allows the use of an additional source of variation (years before and after the program was implemented), and it also allows us to examine the effects on income, which would capture both increases in hours of work and increased effort.³¹ Our specification analogous to equation 3 used with the NFHS estimates a treatment effect of 3.8 percentage points; our preferred specification (that adds fixed effects for Hindu and age interacted with survey year) results in an estimate of 4.1 percentage points. Note that because this specification uses data from survey rounds closer to the passage of the HSA, its estimated effect will not necessarily be exactly the same as that estimated with the NFHS data if treatment effects vary over time. In partic-

³¹We extend the model to allow the spouses to choose the hours of work, instead of making a binary choice, in appendix B.3, and we confirm that the increased autonomy makes the wife spend more time on working outside the home. While effort is not endogenized in our model, if we included it, a similar autonomy effect would result, leading to the potential for increased earnings per hour of work.

Dependent Variable	1(Work)		Log(Income)		1(Professional Job)	
Treated cohort X Hindu	0.038** [0.018]	0.041** [0.019]	0.279*** [0.080]	0.179** [0.074]	0.018*** [0.004]	0.016*** [0.004]
Treated cohort	-0.071*** [0.020]	-0.037*** [0.013]	-0.117 [0.080]	0.082* [0.044]	-0.012*** [0.004]	-0.009** [0.004]
Hindu X Age	Y	Y	Y	Y	Y	Y
Hindu X State	Y	Y	Y	Y	Y	Y
Age X State	Y	Y	Y	Y	Y	Y
Hindu X Year		Y		Y		Y
Age X Year		Y		Y		Y
Mean Dependent Variable	0.318	0.318	0.523	0.523	0.034	0.034
Observations	616,137	616,137	616,137	616,137	616,137	616,137
R-squared	0.102	0.103	0.062	0.064	0.014	0.014

*Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. Sample includes married women ages 15 to 65. All regressions include sampling weights. Standard errors in brackets, clustered at the state level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 4: Effects of the Hindu Succession Act on Women's Labor Supply (in NSS data)

ular, if it takes a while for households to learn about the HSA and bargain over household outcomes, this could explain why the treatment effects are slightly lower than in the NFHS, which occurs many years after the passage of the HSA in most surveyed states. A combination of this extensive margin effect and any effects on the intensive margin (hours or effort) results in increased earnings of 18 percent in our preferred specification. As in the NFHS, we also estimate an increase in labor supply in professional jobs; the increase is 1.6 percentage points by using this measure.³²

A key identification assumption is the presence of parallel trends between Hindu and Muslim women leading up to each state’s passage of the HSA. To test this assumption, we use the National Sample Survey to analyze trends leading up to the passage of the HSA. As with the labor supply results in table 4, we begin by using the same set of controls in our main specification – namely, Hindu dummies interacted with state and age fixed effects – and add state \times age and year fixed-effects as well. Therefore, for a woman i of age a and religion r living in state j and surveyed in year t , we estimate:

$$y_{ijrat} = \beta_1 YearsToReform_{ijrat} + \beta_2 YearsToReform_{ijrat} \times Hindu_{ijra} + \delta_j + Hindu_{ijra} \times \delta_j + \mu_a + \mu_a \times \delta_j + Hindu_{ijra} \times \mu_a + \lambda_t + \varepsilon_{ijrat}. \quad (5)$$

Table 5 reports the results of this regression. We again consider an additional specification that adds year fixed effects interacted with a Hindu dummy and age dummies. While overall labor supply does seem to be increasing in states about to pass the reform, there is no indication that the increase is larger among Hindu women. In the third and fourth columns, we additionally allow the pretrend to be differential for young women (defined as women below the age of 25)³³, and again, we find no evidence of differential trends among young Hindu women.³⁴

³²This measure is similar but not identical to that in the NFHS; we code as professional anyone whose occupation falls under the ISCO categories of “Legislators, senior officials and managers”, “Professionals”, and “Technicians and associate professionals”.

³³This definition is similar to – although not exactly the same as – the treated cohort in regressions 3 and 4, which considers women below the 10th percentile of the age of marriage distribution in that year) and young Hindu women. If we define the young cohort exactly analogously to the treated cohort in regressions 3 and 4, it leads to a very small sample of these women being in the labor force by standard definitions. That is, the 10th percentile of age at marriage ranges from 13 to 16 by year, and the vast majority of these women are too young to be considered in the labor force by standard definitions (e.g., the cutoff of age 15 that we use throughout the paper).

³⁴While the NSS allows the most direct test of the parallel trends assumption, we can also conduct a version of this test using the NFHS data by testing whether members of the control cohort in equation 3 that are closer in age to the treatment group have a different labor supply than members of the control group that are further away. That is, we add regressors $NearTreatedCohort_{ijr\tau}$ and $NearTreatedCohort_{ijr\tau} \times Hindu_{ijr\tau}$ to equation 3. The results, given in table A5, support the results in table 5 that there is no difference in the

	Dependent Variable = 1(Work)			
	(1)	(2)	(3)	(4)
Years to reform	-0.0041*** [0.0006]	-0.0036* [0.0018]	-0.0041*** [0.0006]	-0.0003 [0.0086]
Years to reform X Hindu	0.0004 [0.0007]	0.0004 [0.0008]	0.0004 [0.0007]	0.0004 [0.0008]
Years to reform X Young Cohort			0.0023*** [0.0005]	-0.001 [0.0017]
Years to reform X Young Cohort X Hindu			0.0004 [0.0004]	0.0005 [0.0004]
Hindu X Age	Y	Y	Y	Y
Hindu X State	Y	Y	Y	Y
Age X State	Y	Y	Y	Y
Hindu X Year		Y		Y
Age X Year		Y		Y
Observations	548,995	548,995	548,995	548,995
R-squared	0.095	0.097	0.096	0.097

*The sample includes married women ages 15 to 65 in years before the reform was passed in a woman's state. Young cohort = 1 if the woman was younger than 25 at the time of the survey. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions include sampling weights. Standard errors in brackets, clustered at the state level : *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 5: Test for Parallel Trends leading up to the Hindu Succession Act (in NSS data)

It is possible that by assuming linearity, the specification in table 5 misses a non-linear trend in the labor supply of young Hindu women leading up to the HSA. Figure A1 accordingly estimates the differential labor supply of young, Hindu women in the NSS data for each lead and lag of the HSA that we can estimate in the NSS data. We show the robustness of these results to the young cohort defined as under ages 20, 25, and 30. A caveat to this test is that, because of the limited number of survey years in the NSS (namely, the 1983, 1987, 1993, 1999, and 2004 rounds), we can estimate only the effects of 9 individual pre-reform years (ranging from 1 year to 22 years), and that seven of the pre-reform years are identified only by states with one reform year (and the other two with states with two reform years): see table A6 for further details. In other words, dif-

labor supply of women who will be treated in the period shortly before the HSA passes.

ferent estimated effects for different years pre- and post-treatment capture both variation in effects based on the number of years relative to the treatment and heterogeneity across states in estimated effects.

With this caveat in mind, pre-treatment, a common theme across all three age cut-offs is that the differential labor supply of young Hindu women is small in each year pre-treatment, except for 3 years pre-treatment, which is positive and statistically significant, and drives the significance of the joint test of the Hindu \times young cohort pre-treatment dummies (shown in regression form in table A7). To provide some reassurance that this bump in Andhra Pradesh (the state for which we can estimate effects 3 years pre-reform, as per the above table) does not completely drive our estimated treatment effect, we reestimate our main specification including separate effects for treated cohort \times Andhra Pradesh and Hindu \times treated cohort \times Andhra Pradesh, and assess the extent to which the main treatment effects (given by the Hindu \times treated cohort coefficient) still come through. These results are now presented in tables A8 (NFHS results) and A9 (NSS results). While the extensive margin labor supply results in the NSS drop in magnitude and are no longer statistically significant at conventional levels, the NFHS results and intensive margin results for the NSS are very similar in size and retain statistical significance. Thus, although only the results with the NFHS are fully robust to dropping Andhra Pradesh, this robustness is still a reason to believe that Andhra Pradesh does not entirely drive the full set of treatment effects.³⁵

Post-treatment, every year is not uniformly positive in figure A1, but enough years are positive to provide reassurance that any single year/state pair does not drive the entire treatment effect. Recall also that these treatment effects are similar to the main treatment effects, but not exactly the same, as they define a common, slightly older “young cohort” across all specifications, rather than more precisely defining treatment according to a woman’s age relative to the distribution of age at marriage in the year the HSA was passed.

³⁵A relevant question is why the labor supply results on the extensive margin in the NFHS are so similar when Andhra Pradesh is broken out, while the NSS results drop in magnitude. A possible contributing factor is sample size: as table 1 indicates, a large fraction of treated women in the NSS sample are in Andhra Pradesh, and therefore, the confidence interval on the remaining women widens accordingly. Indeed, we cannot reject that the coefficient on the treated cohort in the regression for labor supply on the extensive margin does not change when Andhra Pradesh is broken out ($P = 0.218$). Alternatively, there could be a substantive reason why the results are stronger in Andhra Pradesh – aside from a pre-treatment bump – given the model’s predictions on heterogeneity, and the stronger effects in Andhra Pradesh come through more clearly in the larger sample size in the NSS data. For instance, women born before 1973, who are old enough not to be in the treated cohort in Andhra Pradesh, have 0.15 more standard deviations of autonomy than women of the same age born in other states. This higher baseline autonomy could correspond to a larger treatment effect in our model (on the society level), similar to our findings in section 2 of a larger treatment effect for high-paying jobs.

Finally, we examine effects of the HSA on the labor supply of two additional groups of interest: men and single women. For men, we estimate an analogous version to equation (3) that identifies treated cohorts of men using the 10th and 90th percentiles of age at marriage in the year the HSA was passed in his state. Labor supply is almost universal among married men in the NFHS (96 percent of the sampled married men work), so we concentrate on the NSS, which has a larger sample (to allow a better chance of detecting effects on the rare outcome of *not* working outside the home)³⁶ and income data (to allow the additional testing of labor supply on the intensive margin).

The results, given in table A10, suggest that there could be a countervailing force to the mechanisms in our baseline model. In particular, if we relax assumption (A1), which postulates parameter values such that men always work, our baseline model would predict that men’s labor supply falls as their wives become eligible because men respond to women’s increased labor supply (and corresponding increased contribution to the household good) by working less themselves. However, in our preferred specification that includes year fixed effects that vary by age and Hindu religion (column 2), we estimate positive, albeit statistically insignificant, effects on male labor supply: a 1.4-percentage-point increase on the extensive margin and an 11.3-percent increase in wages.³⁷ One possible countervailing force to the result in the main model is that, as discussed in section 2 and explored formally in appendix B.5, men dislike their wives having autonomy and working and try to regain power by working more.

We now turn to single women, whose labor supply is affected primarily by an income effect, as the HSA increases their future income but represents an ambiguous effect on their bargaining power.³⁸ We explore the effects of the HSA on single women in the NSS (because the pre-HSA variation it provides is especially important, given that all unmarried Hindu women at the time of the NFHS anticipate being treated once they get

³⁶Another potential difference is that the NSS defines employment as the “situation of working or being engaged in economic activities (employed)”, which is plausibly a stricter definition than the NFHS question about whether the respondent worked for “pay, profit, or gain” in the last seven days. While overall differences in rates of labor supply – 92.5% of married men in the NSS data in table A10 work, compared to 96.4% of men in the NFHS – potentially reflect changes in labor supply over time or the slightly older sample in the NSS, there is some evidence that reported rates of labor supply are slightly lower in the NSS in similar population: 95.3% of married men between 15 and 54 (male ages sampled in the NFHS) in the 2004 NSS round report work.

³⁷Table A11 estimates the effects using the NFHS; the results are also noisy and inconclusive.

³⁸That is, while it is possible that single women bargain with their parents – in the NSS, 82% of single women above 15 are listed as the offspring of the household head and another 15% are designated as another relative of the household head – the link between the HSA and their bargaining with their parents is less clear than among married couples. In particular, it is possible that for some households, the HSA makes the parents grant more control of income to their single daughters, but on the other hand, single daughters may want to please their parents by giving them more control of the income.

married) by reestimating equation (4) with all women and allowing the effect of Treated Cohort and Treated Cohort \times Hindu to vary based on whether the woman is single (including controls for the main effect of being single, interacted with a Hindu dummy). The results, given in table A12, suggest that the HSA had a net zero effect on the labor supply and income of single women; the labor supply effect is 5.0 percentage points lower among single Hindu women ($P = 0.165$), and the income effect is 22.3 percent lower. By contrast, the effect on professional jobs is the same as that for married women, suggesting that bargaining might be a relevant channel for a subset of single women (and/or that income effects are less strong for professional jobs, which are likely desirable).

5 Alternative Mechanisms and Limitations

As explained in the introduction, both economic theory and empirical evidence suggest a link between the HSA and many aspects of women's lives, both before and after marriage. In this section, we examine the link between the HSA and other outcomes in our data. Overall, while we also find evidence that several aspects of women's lives change after the HSA, we argue that it is unlikely these changes single-handedly explain our labor supply result, highlighting a role for our focus on autonomy and the control of income. However, we acknowledge that we cannot rule out these alternate channels entirely. Even given the possibility of other mechanisms linking the HSA to women's labor supply, our results still link a reform that increases women's legal rights to their labor supply.

5.1 Pre-marital investments and marital market outcomes

The HSA could potentially affect the premarital human capital of women or the conditions upon which they enter marriage, both of which in turn could affect their labor supply. For instance, forward-looking parents making human capital investments in their daughters might alter their investments based on the fact that their daughters are now legally entitled to inherit ancestral property. The direction of the effect is theoretically ambiguous. Future inheritances represent an increase in the total expected lifetime transfers to a daughter, so parents may reduce other investments to bring the total investment in their daughters closer to their preferred pre-reform allocation. However, if any human capital investments are complementary to inheritances (if, say, educated daughters can better manage family property), then human capital investments may go up. Indeed, the empirical evidence on the Hindu Succession Act and human capital investment in girls has yielded mixed results. Rosenblum (2015) argues that the HSA raises the cost to par-

ents of having a girl and finds that the HSA increased female child mortality. By contrast, Roy (2015) and Deininger, Goyal and Nagarajan (2013) both find that the HSA increased the education of girls of schooling age at the time of the reform.³⁹

To address the possibility that human capital investments are driving the relationship between the HSA and female labor supply that we estimate, we begin by assessing whether the HSA indeed appears to have affected the human capital of the women in the NFHS. Specifically, in table 6, we examine women's education, height, and age at marriage using the identification strategy we detail in section 3.3. Specifically, we find that age at marriage increased by 0.63 years as a result of the HSA, which parallels closely the estimated effect of 0.59 years found in Deininger, Goyal and Nagarajan (2013). By contrast, we do not find an effect on education, in contrast to the effect of 0.37 years found in Deininger, Goyal and Nagarajan (2013) and of 0.50 years found in Roy (2015). These papers focus on children of eligible women,⁴⁰ so it is possible that the effects do not yet appear in our sample or were driven primarily by mothers' increased bargaining power. Similarly, we do not find an effect on the height of exposed women, in contrast to Rosenblum (2015), who finds that the HSA lowers parents' health investments in their daughters who were young at the time of the passage.

Another possible alternative model that could generate our results is if the HSA affected the characteristics of the husbands of exposed women, and this change in marital matching led to greater female labor force participation. Note that because the HSA was applied to all unmarried Hindu women in a state and marriages rarely occur across state borders or between religions, changes in average husband characteristics are relatively unlikely: essentially all potential wives would become subject to the law at the same time. Nonetheless, we still test whether the HSA led to any changes in husband characteristics – namely, his education, age, and the age difference between him and his wife. Table 6 shows that there is no evidence that marriages after the HSA involved husbands of greater absolute education or who were older or closer in age to their wives. Thus, men seem to have responded to the fact that eligible women delay marriage by delaying marriage themselves, keeping the spousal age gap constant.

³⁹A potential explanation that reconciles these results is that they are driven by different subpopulations. The results in Rosenblum (2015) were driven by young children in families for whom investments in health had a marginal effect on mortality, who were plausibly poorer. By contrast, Roy (2015) finds effects on older, surviving girls in the marriage market. While she does not explicitly examine heterogeneity based on wealth, the fact that she finds a corresponding decrease in dowries suggests that these may be wealthier households, who were planning sufficiently high dowries to allow a scope for adjustment.

⁴⁰In Deininger, Goyal and Nagarajan (2013) they consider children under age 6, whose entire education decisions were arguably made under the HSA. Roy (2015) focuses on children 10 years or younger. By contrast, the members of the treated cohort in equation (3) were 9.5 years old on average when the HSA passed in their states.

DEPENDENT VARIABLE	Premarital Investments			Husband Characteristics and Assortative Mating			
	Age at marriage (1)	Education (years) (2)	Height (cm) (3)	Husband's age (4)	Age difference between husband and wife (5)	Education difference between husband and wife (years) (6)	Education difference between husband and wife (years) (7)
Treated cohort X Hindu	0.625** [0.259]	0.039 [0.278]	-0.004 [0.003]	-0.030 [0.336]	-0.020 [0.336]	0.239 [0.390]	-0.126 [0.242]
Treated cohort	-0.513 [0.523]	0.243 [0.297]	0.009** [0.004]	-0.287 [0.439]	-0.289 [0.438]	0.033 [0.349]	0.193 [0.183]
Mean Dependent Variable	17.16	4.31	151.83	40.37	5.65	6.96	3.21
Observations	62,611	62,607	60,056	62,412	62,412	59,559	59,556
R-squared	0.128	0.158	0.055	0.794	0.078	0.077	0.035

Notes: Data source: National Family Health Survey. All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state-cohort level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Effects of the Hindu Succession Act on Girls' Human Capital and Marriage

While the HSA does not appear to have changed average husband characteristics, it could still have led to changes in the extent of assortative mating. This could happen if, say, the HSA increased wealthy men’s desire to match with wealthy women, who now have better access to their family’s wealth through inheritances. While we do not observe premarital wealth, we test whether marriages in which the wife is subject to the HSA have lower education gaps between spouses. Column 7 of table 6 indicates that the HSA appears not to have changed the degree of assortative mating based on education.

Overall, we find minimal evidence that the HSA changed women’s premarital human capital or choice of partner, as reflected in the measures available in the National Family Health Survey. However, given that other papers found evidence of changes, we cannot fully rule out changes in human capital on dimensions that we cannot detect in our sample. At the same time, given that the literature also does not show a consistent direction of effects, we argue that it is unlikely that a concerted increase in human capital is the main driver of the labor supply effect we find.

One additional consideration before or around the time of marriage is selective migration: what if women with a high desire to work migrate to states that have passed the HSA before they get married? While replacing dummies for the current state of residence with dummies for the state of birth in equation (3) would eliminate this concern, we unfortunately do not know women’s state of birth. Reassuringly, however, while many women migrate at the time of marriage, this migration rarely occurs between states: in the 2001 Census of India, only 0.9 percent of women were interstate migrants (Castaldo, Deshingkar and McKay, 2012). However, we cannot rule out entirely that some degree of selective migration contributes to our results.

5.2 Other channels linking autonomy to female labor force participation

Our model posits that the link between women’s autonomy and her decision to enter the labor force is her ability to control her earnings: the a_f in our theoretical model that determines the fraction of a woman’s income that enters her budget constraint. However, a woman’s autonomy likely determines other outcomes within the household that a husband and wife may value differently or may arise from conflicts between a husband and a newly empowered wife. It is theoretically possible, then, that these outcomes (rather than a woman’s control over her earnings) are the mechanism linking autonomy to her labor supply.

As with the wife’s premarital human capital investments, we begin by estimating the

effects of the HSA on key intra-household outcomes in our sample, using our primary identification strategy detailed in section 3.3. Table 7 tests for the effects of the HSA on fertility, women's health, intimate partner violence, and separations. We find no effects on fertility,⁴¹ but we find improvements in women's health. Specifically, we find a reduction of 3.4 percentage points in severe anemia and a 0.79 unit improvement in body mass index (relative to a mean of 20.8). These results fit with the context of either the non-cooperative or collective household models – as women's increased bargaining power increases their own consumption – or with a unitary household model in which income effects from the HSA improve all household members' health. Alternatively, the health effects could come as a direct effect of increased labor supply, given the evidence of returns to health in the labor market (Strauss and Thomas, 1998). In line with an ambiguous theoretical relationship between women's autonomy and mixed empirical evidence of the HSA's effect on domestic violence (Anderson and Genicot (2014) find an increase, while Mathur and Slavov (2013) find a decrease), we find positive but statistically insignificant coefficients on moderate and severe violence.

While health improvements are policy relevant and provide further evidence of a link between the HSA and women's well-being, as with premarital investments, we believe that it is unlikely that these improvements single-handedly explain the labor supply effects we see (but cannot disprove this theory entirely). To provide some suggestive evidence of this claim, we look at a descriptive regression correlating women's characteristics and labor supply in table A13. Women's health has an ambiguous relationship with labor supply; women with severe anemia are less likely to work, but so are women with higher BMI. These relationships persist in the second column when we control for wealth. The lack of a consistent relationship argues against an obvious clear mechanism connecting women's health and labor supply, but to rule out this mechanism definitively, we would need to know the causal relationships between women's health and labor supply in this population.

One final potential effect of women's increased autonomy is that the HSA lead to more separations or divorces, which would be another channel that links the HSA and women's labor supply if women begin working in anticipation of marital dissolution. Indeed, using our identification strategy (but reporting marginal effects from a logit specification, given the infrequency of separation and divorce), we find that the HSA has a positive marginal

⁴¹While in other contexts, women appear to prefer fewer children than men (Ashraf, Field and Lee, 2010), and can translate increased bargaining power into lower realized fertility (Klawon and Tiefenthaler 2001; Rasul 2008), both differential preferences of women and men and the availability of birth control technologies that allow women to translate their preferences into reduced fertility are highly likely to be context-specific.

DEPENDENT VARIABLE	Mild, moderate or severe anemia		Moderate or severe anemia		Bmi	Moderate or severe domestic violence		Severe domestic violence		Separated or divorced
	Fertility									
Treated cohort X Hindu	0.062 [0.176]	-0.029 [0.029]	-0.031 [0.040]	-0.034*** [0.011]	0.785*** [0.246]	0.036 [0.033]	0.009 [0.021]	0.0052*** [0.0017]	0.0049 [0.0062]	
Treated cohort	0.203 [0.230]	0.021 [0.029]	0.025 [0.043]	0.032** [0.013]	-1.057*** [0.252]	-0.031 [0.036]	-0.02 [0.013]	-0.0064*** [0.0017]	-0.0075* [0.0042]	
Mean Dep Var	3.260	0.560	0.172	0.017	20.802	0.352	0.114	0.003	0.019	
Observations	62,611	57,217	57,217	57,217	60,020	46,605	46,605	59,043	63,764	
R-squared	0.382	0.036	0.013	0.008	0.11	0.066	0.025			

Notes: Data source: National Family Health Survey. All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. The sample in columns 1-7 is currently married women; in columns 8 and 9 the sample is ever-married women. All regressions and the calculation of the mean dependent variable include sampling weights. Columns 1-7 are estimated using OLS; Columns 8 and 9 are estimated with logit, with marginal effects displayed. Standard errors in brackets, clustered at the state-cohort level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Effects of the Hindu Succession Act on Fertility and Women's Health

effect of 0.52 percentage points on the probability of divorce in our sample. This effect is large relative to the mean divorce rate; only 0.34 percent of ever-married women are divorced. The estimated marginal effect of the HSA on separations and divorces together is of the same magnitude but more noisily estimated and, thus, is no longer statistically significant at conventional levels. While the fact that divorce is so uncommon is *prima facie* evidence that women who begin working in anticipation of future divorce cannot by itself explain the entire labor supply effect that we see, if divorce is costly enough that even a small change in its probability causes big changes in behavior within a marriage,⁴² we cannot rule out the anticipatory channel entirely.

6 Conclusion

We find that the Hindu Succession Act, which improved women's ability to inherit property, increased their labor supply. Women exposed to the HSA were between 3.8 and 6.1 percentage points more likely to work; this effect was driven by jobs likely to be high-paying (working for a non-family member, for cash, and year-round). Our theoretical model explains that a woman's unearned income can increase her labor supply by raising her autonomy, which subsequently increases her gains from working.

By highlighting the relationship between control over household resources and labor supply, our results suggest that women's unearned income affects labor supply not just through income effects but also through her ability to control decisions directly. Therefore, policies that affect the distribution of resources in the household – not just the inheritance laws that we study but also other reforms to the legal system or targeted land titling programs – can affect the labor supply decisions of household members. Since labor supply is an important driver of firms' productivity and thus economic growth, our results also provide a new channel linking women's bargaining power to economic growth. Previous literature has focused on the link between women's bargaining power and human capital investments as a mechanism for this result (Doepke and Tertilt, 2014).

Finally, our results suggest that there can be important multiplier effects to women's labor force participation. Since there is evidence that work causally increases a woman's autonomy (Anderson and Eswaran 2009; Atkin 2009), policies that seek to empower women can prompt newly empowered women seek out opportunities to earn money and become further empowered. The flip side of this compounding is that women with low autonomy have little to gain from earning money, resulting in a low bargaining power

⁴²Allen (2015) makes an analogous argument: changes in the probability of escape affected the fertility decisions of slaves in the United States even though successful escape was very rare.

trap. Our results suggest that reforms to women's property or inheritance rights, such as the HSA, can propel these women into considerably better bargaining positions within the household.

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Appendix FOR ONLINE PUBLICATION.

Coefficient on treated religion X young cohort

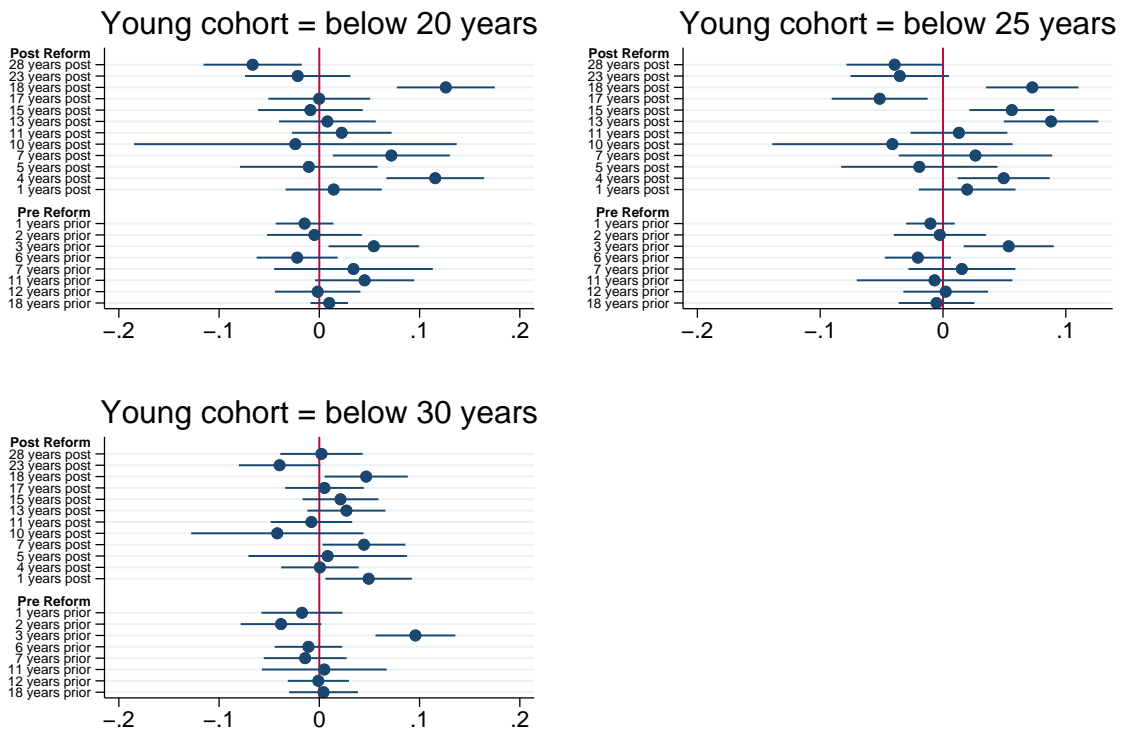


Figure A1: Labor supply of young Hindu women pre- and post-HSA

	Treated religions	Non-Treated religions
Panel A: National Family Health Survey (Currently married women ages 15-49)		
Autonomy measures:		
Has say in own health care	0.620	0.638
Has say in large household purchases	0.529	0.529
Has say in visits to family	0.600	0.609
Has say in purchases for daily needs	0.608	0.590
Has say in spending husband's earnings	0.685	0.672
Can go to market alone	0.538	0.480
Can go to health facility alone	0.506	0.481
Can leave village alone	0.398	0.365
Religion:		
Hindu	0.968	0.000
Muslim	0.000	0.833
Christian	0.000	0.138
Sikh	0.020	0.000
Buddhist	0.009	0.000
Jain	0.004	0.000
Other religion	0.000	0.029
Other Characteristics		
Scheduled caste/scheduled tribe	0.302	0.117
Rural	0.705	0.630
Age at marriage	17.149	17.197
Education (years)	4.408	3.807
Children	2.774	3.235
Height (cm)	151.992	151.977
Bmi	20.734	21.173
Anemia: mild or worse	0.561	0.555
Anemia: moderate or worse	0.171	0.176
Anemia: severe	0.018	0.015
Labor Supply		
Worked in last seven days	0.379	0.259
<i>conditional on having worked in last seven days...</i>		
Work for self	0.148	0.139
Work for family member	0.463	0.419
Work for another person	0.388	0.440
Work for cash	0.663	0.738
Work all year	0.657	0.666

Work in management/technical/professional	0.056	0.086
Work in clerical/sales/service	0.125	0.139
Work in manual (skilled or unskilled)	0.191	0.345
Work in agriculture	0.626	0.422
N	68,737	19,120
Panel B: National Sample Survey (Women ages 15 to 65)		
Year = 1983	0.161	0.155
Year = 1987	0.170	0.171
Year = 1993	0.195	0.181
Year = 1999	0.226	0.235
Year = 2004	0.248	0.259
Never Married	0.141	0.182
Rural	0.760	0.671
Religion		
Hindu	0.967	0.000
Muslim	0.000	0.789
Christian	0.000	0.180
Sikh	0.022	0.000
Buddhist	0.008	0.000
Jain	0.004	0.000
Other religion	0.000	0.031
Labor Supply		
Work (defined as currently employed)	0.358	0.231
Log(income)	1.825	1.757
Professional Job	0.065	0.119
N	675,188	155,085

Means are calculated using sampling weights.

Table A1: Summary Statistics of the Full Sample

DEPENDENT VARIABLE	own health			large hh			visits to family			purchases for daily life			spending husband's earnings			places		
	care	large hh purchases	visits to family	large hh purchases	visits to family	purchases for daily life	spending husband's earnings	market	health facility	outside village	Autonomy index with women's reports	Autonomy index with men's reports	Autonomy index with women's reports	Autonomy index with men's reports	just men's reports	and men's reports	decision-making	
Treated cohort X Hindu	0.050* [0.027]	0.095*** [0.033]	0.091** [0.040]	0.047* [0.026]	0.038 [0.033]	0.019 [0.030]	0.020 [0.038]	0.062 [0.039]	0.020 [0.038]	0.062 [0.039]	0.18 [0.149]	0.269*** [0.096]	0.179*** [0.061]	0.018 [0.149]	0.269*** [0.096]	0.179*** [0.061]	0.018 [0.149]	
Treated cohort	-0.033 [0.028]	-0.039 [0.026]	-0.04 [0.041]	0.006 [0.027]	-0.02 [0.029]	0.012 [0.034]	-0.007 [0.047]	-0.059 [0.042]	-0.007 [0.047]	-0.059 [0.042]	0.012 [0.034]	-0.007 [0.047]	-0.059 [0.042]	0.012 [0.034]	-0.007 [0.047]	-0.059 [0.042]	-0.059 [0.042]	
Mean Dep Var	0.653	0.571	0.645	0.646	0.709	0.5767	0.5494	0.4335	0.5494	0.4335	0.5767	0.5494	0.4335	0.5767	0.5494	0.4335	0.4335	
Observations	62,611	62,608	62,608	62,608	61,316	62,603	62,604	62,598	62,604	62,598	62,603	62,604	62,598	62,603	62,604	62,598	62,598	
R-squared	0.049	0.062	0.071	0.077	0.054	0.127	0.100	0.097	0.100	0.097	0.127	0.100	0.097	0.127	0.100	0.097	0.097	

Reports that his wife has a say in...

large hh purchases	visits to family	purchases for daily life	what to do with money			how many children to have
			visits to family	purchases for daily life	wife earns	
0.038 [0.051]	0.077*** [0.028]	0.011 [0.038]	0.042 [0.026]	0.008 [0.033]	0.008 [0.033]	0.008 [0.033]
-0.047 [0.049]	-0.073*** [0.021]	-0.038 [0.034]	-0.036 [0.027]	-0.006 [0.027]	-0.006 [0.027]	-0.006 [0.027]
0.7305	0.7766	0.7362	0.8569	0.9098	0.9098	0.9098
27,541	27,439	27,472	27,262	27,504	27,504	27,504
0.069	0.047	0.044	0.049	0.033	0.033	0.033

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. In top panel, Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. In bottom panel, treated cohort = 1 if the man was younger than the 10th percentile of the age at marriage distribution for men in the year in which the HSA passed in his state; Treated cohort = 0 if the man was older than the 90th percentile of the age at marriage distribution for men in the year in which the HSA passed in his state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state-cohort level. *** p<0.01, ** p<0.05, * p<0.1.

Table A2: Effects of the Hindu Succession Act on Autonomy: Alternate Measures

DEPENDENT VARIABLE	Autonomy		Work for...					Work away from home
	index	Work	self	family	another	year	cash	
Treated cohort X Hindu	0.191 [0.116]	0.069*** [0.025]	-0.038* [0.021]	0.003 [0.017]	0.073*** [0.025]	0.051 [0.035]	0.073* [0.039]	0.029 [0.037]
Treated cohort	-0.119 [0.078]	-0.067** [0.033]	0.036 [0.023]	-0.001 [0.015]	-0.097** [0.038]	-0.042 [0.027]	-0.060* [0.032]	-0.046 [0.033]
Mean Dep Var	-0.0564	0.3816	0.0679	0.2091	0.1702	0.2663	0.2888	0.3582
Observations	41,131	41,131	41,131	41,131	41,131	41,131	41,131	41,131
R-squared	0.152	0.070	0.030	0.075	0.050	0.053	0.058	0.084

	Work in...		
	professional / managerial / technical	clerical / sales / service	agri
Treated cohort X Hindu	0.027 [0.026]	0.006 [0.009]	-0.052** [0.023]
Treated cohort	-0.033 [0.020]	-0.018 [0.014]	0.025 [0.025]
Mean Dep Var	0.0247	0.0539	0.280
Observations	41,131	41,131	41,131
R-squared	0.014	0.016	0.080

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger (by 10 years or fewer) than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older (by 10 years or fewer) than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: Effects of the Hindu Succession Act: 10-year wide cohorts

DEPENDENT VARIABLE	Autonomy		Work for...				Work away from home	
	index	Work	self	family	another	year		cash
Treated cohort X Hindu	0.209** [0.084]	0.072** [0.029]	-0.022** [0.010]	0.022 [0.025]	0.073** [0.029]	0.054* [0.028]	0.052* [0.027]	0.062** [0.024]
Treated cohort	-0.09 [0.082]	-0.029 [0.035]	0.024** [0.009]	0.008 [0.015]	-0.063** [0.029]	-0.013 [0.024]	-0.034 [0.031]	-0.028 [0.020]
Mean Dep Var	-0.0564	0.3816	0.0679	0.2091	0.1702	0.2663	0.2888	0.3582
Observations	62,501	62,501	62,501	62,501	62,501	62,501	62,501	62,501
R-squared	0.142	0.068	0.032	0.079	0.046	0.047	0.049	0.087

	Work in...		
	professional / managerial / technical	clerical / sales / service	agri
Treated cohort X Hindu	0.034*** [0.011]	-0.012 [0.013]	0.02 [0.017]
Treated cohort	-0.034*** [0.012]	0.002 [0.012]	0.008 [0.021]
Mean Dep Var	0.0247	0.0539	0.280
Observations	62,501	62,501	62,501
R-squared	0.012	0.014	0.087

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state (among states passing the HSA before 2005); Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. Sample includes married women ages 15 to 49. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Effects of the Hindu Succession Act: Considering only women in States Passing the HSA before 2005 as treated

Dependent Variable	Autonomy			Work				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated cohort X Hindu	0.169*** [0.061]	0.259* [0.140]	0.169** [0.062]	0.175*** [0.060]	0.062*** [0.017]	0.170*** [0.053]	0.062*** [0.017]	0.150*** [0.034]
Treated cohort	-0.073 [0.060]	-0.352** [0.156]	-0.072 [0.060]	-0.249*** [0.061]	-0.034 [0.022]	-0.109** [0.044]	-0.033 [0.022]	-0.107*** [0.036]
Near treated cohort X Hindu	-0.066 [0.152]	0.148 [0.099]	-0.045 [0.171]	-0.091 [0.185]	-0.046 [0.063]	0.065 [0.070]	0.020 [0.056]	0.082 [0.053]
Near treated cohort	0.142 [0.144]	-0.068 [0.109]	-0.016 [0.188]	0.024 [0.148]	0.034 [0.069]	-0.089 [0.069]	0.026 [0.048]	-0.03 [0.054]
Size of "near treated" cohort	3 years	3 years	5 years	5 years	3 years	3 years	5 years	5 years
Years of control cohort included	Entire	6 years	Entire	10 years	Entire	6 years	Entire	10 years
Observations	62,501	10,996	62,501	20,526	62,501	10,996	62,501	20,526
R-squared	0.141	0.08	0.141	0.075	0.067	0.062	0.067	0.059

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. Near treated cohort is a subset of the control cohort equal to 1 if the woman was within 3 years of the 90th percentile of age at marriage when the HSA was passed in her state in columns 1-2 and 5-6, and within 5 years of the 90th percentile of age at marriage when the HSA was passed in her state in columns 3-4 and 7-8. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Comparing Cohorts Nearer to Treatment to those Further from Treatment

years to reform	HSA year passed	state(s) identifying	NSS survey year	N
1	1994	Maharashtra and Karnataka	1993	15,782
	2005	remaining 24 states	2004	97,656
2	1989	Tamil Nadu	1987	8535
3	1986	Andhra Pradesh	1983	9301
6	1989	Tamil Nadu	1983	8183
	2005	remaining 24 states	1999	93,830
7	1994	Maharashtra and Karnataka	1987	18,340
11	1994	Maharashtra and Karnataka	1983	16,931
12	2005	remaining 24 states	1993	88,099
18	2005	remaining 24 states	1987	10,1220
22	2005	remaining 24 states	1983	91,118
years since reform	HSA year passed	state(s) identifying	NSS survey year	N
28	1976	Kerala	2004	5770
23	1976	Kerala	1999	5180
18	1986	Andhra Pradesh	2004	8446
17	1976	Kerala	1993	4624
15	1989	Tamil Nadu	2004	7659
13	1986	Andhra Pradesh	1999	9301
11	1976	Kerala	1987	5101
10	1989	Tamil Nadu	1999	33,820
	1994	Maharashtra and Karnataka	2004	70,093
7	1976	Kerala	1986	23,455
	1986	Andhra Pradesh	1993	37,342
5	1994	Maharashtra and Karnataka	1999	15606
4	1989	Tamil Nadu	1993	7519
1	1986	Andhra Pradesh	1987	9861

Table A6: Identifying variation in years pre- and post-reform, by state

Young cohort	20 and under	25 and under	30 and under
Years to reform = 1	0.006 [0.042]	0.006 [0.042]	0.014 [0.046]
Years to reform = 2	0.005 [0.052]	-0.012 [0.056]	0.009 [0.057]
Years to reform = 3	-0.449*** [0.112]	-0.430*** [0.116]	-0.441*** [0.112]
Years to reform = 6	-0.029 [0.049]	-0.024 [0.040]	-0.035 [0.039]
Years to reform = 7	-0.053 [0.108]	-0.036 [0.109]	-0.004 [0.102]
Years to reform = 11	-0.144* [0.081]	-0.09 [0.093]	-0.085 [0.091]
Years to reform = 12	0.101 [0.126]	0.092 [0.126]	0.089 [0.126]
Years to reform = 18	0.059** [0.027]	0.074*** [0.026]	0.068*** [0.023]
Hindu X Years to reform = 1	-0.015 [0.014]	-0.01 [0.010]	-0.017 [0.020]
Hindu X Years to reform = 2	-0.005 [0.023]	-0.003 [0.018]	-0.038* [0.020]
Hindu X Years to reform = 3	0.054** [0.022]	0.054*** [0.018]	0.096*** [0.019]
Hindu X Years to reform = 6	-0.022 [0.020]	-0.02 [0.013]	-0.011 [0.016]
Hindu X Years to reform = 7	0.034 [0.039]	0.015 [0.021]	-0.014 [0.020]
Hindu X Years to reform = 11	0.045* [0.024]	-0.007 [0.031]	0.005 [0.030]
Hindu X Years to reform = 12	-0.002 [0.021]	0.002 [0.017]	-0.001 [0.015]
Hindu X Years to reform = 18	0.01 [0.009]	-0.005 [0.015]	0.004 [0.017]
Mean Dependent Variable	0.313	0.313	0.313
Observations	665,853	665,853	665,853
R-squared	0.105	0.105	0.105

Table A7: Regression results for pre- and post-treatment dummies

DEPENDENT VARIABLE	Autonomy				
	index	Work	self	family	another
Treated cohort X Hindu	0.159*** [0.057]	0.062*** [0.017]	-0.022** [0.009]	0.033 [0.026]	0.051 [0.033]
Treated cohort	-0.088 [0.064]	-0.054** [0.026]	0.018 [0.015]	-0.006 [0.015]	-0.080** [0.038]
Treated cohort X Hindu X Andhra Pradesh	-0.002 [0.048]	-0.061*** [0.019]	-0.004 [0.011]	-0.103*** [0.018]	0.016 [0.025]
Treated cohort X Andhra Pradesh	0.090** [0.042]	0.133*** [0.020]	0.035*** [0.012]	0.048** [0.019]	0.087*** [0.027]
Mean Dep Var	-0.1830	0.3600	0.0620	0.2000	0.1660
Observations	62,395	62,395	62,395	62,395	62,395
R-squared	0.142	0.068	0.032	0.079	0.047

DEPENDENT VARIABLE	Work in...					
	Work all year	Work for cash	Work away from home	prof / manage / tech	clerical / sales / service	manual agri
Treated cohort X Hindu	0.056** [0.025]	0.054* [0.027]	0.054** [0.020]	0.026** [0.011]	-0.012 [0.015]	0.050** [0.021]
Treated cohort	-0.046 [0.028]	-0.063 [0.038]	-0.069*** [0.024]	-0.026** [0.012]	0.003 [0.017]	-0.021* [0.012]
Treated cohort X Hindu X Andhra Pradesh	-0.058*** [0.021]	-0.056** [0.022]	-0.075*** [0.012]	0.01 [0.008]	0.020* [0.011]	-0.073*** [0.018]
Treated cohort X Andhra Pradesh	0.127*** [0.022]	0.143*** [0.028]	0.150*** [0.010]	0.008 [0.007]	-0.018 [0.012]	0.107*** [0.017]
Mean Dep Var	0.2500	0.2750	0.3430	0.0230	0.0480	0.2720
Observations	62,395	62,395	62,395	62,395	62,395	62,395
R-squared	0.048	0.05	0.088	0.012	0.014	0.027

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. Sample includes married women ages 15 to 49. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A8: Effects of the Hindu Succession Act (in NFHS data): Separate effect of Andhra Pradesh

Dependent Variable	1(Work)		Log(Income)		1(Professional Job)	
Treated cohort X Hindu	0.015	0.021	0.157***	0.071	0.016***	0.014**
	[0.014]	[0.016]	[0.056]	[0.060]	[0.005]	[0.006]
Treated cohort	-0.062**	-0.030**	-0.083	0.095	-0.012**	-0.010*
	[0.023]	[0.012]	[0.090]	[0.065]	[0.006]	[0.006]
Treated cohort X Hindu X Andhra Pradesh	0.076***	0.064***	0.384***	0.328***	0.005	0.005
	[0.011]	[0.010]	[0.064]	[0.063]	[0.005]	[0.005]
Treated cohort X Andhra Pradesh	-0.036*	-0.035***	-0.147**	-0.108**	0.001	0.002
	[0.019]	[0.008]	[0.070]	[0.051]	[0.005]	[0.004]
Hindu X Age	Y	Y	Y	Y	Y	Y
Hindu X State	Y	Y	Y	Y	Y	Y
Age X State	Y	Y	Y	Y	Y	Y
Hindu X Year		Y		Y		Y
Age X Year		Y		Y		Y
Mean Dependent Variable	0.318	0.318	0.523	0.523	0.034	0.034
Observations	616,137	616,137	616,137	616,137	616,137	616,137
R-squared	0.102	0.103	0.062	0.064	0.014	0.014

*Treated cohort = 1 if the woman was younger than the 10th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state; Treated cohort = 0 if the woman was older than the 90th percentile of the age at marriage distribution for women in the year in which the HSA passed in her state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. Sample includes married women ages 15 to 65. All regressions include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.*

Table A9: Effects of the Hindu Succession Act (in NSS data): Separate effect of Andhra Pradesh

Dependent Variable	<u>1(Work)</u>		<u>Log(Income)</u>		<u>1(Professional Job)</u>	
Treated cohort X Hindu	0.020*	0.014	0.262*	0.113	-0.015	-0.015
	[0.010]	[0.011]	[0.141]	[0.148]	[0.010]	[0.011]
Treated cohort	0.025*	0.031**	0.382***	0.455***	0.008**	0.012**
	[0.014]	[0.015]	[0.135]	[0.165]	[0.003]	[0.005]
Hindu X Age	Y	Y	Y	Y	Y	Y
Hindu X State	Y	Y	Y	Y	Y	Y
Hindu X Year		Y		Y		Y
Age X Year		Y		Y		Y
Mean Dependent Variable	0.925	0.925	2.004	2.004	0.131	0.131
Observations	599,440	599,440	599,440	599,440	599,440	599,440
R-squared	0.079	0.081	0.111	0.114	0.03	0.031

*Treated cohort = 1 if the man was younger than the 10th percentile of the age at marriage distribution for men in the year in which the HSA passed in his state; Treated cohort = 0 if the man was older than the 90th percentile of the age at marriage distribution for men in the year in which the HSA passed in his state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table A10: Effects of the Hindu Succession Act on Men's Labor Supply (in NSS data)

DEPENDENT VARIABLE	Pay scheme: work for...				Work in...			
	Work	no pay	cash	in kind	professional / managerial / technical	clerical / sales / service	manual	agri
Treated cohort X Hindu	-0.022 [0.023]	-0.015 [0.015]	0.020 [0.022]	0.072* [0.040]	-0.004 [0.023]	-0.044 [0.041]	-0.016 [0.050]	0.061 [0.043]
Treated cohort	0.022 [0.019]	0.023 [0.015]	-0.031* [0.018]	-0.081** [0.035]	0.025 [0.017]	0.043 [0.034]	0.000 [0.036]	-0.066** [0.031]
Mean Dep Var	0.964	0.050	0.902	0.225	0.067	0.218	0.341	0.358
Observations	29,128	29,128	29,128	29,128	29,128	29,128	29,128	29,128
R-squared	0.035	0.116	0.084	0.100	0.020	0.031	0.039	0.062

Notes: All regressions include controls for state X Hindu fixed effects and Hindu X year of birth fixed effects. Treated cohort = 1 if the man was younger than the 10th percentile of the age at marriage distribution for men in the year in which the HSA passed in his state; Treated cohort = 0 if the man was older than the 90th percentile of the age at marriage distribution for men in the year in which the HSA passed in his state. The Hindu dummy also includes Sikhs, Buddhists, and Jains, as described in section 3. All regressions and the calculation of the mean dependent variable include sampling weights. Standard errors in brackets, clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A11: Effects of the Hindu Succession Act on Men's Labor Supply (in NFHS data)

Dependent Variable	1(Work)		Log(Income)		1(Professional Job)	
Treated cohort X Hindu	0.054**	0.053*	0.338***	0.222**	0.016***	0.013**
	[0.026]	[0.027]	[0.106]	[0.101]	[0.005]	[0.006]
Treated cohort X Hindu X Single	-0.051	-0.050	-0.223*	-0.223*	-0.001	0.000
	[0.033]	[0.034]	[0.130]	[0.127]	[0.009]	[0.009]
Treated cohort	-0.083***	-0.050***	-0.171**	0.046	-0.008	-0.006
	[0.017]	[0.013]	[0.081]	[0.046]	[0.005]	[0.005]
Treated cohort X Single	0.015	0.038	0.145	0.211*	-0.013*	-0.010
	[0.030]	[0.031]	[0.118]	[0.105]	[0.007]	[0.007]
Single	0.088***	0.087***	0.371***	0.378***	0.057***	0.057***
	[0.010]	[0.009]	[0.070]	[0.063]	[0.009]	[0.009]
Single X Hindu	-0.103***	-0.101***	-0.237***	-0.239***	-0.015	-0.015
	[0.022]	[0.021]	[0.079]	[0.076]	[0.012]	[0.012]
Hindu X Age	Y	Y	Y	Y	Y	Y
Hindu X State	Y	Y	Y	Y	Y	Y
Age X State	Y	Y	Y	Y	Y	Y
Hindu X Year		Y		Y		Y
Age X Year		Y		Y		Y
Mean Dependent Variable	0.3436	0.3436	0.6091	0.6091	0.0241	0.0241
Observations	814,265	814,265	814,265	814,265	814,265	814,265

Table A12: Estimates of the Effects of the Hindu Succession Act on Single versus Married Women's Labor Supply

Dependent Variable	1(Work)	
Education (years)	-0.015*** [0.002]	-0.002 [0.002]
Height (cm)	-0.0008 [0.0005]	0.0005 [0.0005]
Marriage Age	-0.001 [0.002]	-0.001 [0.002]
Children	0.001 [0.003]	-0.006** [0.003]
Mild anemia (or worse)	0.003 [0.006]	-0.003 [0.006]
Moderate anemia (or worse)	0.008 [0.007]	0.007 [0.007]
Severe anemia	-0.058** [0.027]	-0.063** [0.026]
BMI	-0.014*** [0.001]	-0.007*** [0.001]
Wealth (standard deviations)		-0.124*** [0.011]
Mean Dependent Variable	0.385	0.385
Observations	59,951	57,040
R-squared	0.101	0.114

*All regressions include controls for state X Hindu fixed effects, Hindu X age fixed effects. Mild anemia (or worse) = 1 if individual has mild, moderate, or severe anemia. Moderate anemia (or worse) = 1 if individual has moderate or severe anemia. All regressions include sampling weights. Standard errors in brackets, clustered at the state-cohort level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table A13: Descriptive relationship between women's characteristics and labor supply

A Appendix: Proofs

Throughout of the proofs, we consider two equivalent utility maximization problems for the spouses, in which the wife maximizes u_f/γ_f and the husband maximizes u_m/γ_m . As γ_f and γ_m are constantly in the denominators, as shown, for example, in equation (8) below, normalizing them simplifies notations. This normalization is without loss of generality because it preserves the equilibrium strategy profiles and the signs of the changes to the spouses' utilities.

We also note that many of the equilibrium conditions are (mostly) the same, and to prevent repetition, we derive a full set of equilibrium conditions in the first proof below and refer back to them in the following proofs.

Proof of Remark 2.1: First, suppose the equilibria remain interior. Let the strategy profile $(e_f^*, e_m^*, y_f^*, y_m^*)$ be the interior equilibrium for the original unearned incomes. For any positive transfer Δ from R_m to R_f , the fact that the equilibrium remains interior implies $a_f\Delta < y_m^*$ (formally shown below). We show that for any such transfer, the strategy profile $(e_f^*, e_m^*, y_f^* + a_f\Delta, y_m^* - a_f\Delta)$ is the new interior equilibrium.

In interior equilibria, $y_f > 0$ and $y_m > 0$, and their FOCs are

$$[y_f] : \frac{-\beta_f}{a_f(w_f e_f + R_f) - y_f} + \frac{\gamma_f}{y_m + y_f} = 0, \quad (6)$$

$$[y_m] : \frac{-\beta_m}{w_m e_m + R_m + (1 - a_f)(w_f e_f + R_f) - y_m} + \frac{\gamma_m}{y_m + y_f} = 0. \quad (7)$$

Then, the household public good $z = y_f + y_m$ is

$$z = \frac{w_m e_m + w_f e_f + R_m + R_f}{\beta_f/\gamma_f + \beta_m/\gamma_m + 1}. \quad (8)$$

After the normalization, the public good can be simplified to

$$z = \frac{w_m e_m + w_f e_f + R_m + R_f}{\beta_f + \beta_m + 1}. \quad (9)$$

And the spouse' contributions to the household public good are

$$y_f = a_f(e_f w_f + R_f) - \frac{\beta_f}{\beta_f + \beta_m + 1}(w_m e_m + w_f e_f + R_m + R_f), \quad (10)$$

$$y_m = \frac{\beta_f + 1}{\beta_f + \beta_m + 1}(w_m e_m + w_f e_f + R_m + R_f) - a_f(e_f w_f + R_f). \quad (11)$$

Thus, $y_f^* + a_f \Delta$ and $y_m^* - a_f \Delta$ satisfies the two FOCs – (6) and (7) – conditional on (e_f^*, e_m^*) after the transfer, and the household public good remains the same.

Then, we show that the labor supplies remain the same. First, check if $e_f = 0$ is an equilibrium. Assume it is true; then, in the equilibrium, we have (10), and

$$u_f(e_f = 0) = \beta_f \ln \frac{\beta_f(w_m e_m + R_m + R_f)}{\beta_f + \beta_m + 1} + \ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1}.$$

We can omit p_f and p_m from all utility functions when analyzing the labor supply. Because we are interested in the comparison between $u_f(e_f = 0)$ and $u_f(e_f = E_f)$, subtracting a constant, $-\beta_f \ln p_f$, from both does not affect the comparison.

Alternatively, the wife may deviate and go out to work. Note that as the wife changes her labor supply, she will choose the optimal contribution to the public good conditional on the new labor supply:

$$y_f = a_f R_f - \frac{\beta_f}{\beta_f + \beta_m + 1}(w_m e_m + R_m + R_f) + \frac{1}{\beta_f + 1} a_f w_f e_f,$$

Then, her utility is

$$\begin{aligned} u_f(e_f = E_f) &= \beta_f \ln \left(\frac{\beta_f}{\beta_f + 1} a_f w_f E_f + \frac{\beta_f}{\beta_f + \beta_m + 1} (w_m e_m + R_m + R_f) \right) \\ &+ \ln \left(\frac{1}{\beta_f + 1} a_f w_f E_f + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) + \delta_f \ln(1 - E_f). \end{aligned}$$

To make sure deviation is not profitable, we need $u_f(e_f = 0) \geq u_f(e_f = E_f)$, which is

$$\ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \geq \ln \left(\frac{a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f). \quad (12)$$

Clearly, given e_m^* , if $e_f^* = 0$ is an equilibrium with the original unearned incomes, then it is also the equilibrium female labor supply after the transfer.

Next, check if $e_f = E_f$ is an equilibrium. Assume it is true; then we have

$$u_f(e_f = E_f) = \beta_f \ln \frac{\beta_f(w_m e_m + w_f E_f + R_m + R_f)}{\beta_f + \beta_m + 1} + \ln \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} + \delta_f \ln(1 - E_f).$$

Alternatively, the wife may deviate and not go to work,

$$u_f(e_f = 0) = \beta_f \ln \left(\frac{-\beta_f a_f w_f E_f}{\beta_f + 1} + \beta_f \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right) + \ln \left(\frac{-a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right).$$

To make sure deviation is not profitable, we need $u_f(e_f = E_f) \geq u_f(e_f = 0)$, which is

$$\ln \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f) \geq \ln \left(\frac{-a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right). \quad (13)$$

Again, given e_m^* , if $e_f^* = E_f$ is an equilibrium with the original unearned incomes, then it is also the equilibrium female labor supply after the transfer.

It is analogous to show that given e_f^* , e_m^* remains to be the equilibrium male labor supply after the transfer. Notice also that when $y_m^* = a_f \Delta$, the equilibrium contribution from the husband is zero, which is no longer interior. Therefore, $\Delta < y_m^* / a_f$ is needed to ensure we remain in the regime of interior equilibria.

To sum up, while there is a positive transfer from the husband to the wife, all equilibrium outcomes remain constant, including both spouses' labor supply (e_f and e_m), the public good (z), and both spouses' utilities (u_f and u_m).

Next, suppose that in the equilibria, only the wife contributes to the household public good. Then, we can separately examine the wife and the husband. Let us begin with the wife; her optimal contribution to the household public good is

$$z = y_f = \frac{1}{\beta_f + 1} a_f (w_f e_f + R_f). \quad (14)$$

Thus, the household public good increases as R_f increases, unless e_f changes from E_f to

zero. The wife's utility with the optimal y_f is

$$\beta_f \ln \beta_f + (\beta_f + 1) \ln \left(\frac{1}{\beta_f + 1} a_f (w_f e_f + R_f) / p_f \right) + \delta_f \ln(1 - e_f).$$

Then, we identify her labor supply.

$$\begin{aligned} u_f(e_f = 0) &= \beta_f \ln \beta_f + (\beta_f + 1) \ln \left(\frac{1}{\beta_f + 1} a_f R_f / p_f \right), \\ u_f(e_f = E_f) &= \beta_f \ln \beta_f + (\beta_f + 1) \ln \left(\frac{1}{\beta_f + 1} a_f (w_f E_f + R_f) / p_f \right) + \delta_f \ln(1 - E_f), \\ u_f(e_f = E_f) - u_f(e_f = 0) &= (\beta_f + 1) \ln \left(\frac{w_f E_f}{R_f} + 1 \right) + \delta_f \ln(1 - E_f). \end{aligned} \quad (15)$$

The difference in (15) decreases as R_f increases, implying that $e_f = 0$ is more likely to be optimal when R_f increases. As the wife is under a positive income shock and is not affected by the husband's strategies, her utility always increases.

The husband's problem is simpler as $y_m = 0$, and he decides only his labor supply.

$$\begin{aligned} u_m(e_m = 0) &= \beta_m \ln ((R_m + (1 - a_f)(w_f e_f + R_f)) / p_m) + \ln z, \\ u_m(e_m = E_m) &= \beta_m \ln ((w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f)) / p_m) + \ln z + \delta_m \ln(1 - E_m), \\ u_m(e_m = E_m) - u_m(e_m = 0) &= \beta_m \ln \left(\frac{w_m E_m}{R_m + (1 - a_f)(w_f e_f + R_f)} + 1 \right) + \delta_m \ln(1 - E_m). \end{aligned} \quad (16)$$

When $R_f + R_m$ is constant, the difference in (16) increases as R_f increases, implying that $e_f = E_f$ is more likely to be optimal when R_f increases. The husband suffers a negative income shock, which we claim dominates the possible increase in the household public good due to the wife's increased contribution. To prove the claim, we first note that before the transfer, the husband spends Δ on his private consumption instead of on the household public good. After the transfer, it is now spent on his less preferred channel, the household public good instead of his private consumption, and by (14), only part of the transfer is spent on the public good and the rest is spent on the wife's private consumption. Therefore, the husband's utility decreases. ■

Proof of Lemma 2.2: We start with interior equilibria. Using FOC of y_m in (7),

$$y_m = \frac{\gamma_m}{\beta_m + 1} (w_m e_m + R_m + (1 - a_f)(w_f e_f + R_f)) - \frac{\beta_m}{\beta_m + 1} y_f.$$

Put y_m back into the utility function (omitting p_m),

$$u_m(e_m = 0) = \beta_m \ln(\beta_m) + (\beta_m + 1) \ln \frac{R_m + (1 - a_f)(w_f e_f + R_f) + y_f}{\beta_m + 1}.$$

$$u_m(e_m = E_m) =$$

$$\beta_m \ln(\beta_m) + (\beta_m + 1) \ln \frac{w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f) + y_f}{\beta_m + 1} + \delta_m \ln(1 - E_m).$$

Therefore, $u_m(e_m = E_m) - u_m(e_m = 0) =$

$$(\beta_m + 1) \ln \frac{w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f) + y_f}{R_m + (1 - a_f)(w_f e_f + R_f) + y_f} + \delta_m \ln(1 - E_m).$$

Define $f(E_m)$ as $f(E_m) = u_m(e_m = E_m) - u_m(e_m = 0)$, then $f(0) = 0$. In order to show $f(E_m) > 0$ for all $E_m \in (0, 1)$, a sufficient condition is $f'(E_m) > 0$.

$$f'(E_m) = \frac{w_m(\beta_m + 1)}{w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f) + y_f} - \frac{\delta_m}{1 - E_m} > 0,$$

$$\frac{\beta_m + 1}{\delta_m} > \frac{w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f) + y_f}{w_m(1 - E_m)}. \quad (17)$$

Since $y_f \leq a_f(w_f e_f + R_f)$ and $e_f \leq E_f$, a sufficient condition (de-normalizing γ_m) is

$$\frac{\beta_m + \gamma_m}{\delta_m} > \frac{w_m E_m + R_m + w_f E_f + R_f}{w_m(1 - E_m)}.$$

This condition clearly holds, given (A1).

Then, consider only one spouse contributes to the household public good. If the contributor is the husband, then $y_f = 0$ in (17), so it holds given (A1). If the contributor is the wife, then

$$u_m(e_m = E_m) - u_m(e_m = 0) = \beta_m \ln \frac{w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f)}{R_m + (1 - a_f)(w_f e_f + R_f)} + \delta_m \ln(1 - E_m).$$

Similarly as above, a sufficient condition to ensure $u_m(e_m = E_m) - u_m(e_m = 0) > 0$ is

$$\frac{\beta_m}{\delta_m} > \frac{w_m E_m + R_m + w_f E_f + R_f}{w_m(1 - E_m)}.$$

This inequality is exactly our (A1). ■

Proof of Proposition 2.3: First, check if $e_f = 0$ is an equilibrium. To make sure deviation is not profitable, we need by (12),

$$\ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \geq \ln \left(\frac{a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f).$$

Case 1a: $R_f + R_m$ is constant. There exists a threshold $t_1^a(w_f)$ decreasing in w_f , such that $e_f = 0$ is an equilibrium if and only if $a_f \leq t_1^a(w_f)$.

Second, check if $e_f = E_f$ is an equilibrium, and we need by (13),

$$\ln \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f) \geq \ln \left(\frac{-a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right).$$

Case 1b: $R_f + R_m$ is constant. There exists a threshold $t_2^a(w_f)$ decreasing in w_f , such that $e_f = E_f$ is an equilibrium if and only if $a_f \geq t_2^a(w_f)$.

Thus, as R_f increases, a_f increases, and it is less likely to have $e_f = 0$ be an equilibrium and more likely to have $e_f = E_f$ be an equilibrium. By (9), as $R_f + R_m$ and $e_m = E_m$ are constant and e_f weakly increases, z also weakly increases. ■

Proof of Proposition 2.4: First, check if $e_f = 0$ is an equilibrium. Focus on (12),

$$\ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \geq \ln \left(\frac{w_f E_f}{\beta_f + 1} \frac{\alpha_f R_f}{R_f + R_m} + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f). \quad (18)$$

Let $f(R_f)$ be

$$f(R_f) = \ln \left(\frac{w_f E_f}{\beta_f + 1} \frac{\alpha_f R_f}{R_f + R_m} + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) - \ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1},$$

where $f(0) = 0$ and $f(R_f) \rightarrow 0$ as $R_f \rightarrow \infty$. The condition in (18) can be rewritten as $f(R_f) \leq C$, where $C = -\frac{\delta_f}{\beta_f + 1} \ln(1 - E_f)$ is positive.

$$f'(R_f) \stackrel{\text{sign}}{=} R_m(R_m + w_m E_m) - R_f^2.$$

Therefore, $f(R_f)$ first increases and then decreases.

Case 2a: R_m is constant. There exist a threshold t_1^w , such that $e_f = 0$ is an equilibrium if $w_f < t_1^w$. Otherwise, there are two thresholds $t_{1L}^R(w_f) < t_{1H}^R(w_f)$, the former decreasing in w_f and the latter increasing in w_f , such that $e_f = 0$ is an equilibrium if $R_f < t_{1L}^R(w_f)$ or $R_f > t_{1H}^R(w_f)$.

Second, check if $e_f = E_f$ is an equilibrium. Focus on (13),

$$\begin{aligned} & \ln \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f) \\ & \geq \ln \left(\frac{-w_f E_f}{\beta_f + 1} \frac{\alpha_f R_f}{R_f + R_m} + \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right). \end{aligned} \quad (19)$$

Let $g(R_f)$ be

$$g(R_f) = \ln \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} - \ln \left(\frac{-w_f E_f}{\beta_f + 1} \frac{\alpha_f R_f}{R_f + R_m} + \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right),$$

where $g(0) = 0$ and $g(R_f) \rightarrow 0$ as $R_f \rightarrow \infty$. The condition in (19) can be rewritten as $g(R_f) \geq C$.

$$g'(R_f) \stackrel{\text{sign}}{=} R_m(R_m + w_m E_m + w_f E_f) - R_f^2.$$

Therefore, $g(R_f)$ first increases and then decreases.

Case 2b: R_m is constant. There exist a threshold t_2^w , such that $e_f = E_f$ is never an equilibrium if $w_f < t_2^w$. Otherwise, there are two thresholds $t_{2L}^R(w_f) < t_{2H}^R(w_f)$, with the former decreasing in w_f and the latter increasing in w_f , such that $e_f = E_f$ is an equilibrium if $R_f \in (t_{2L}^R(w_f), t_{2H}^R(w_f))$.

Thus, as the wife's unearned income increases from R_f^0 to R_f , her labor supply exhibits an inverse U shape, first increasing then decreasing. By (9), z increases as R_f increases, except when e_f decreases from E_f to 0, and the decrease is substantial: $w_f E_f > R_f - R_f^0$.

■

Proof of Remark 2.5: First, suppose the equilibria remain interior and we follow the proof of Proposition 2.3. For the wife's utility change, take $u_f(e_f = 0)$ from case 1a and

$u_f(e_f = E_f)$ from case 1b,

$$u_f^{1b}(e_f = E_f) - u_f^{1a}(e_f = 0) = (\beta_f + 1) \ln \frac{w_m E_m + w_f E_f + R_m + R_f}{w_m E_m + R_m + R_f} + \delta_f \ln(1 - E_f) \geq 0.$$

Undoing the normalization of γ_f , we have

$$(\beta_f + \gamma_f) \ln \frac{w_m E_m + w_f E_f + R_m + R_f}{w_m E_m + R_m + R_f} + \delta_f \ln(1 - E_f) \geq 0.$$

It is exactly our (A2). The husband's utility is

$$u_m = \beta_m \ln(w_m e_m + R_m + (1 - a_f)(w_f e_f + R_f) - y_m) + \ln(z) + \delta_m \ln(1 - e_m).$$

By (7), $u_m = \beta_m \ln(\beta_m z) + \ln(z) + \delta_m \ln(1 - e_m)$, which weakly increases.

Second, suppose in the equilibria, only the wife contributes to the household public good. The labor supply changes are shown in Proposition B.7. Then, similarly to the proof of Remark 2.1, the wife's utility increases because she experiences a positive income shock, and the husband's utility decreases because he suffers a negative income shock. ■

Proof of Remark 2.6: First, suppose that the equilibria remain interior and we follow the proof of Proposition 2.4. For the wife's utility change, if her labor supply remains constant, $u_f^{1b}(e_f = E_f)$ and $u_f^{1a}(e_f = 0)$ increase in R_f . Alternatively, if her labor supply increases when her unearned income increases from R_f^0 to R_f ,

$$u_f^{1b}(e_f = E_f) - u_f^{1a}(e_f = 0) = (\beta_f + 1) \ln \frac{w_m E_m + w_f E_f + R_m + R_f}{w_m E_m + R_m + R_f^0} + \delta_f \ln(1 - E_f).$$

By (A2) and the fact that $R_f^0 < R_f$, $u_f^{1b}(e_f = E_f) - u_f^{1a}(e_f = 0) > 0$. Therefore, the wife is better off. The husband's utility is $u_m = \beta_m \ln(\beta_m z) + \ln(z) + \delta_m \ln(1 - e_m)$. When e_f weakly increases, z increases as R_f increases, so does u_m .

Second, suppose in the equilibria, only the wife contributes to the household public good. The wife's utility increases because she experiences a positive income shock. The husband also receives a positive income shock if the wife's labor supply does not decrease because his control of the wife's unearned income, $(1 - \frac{\alpha_f R_f}{R_f + R_m})R_f$, increases in R_f . Thus, the husband's utility also increases. ■

B Appendix: Extensions

B.1 Alternative model: A collective household

In a collective model, the wife and husband maximize a weighted total utility: $U = a_f u_f + (1 - a_f) u_m$. The optimization problem in the baseline case then becomes

$$\begin{aligned} \max_{x_f, x_m, e_f, e_m, z} \quad & a_f(\beta_f \ln x_f + \gamma_f \ln z + \delta_f \ln(1 - e_f)) + (1 - a_f)(\beta_m \ln x_m + \gamma_m \ln z + \delta_m \ln(1 - e_m)), \\ \text{s.t.} \quad & e_f \in \{0, E_f\}, \quad e_m \in \{0, E_m\}, \quad x_f, x_m, z \geq 0, \\ & z + p_f x_f + p_m x_m \leq w_m e_m + R_m + w_f e_f + R_f. \end{aligned}$$

We assume $\beta_f + \gamma_f = \beta_m + \gamma_m = 1$ (their preferences on their private consumption and the household public good) in order to set the spouses' unweighted preference on the same scale and also to make the analysis tractable. Similarly as before, we focus on the case in which the husband always works. The following assumption ensures it.

Assumption 3 (A3): parameters satisfy

$$\frac{a_f(\beta_f + \gamma_f) + (1 - a_f)(\beta_m + \gamma_m)}{(1 - a_f)\delta_m} (= \frac{1}{(1 - a_f)\delta_m}) > \frac{w_m E_m + R_m + w_f E_f + R_f}{w_m(1 - E_m)}.$$

Proposition B.1. *In this collective model, suppose the Nash equilibrium is interior and (A3) holds. In equilibrium, an increase in the wife's unearned income will:*

- Weakly decrease her labor supply (e_f).
- Keep the husband's labor supply constant, i.e., $e_m = E_m$.
- Increase the household public good (z) if the wife cares more about it than the husband ($\gamma_f > \gamma_m$) unless the decrease in e_f is too high.

These hold in both cases when $R_f + R_m$ is constant and when R_m is constant.

Proof of Proposition B.1: Consider the FOCs with respect to (x_f, x_m) :

$$\begin{aligned} \frac{a_f \beta_f}{x_f} - \frac{(a_f \gamma_f + (1 - a_f) \gamma_m) p_f}{w_m e_m + R_m + w_f e_f + R_f - x_f p_f - x_m p_m} &= 0, \\ \frac{(1 - a_f) \beta_m}{x_m} - \frac{(a_f \gamma_f + (1 - a_f) \gamma_m) p_m}{w_m e_m + R_m + w_f e_f + R_f - x_f p_f - x_m p_m} &= 0. \end{aligned}$$

$$p_f x_f = \frac{a_f \beta_f z}{a_f \gamma_f + (1 - a_f) \gamma_m},$$

$$p_m x_m = \frac{(1 - a_f) \beta_m z}{a_f \gamma_f + (1 - a_f) \gamma_m}.$$

The household public good is

$$z = \frac{a_f \gamma_f + (1 - a_f) \gamma_m}{a_f (\beta_f + \gamma_f) + (1 - a_f) (\beta_m + \gamma_m)} (w_m e_m + R_m + w_f e_f + R_f).$$

Let $f(E_m)$ be

$$f(E_m) = u(e_m = E_m) - u(e_m = 0)$$

$$= (a_f (\beta_f + \gamma_f) + (1 - a_f) (\beta_m + \gamma_m)) \ln \frac{w_m E_m + R_m + w_f e_f + R_f}{R_m + w_f e_f + R_f} + (1 - a_f) \delta_m \ln(1 - E_m).$$

$$f'(E_m) = \frac{w_m (a_f (\beta_f + \gamma_f) + (1 - a_f) (\beta_m + \gamma_m))}{w_m E_m + R_m + w_f e_f + R_f} - \frac{(1 - a_f) \delta_m}{1 - E_m}.$$

(A3) ensures $f'(E_m)$ is positive, together with $f(0) = 0$, we have $f(E_m) > 0$, implying that the husband always works.

Similarly,

$$g(E_f) = u(e_f = E_f) - u(e_f = 0) = \ln \frac{w_m E_m + R_m + w_f E_f + R_f}{R_m + w_m E_m + R_f} + a_f \delta_f \ln(1 - E_f).$$

Regardless of whether $R_m + R_f$ or R_m is constant, an increase in R_f decreases $g(E_f)$. The threshold of the change from working to not working, $t(w_f)$, is an increasing function of her wage w_f .

$$z = (a_f (\gamma_f - \gamma_m) + \gamma_m) (w_m e_m + R_m + w_f e_f + R_f).$$

Thus, an increase in R_f increases z if $\gamma_f > \gamma_m$ unless the decrease in e_f is sufficiently high. (Note that the normalization $\beta_f + \gamma_f = \beta_m + \gamma_m = 1$ helps to simplify the proof here. Without it, the analysis is less tractable, but we believe the intuition that women work less when getting more autonomy in collective households remains.) ■

As the wife's unearned income increases, her autonomy (the weight on her utility, a_f) increases, and thus, her utility is more important in the total weighted household utility. As a result, the wife could consume more, work less and enjoy more leisure. The

wife's increased consumption may come from the increase in the unearned income or the decrease in the husband's consumption (when $R_f + R_m$ is constant). At the same time, the wife is likely to work less and enjoy more leisure as the weight on her utility increases. If the wife puts a higher weight on the household public good than the husband ($\gamma_f > \gamma_m$), as the weight on her utility increases, the expenditure on the household public good could increase. Aggregately, the decrease in female labor supply is stronger for low-paying jobs. Intuitively, it is easier for the increased value in her leisure to make women stop working if they weren't making much from working.

Thus, our noncooperative model and the simple collective model give very different predictions about the HSA's effect on labor supply. If the noncooperative model is correct, we may observe an overall increase in female labor supply, while if the simple collective model is correct, we will observe an overall decrease in female labor supply. Therefore, our finding that the HSA increases female labor supply provides evidence against a simple collective household model.

We acknowledge that when moving beyond the simple collective household model, it is possible to predict an increase in female labor supply as her weight increases. For example, when the husband dislikes his wife working outside the home. The optimization problem becomes

$$\begin{aligned} \max_{x_f, x_m, e_f, e_m, z} & a_f (\beta_f \ln x_f + \gamma_f \ln z + \delta_f \ln(1 - e_f)) \\ & + (1 - a_f) (\beta_m \ln x_m + \gamma_m \ln z + \delta_m \ln(1 - e_m) + \varphi_m \ln(1 - e_f)), \quad (20) \\ \text{s.t. } & e_f \in \{0, E_f\}, \quad e_m \in \{0, E_m\}, \quad x_f, x_m, z \geq 0, \\ & z + p_f x_f + p_m x_m \leq w_m e_m + R_m + w_f e_f + R_f. \end{aligned}$$

Notice that $\varphi_m(1 - e_f)$ represents that the husband obtains a higher utility when his wife does not work. Since e_f is not a choice variable of the husband, in the non-cooperative model, all predictions in Proposition 2.3 and Proposition 2.4 remain the same, except the husband's utility may decrease when e_f increases. While the prediction of the collective model could change, in particular, it is possible to predict an increase in the wife's labor supply when her unearned income increases.

Claim. *It is possible to predict an increase in the wife's labor supply when her unearned income increases in a collective household model if the husband dislikes her working.*

Following the proof of Proposition B.1,

$$u(e_f = E_f) - u(e_f = 0) = \ln \frac{w_m E_m + R_m + w_f E_f + R_f}{R_m + w_m E_m + R_f} + (a_f \delta_f + (1 - a_f) \varphi_m) \ln(1 - E_f).$$

It is possible that when R_f increases (so a_f increases), $u(e_f = E_f) - u(e_f = 0)$ increases, especially when φ_m is sufficiently high. Then, female labor supply may increase as her autonomy increases.

B.2 Extension: General utility functions

We verify the robustness of our main results by considering a general set of utility functions. In particular, let $u_f(x_f, z, l_f)$ and $u_m(x_m, z, l_m)$ be the utility functions for the wife and the husband, respectively. We maintain a few standard assumptions for the utility functions as follows.⁴³

Assumption 4 (A4): utilities u_f and u_m are continuous, twice differentiable, strictly increasing, strictly concave, and supermodular.

Supermodularity, i.e., $\frac{\partial u}{\partial x \partial z} \geq 0$, is commonly used to study comparative statics (see Topkis 2011). Here, we use it to establish the uniqueness of the solutions for the continuous variables y_f and y_m .⁴⁴ The following result is the counterpart for Proposition 2.3, and it confirms the stability of the autonomy effect.

Proposition B.2. *Suppose the Nash equilibrium is interior, the husband always work, and (A4) holds. In equilibrium, keeping the total unearned income constant, an increase in the wife's unearned income will:*

- *Weakly increase her labor supply (e_f).*
- *Weakly increase the household public good (z).*

Proof of Proposition B.2: The proof follows the proof of Proposition 2.3 closely.

In the equilibrium, FOCs for interior (y_f, y_m) are:

$$-\frac{1}{p_f} \cdot \frac{\partial u_f}{\partial x_f} + \frac{\partial u_f}{\partial z} = 0, \text{ and } -\frac{1}{p_m} \cdot \frac{\partial u_m}{\partial x_m} + \frac{\partial u_m}{\partial z} = 0. \quad (21)$$

⁴³Notice that since the leisure (l_f and l_m) is a binary variable, only the monotonicity in assumption A4 is relevant for it.

⁴⁴Supermodularity is sufficient but not necessary for the uniqueness of the solution, so alternatively, we can directly assume the uniqueness.

First, check if $e_f = 0$ is an equilibrium. Assume it is true; then, in the equilibrium, we claim that both $z(e_f = 0)$ and $u_f(e_f = 0)$ depend on the household's total wealth $w_m E_m + R_f + R_m$ and are independent of the autonomy a_f . To prove the claim, we first show the equilibrium is unique for any given autonomy. Suppose the contrary that both (y_f, y_m) and (y'_f, y'_m) satisfy the FOCs in (21). Let $z = y_f + y_m$ and $z' = y'_f + y'_m$, and consider three separate possibilities. First, if $z = z'$, then players must consume differently in the two equilibria; say $x_f < x'_f$. By concavity and supermodularity, respectively,

$$\frac{\partial u_f}{\partial x_f}(y_f, y_m) > \frac{\partial u_f}{\partial x_f}(y'_f, y'_m), \text{ while } \frac{\partial u_f}{\partial z}(y_f, y_m) \leq \frac{\partial u_f}{\partial z}(y'_f, y'_m).$$

Therefore, the FOCs cannot hold for both (y_f, y_m) and (y'_f, y'_m) . Second, if $z < z'$, then some player must consume less in the (y'_f, y'_m) outcome; say $x_f > x'_f$. Again, by concavity and supermodularity, we have a contradiction:

$$\frac{\partial u_f}{\partial x_f}(y_f, y_m) < \frac{\partial u_f}{\partial x_f}(y'_f, y'_m), \text{ while } \frac{\partial u_f}{\partial z}(y_f, y_m) > \frac{\partial u_f}{\partial z}(y'_f, y'_m).$$

The third case with $z > z'$ is analogous to the second case. Then, we prove the claim that given $e_f = 0$, the equilibrium outcome (y_f, y_m) is independent of a_f . This is because if (y_f, y_m) is an equilibrium outcome for some a_f , they satisfy the FOCs for any a_f , and by uniqueness, it is the only equilibrium outcome. Thus, both $z(e_f = 0)$ and $u_f(e_f = 0)$ depend only on the household's total wealth $w_m E_m + R_f + R_m$.

Alternatively, the wife may deviate and go out to work,

$$u_f(e_f = E_f) = \max_{y_f} u_f \left(\frac{1}{p_f} (a_f (w_f E_f + R_f) - y_f), y_f + y_m, 1 - E_f \right),$$

in which both $a_f R_f - y_f$ and $y_f + y_m$ must be functions of the household's total wealth. To make sure no deviation is profitable, we need $u_f(e_f = 0) \geq u_f(e_f = E_f)$. When $R_f + R_m$ is constant, there exists a threshold t_1^a , such that $e_f = 0$ is an equilibrium if and only if $a_f \leq t_1^a$.

Second, check if $e_f = E_f$ is an equilibrium. Using the same argument, in the equilibrium, both $z(e_f = E_f)$ and $u_f(e_f = E_f)$ depend only on the household's total wealth $w_f E_f + w_m E_m + R_f + R_m$.

Alternatively, the wife may deviate and not go to work,

$$u_f(e_f = 0) = \max_{y_f} u_f \left(\frac{1}{p_f} (a_f(w_f E_f + R_f) - a_f w_f E_f - y_f), y_f + y_m, 1 \right),$$

in which both $a_f(w_f E_f + R_f) - y_f$ and $y_f + y_m$ must be functions of the household's total wealth. To make sure no deviation is profitable, we need $u_f(e_f = E_f) \geq u_f(e_f = 0)$. When $R_f + R_m$ is constant, there exists a threshold t_2^a , such that $e_f = E_f$ is an equilibrium if and only if $a_f \geq t_2^a$.

Lastly, since in the equilibrium, both z and x_m are functions of the household's total wealth, they both increase when the wife goes out to work. ■

While we believe that the autonomy effect in the setting with $R_f + R_m$ held constant is more relevant for describing aggregate effects across India, because the HSA also affects husbands' unearned income, the income effect could be an important component. Since the income effect is well known in the literature, we believe that the interaction of the two effects, as shown in Proposition 2.4, is also robust. However, the interaction adds more complexity and requires more restrictions on the utility functions to obtain a clear prediction, so we leave it for further study.

B.3 Extension: Continuous effort

Here, we assume that instead of making a binary choice, $e_f \in \{0, E_f\}$, the wife can choose the number of hours to work – the continuous effort $e_f \geq 0$ – and the same applies for the husband. We examine both types of unearned income changes below: one with constant $R_f + R_m$ and the other one with constant R_m .

Proposition B.3. *Suppose the Nash equilibrium is interior. In equilibrium, keeping the total unearned income constant, an increase in the wife's unearned income will:*

- *Increase the amount of time she works outside the home (e_f).*
- *Increase the supply of the household public good (z).*
- *Reduce the amount of time the husband works outside the home (e_m).*

Proof of Proposition B.3: We calculate the FOC on (e_f, y_f, e_m, y_m) as follows:

$$\begin{aligned} [e_f] : & \frac{\beta_f w_f a_f}{a_f(w_f e_f + R_f) - y_f} - \frac{\delta_f}{1 - e_f} \leq 0, \\ [y_f] : & \frac{-\beta_f}{a_f(w_f e_f + R_f) - y_f} + \frac{\gamma_f}{y_m + y_f} \leq 0, \\ [e_m] : & \frac{w_m \beta_m}{w_m e_m + R_m + (1 - a_f)(w_f e_f + R_f) - y_m} - \frac{\delta_m}{1 - e_m} \leq 0, \\ [y_m] : & \frac{-\beta_m}{w_m e_m + R_m + (1 - a_f)(w_f e_f + R_f) - y_m} + \frac{\gamma_m}{y_m + y_f} \leq 0. \end{aligned}$$

Supposing the Nash equilibrium is fully interior, we have four equations. Since $z = y_f + y_m$, we have $e_m = 1 - \frac{\delta_m z}{\gamma_m w_m}$ and $e_f = 1 - \frac{\delta_f z}{\gamma_f w_f \alpha_f R_f / (R_f + R_m)}$. Thus,

$$z = \frac{\gamma_f \gamma_m (w_m + R_m + w_f + R_f)}{\gamma_f + \gamma_m \left(\beta_f + \delta_f \frac{1}{\alpha_f R_f / (R_f + R_m)} \right)}.$$

As $R_f + R_m$ is constant and R_f increases, z increases.

$$e_m = 1 - \frac{\delta_m z}{\gamma_m w_m} = 1 - \left(1 + \frac{w_f + R_f + R_m}{w_m} \right) \frac{\delta_m \gamma_f}{\gamma_f + \gamma_m \beta_f + \delta_f \gamma_m / a_f}.$$

As $R_f + R_m$ is constant and R_f increases, z increases, and thus, e_m decreases.

$$\begin{aligned} e_f &= 1 - \frac{\delta_f}{\gamma_f w_f \alpha_f R_f / (R_f + R_m)} z \\ &= 1 - \frac{\delta_f \gamma_m (w_m + R_m + w_f + R_f)(R_m + R_f)}{w_f ((\gamma_f \alpha_f + \gamma_m \beta_f \alpha_f) R_f + \gamma_m \delta_f (R_f + R_m))}. \end{aligned}$$

As $R_f + R_m$ is constant and R_f increases, e_f increases. ■

Proposition B.4. Suppose the Nash equilibrium is interior. In equilibrium, there exist two thresholds: $\alpha^*(w_f)$ is strictly decreasing in w_f and $R_f^*(w_f)$ is strictly increasing in w_f .⁴⁵ Keeping the husband's unearned income constant, an increase in the wife's unearned income will:

- Increase the amount of time she works outside the home (e_f), if $\alpha_f > \alpha^*(w_f)$ and $R_f < R_f^*(w_f)$.

⁴⁵In fact, both α^* and R_f^* depend on all exogenous parameters, including w_m , w_f , R_m and so on. We highlight their relationships with w_f to identify the heterogenous labor supply changes for different jobs.

- Otherwise, decrease the amount of time she works outside the home (e_f).
- Increase the household public good (z) and decrease the amount of time the husband works outside the home (e_m).

Proof of Proposition B.4: The equilibrium is calculated in the proof of Proposition B.3.

$$z = \frac{\gamma_f \gamma_m (w_m + R_m + w_f + R_f)}{\gamma_f + \gamma_m \left(\beta_f + \delta_f \frac{1}{\alpha_f R_f / (R_f + R_m)} \right)}.$$

As R_f increases, $R_f / (R_f + R_m)$ increases, and thus, z increases.

$$e_m = 1 - \frac{\delta_m z}{\gamma_m w_m}.$$

As R_f increases, z increases, and thus, e_m decreases.

$$\begin{aligned} e_f &= 1 - \frac{\delta_f}{\gamma_f w_f \alpha_f R_f / (R_f + R_m)} z \\ &= 1 - \frac{\delta_f \gamma_m (w_m + R_m + w_f + R_f) (R_m + R_f)}{w_f ((\gamma_f \alpha_f + \gamma_m \beta_f \alpha_f + \gamma_m \delta_f) R_f + \gamma_m \delta_f R_m)}. \end{aligned}$$

Take FOC, $\partial(1 - e_f) / \partial R_f$, the FOC has the same sign as

$$(\gamma_f \alpha_f + \gamma_m \beta_f \alpha_f + \gamma_m \delta_f) R_f^2 + 2\gamma_m \delta_f R_m R_f + (\delta_f \gamma_m R_m - \alpha_f (\gamma_f + \beta_f \gamma_m) (w_m + w_f + R_m)) R_m.$$

If $\alpha_f \leq \frac{\delta_f \gamma_m R_m}{(\gamma_f + \beta_f \gamma_m) (w_m + w_f + R_m)} = \alpha^*(w_f)$, the FOC is always positive. Therefore, an increase in R_f leads to a decrease in e_f .

Otherwise,

$$R_f^*(w_f) = \frac{\sqrt{(\gamma_m \delta_f R_m)^2 - (\gamma_f \alpha_f + \gamma_m \beta_f \alpha_f + \gamma_m \delta_f) (\delta_f \gamma_m R_m - \alpha_f (\gamma_f + \beta_f \gamma_m) (w_m + w_f + R_m))} R_m - \gamma_m \delta_f R_m}{\gamma_f \alpha_f + \gamma_m \beta_f \alpha_f + \gamma_m \delta_f}.$$

If $R_f < R_f^*(w_f)$, an increase in R_f leads to an increase in e_f ; if $R_f > R_f^*(w_f)$, an increase in R_f leads to a decrease in e_f . ■

B.4 Extension: Contributing time to the household public good

Consider an extension where the wife also contributes time to produce the household public good. Specifically, the household public good depends on the monetary contri-

bution from both spouses and the wife's time contribution. We follow [Anderson and Eswaran \(2009\)](#) and assume that time and money are perfect substitutes.

$$z = f(y_m, y_f, h_f) = y_m + y_f + bh_f,$$

where the wife spends a unit of time on working at home h_f , working outside e_f and her leisure l_f , such that $h_f + e_f + l_f = 1$.

Proposition B.5. *Suppose the Nash equilibrium is interior and the husband always works. In equilibrium, an increase in the wife's unearned income will:*

- *Weakly increase her labor supply (e_f).*
- *Weakly increase the household public good (z).*

These hold in both cases when $R_f + R_m$ is constant and when R_m is constant.

Proof of Proposition B.5: Consider the FOC on (y_m, y_f, h_f) :

$$\begin{aligned} [y_m] : & \frac{-\beta_f}{a_f(w_f e_f + R_f) - y_f} + \frac{1}{y_m + y_f + bh_f} = 0, \\ [y_f] : & \frac{-\beta_m}{w_m E_m + R_m + (1 - a_f)(w_f e_f + R_f) - y_m} + \frac{1}{y_m + y_f + bh_f} = 0, \\ [h_f] : & \frac{b}{y_m + y_f + bh_f} - \frac{\delta_f}{1 - h_f - e_f} = 0. \end{aligned}$$

The household public good is

$$z = \frac{w_m E_m + R_m + w_f e_f + R_f + b(1 - e_f)}{\beta_f + \beta_m + \delta_f + 1}.$$

Suppose that $e_f = 0$ is the equilibrium,

$$\begin{aligned} & u_f^0(e_f = 0) - u_f^0(e_f = E_f) \\ & = (\beta_f + \delta_f + 1) \left(\ln \frac{w_m E_m + R_m + R_f + b}{\beta_f + \beta_m + \delta_f + 1} - \ln \left(\frac{(a_f w_f - b) E_f}{\beta_f + \delta_f + 1} + \frac{w_m E_m + R_m + R_f + b}{\beta_f + \beta_m + \delta_f + 1} \right) \right). \end{aligned}$$

So we need $b \geq a_f w_f$.

Next, suppose that $e_f = E_f$ is the equilibrium,

$$u_f^E(e_f = E_f) - u_f^E(e_f = 0) = (\beta_f + \delta_f + 1) \left(\ln \frac{w_m E_m + w_f E_f + R_m + R_f + b(1 - E_f)}{\beta_f + \beta_m + \delta_f + 1} - \ln \left(\frac{(b - a_f w_f) E_f}{\beta_f + \delta_f + 1} + \frac{w_m E_m + w_f E_f + R_m + R_f + b(1 - E_f)}{\beta_f + \beta_m + \delta_f + 1} \right) \right).$$

So we need $b \leq a_f w_f$. ■

It is possible that the husband also contributes time to the household public good. Similarly to the above discussion of the wife's potential time input, this modification allows the husband to balance his time allocation. In a noncooperative model, it does not change the result on the wife's side that under the HSA, the wife works more.

B.5 Extension: Husband dislikes his wife working outside the home

In many traditional and conservative societies, the husband may consider his "pride" hurt if his wife goes out to work or may forbid her from working to keep her bargaining power low (Basu 2006; Field et al. 2016). For simplicity, we assume that the husband loses utility if his wife works outside the home:

$$u_m(x_m, z, l_m, e_f) = \beta_m \ln x_m + \gamma_m \ln z + \delta_m \ln l_m + \varphi_m \ln(1 - e_f).$$

Despite this modification of the main model, all results in Proposition 2.3 and Proposition 2.4 remain the same, except the change of the husband's utility. Since the wife does not take her husband's utility into account in the noncooperative model, she still increases her labor supply e_f even if it affects the husband's utility. The only difference is that it is now possible that the husband suffers from the wife's increased autonomy, especially if he dislikes his wife's working more than his gain from an increase in his private consumption and the household public good, i.e., φ_m is relatively higher than β_m and γ_m .

Furthermore, husbands may not only control their wives' income but also make the final decision about whether or not their wives can work outside the home. Consider the following sequential game:

1. First, the husband decides whether to allow his wife to work outside or not.
2. If the wife is allowed to work, the husband and wife choose their optimal strategies as in the main model. The wife's optimal labor supply is denoted as e_f^* . Otherwise, the wife can either not work or leave the husband. If the wife leaves her husband,

they obtain separate utilities, $u_m^d(R_m, w_m)$ and $u_f^d(R_f, w_f)$, based on their own unearned incomes and their potential wages.

We focus on the case where the husband prefers his wife not to work and extremely dislikes divorce. Consider the utility u_m from the equilibrium,

$$u_m(e_f = 0) \geq u_m(e_f = e_f^*) \geq u_m^d(R_m, w_m),$$

where the husband's utility is the highest if they stay married and the wife does not work outside the home; otherwise, staying married with the wife working outside the home is better than being separated.

Since it takes quite a few steps to solve this sequential game, we focus on explaining the intuition behind the possibility that an increase in R_f can increase the wife's labor supply. In the beginning, R_f is low and, thus, the wife's outside option $u_f^d(R_f, w_f)$ is low. When $u_f^d(R_f, w_f) < u_f(e_f = 0)$, she does not prefer to be alone and the husband's optimal action is to forbid her from working. When R_f increases, $u_f^d(R_f, w_f)$ may increase at a higher speed than that of $u_f(e_f = 0)$ because the wife controls only a part of her income if she is in a household. When $u_f^d(R_f, w_f)$ exceeds $u_f(e_f = 0)$, the wife prefers to leave the husband. In order to keep the wife, the husband must allow her to work.

Both the main model and this alternative mechanism suggest that an increase in the wife's unearned income could increase her labor supply through the autonomy channel. The only difference is that in the main model with an increase in her autonomy, the wife has a higher control over her income, which gives her incentives to work more; in the alternative mechanism, autonomy increases the wife's outside option and the husband must allow her to work in order to keep her in the marriage.

B.6 Extension: Autonomy depends on potential wage

Consider another extension: the wife's potential wage also affects her autonomy:

$$a_f = \alpha_f \frac{R_f + \theta w_f}{R_f + R_m + \theta w_f + \theta w_m}.$$

The equation is based on the intuition that the wife's outside option depends on her unearned income and her potential wage, which would determine her income if she leaves the household. We assume that there is a discount $\theta < 1$ on her potential wage compared to unearned income since earning income costs effort.

Proposition B.6. *Making autonomy dependent on a woman's potential wage does not change the predictions in Proposition 2.3 and Proposition 2.4 (if w_f is lower than a threshold).*

Proof of Proposition B.6: In a non-cooperative model, we need

$$\ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \geq \ln \left(\frac{a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f),$$

to ensure that $e_f = 0$ is an equilibrium. Additionally, we need

$$\ln \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} + \frac{\delta_f}{\beta_f + 1} \ln(1 - E_f) \geq \ln \left(\frac{-a_f w_f E_f}{\beta_f + 1} + \frac{w_m e_m + w_f E_f + R_m + R_f}{\beta_f + \beta_m + 1} \right),$$

to ensure that $e_f = E_f$ is an equilibrium.

If $R_m + R_f$ is constant, the thresholds on autonomy remain the same. As w_f increases, the thresholds decrease and the autonomy increases, so the wife is more likely to start working outside the home.

If R_m is constant, as in the proof of Proposition 2.4, let $f(R_f)$ be

$$f(R_f) = \ln \left(\frac{w_f E_f}{\beta_f + 1} \frac{\alpha_f (R_f + \theta w_f)}{R_f + R_m + \theta w_f + \theta w_m} + \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1} \right) - \ln \frac{w_m e_m + R_m + R_f}{\beta_f + \beta_m + 1}.$$

$$f'(R_f) \stackrel{\text{sign}}{\equiv} (R_m + \theta w_m)(R_m + w_m E_m) - \theta w_f (R_m + \theta w_f + \theta w_m) - R_f^2.$$

When w_f is sufficiently small, we still have $f(0) < C$, $f(\infty) = 0$, and $f(R_f)$ first increasing and then decreasing. The same is also true for the function $g(R_f)$ defined in the proof of Proposition 2.4. ■

B.7 Extension: Corner solutions of y_m and y_f

Suppose that only one of the spouses contributes to the household public good. We focus on when the wife contributes; then, her utility is

$$\beta_f \ln ((a_f(w_f e_f + R_f) - y_f) / p_f) + \gamma_f \ln y_f + \delta_f \ln(1 - e_f).$$

When the husband contributes, the wife's utility is

$$\beta_f \ln (a_f(w_f e_f + R_f) / p_f) + \gamma_f \ln y_m + \delta_f \ln(1 - e_f),$$

In both cases, we can examine the wife and the husband separately.

Proposition B.7. *Suppose that only the wife contributes to the household public good and (A1) holds. An increase in R_f will*

- *Weakly decrease the wife's labor supply (e_f).*
- *Increase the household public good (z) unless the wife stops working.*

These results hold both when $R_f + R_m$ is constant and when R_m is constant.

Suppose that only the wife contributes; then, by the proof of Remark 2.1,

$$u_f(e_f = E_f) - u_f(e_f = 0) = (\beta_f + 1) \ln \left(\frac{w_f E_f}{R_f} + 1 \right) + \delta_f \ln(1 - E_f).$$

It decreases as R_f increases, which implies that $e_f = 0$ is more likely to be optimal when R_f increases. As the wife controls more income, she spends more on the public good.

While less likely to happen in the India context, we verify that the prediction on the female labor supply is similar when only the husband contributes to the public good,

$$u_f(e_f = 0) = \beta_f \ln(a_f R_f / p_f) + \gamma_f \ln y_m,$$

$$u_f(e_f = E_f) = \beta_f \ln(a_f(w_f E_f + R_f) / p_f) + \gamma_f \ln y_m + \delta_f \ln(1 - E_f),$$

$$u_f(e_f = E_f) - u_f(e_f = 0) = \beta_f \ln \left(\frac{w_f E_f}{R_f} + 1 \right) + \delta_f \ln(1 - E_f).$$

The difference in utilities is similar, and thus, the same argument that $e_f = 0$ is more likely applies.

We remark that it may be surprising that while the wife controls a higher fraction of her income, the autonomy effect does not appear in the wife-solo-contributing equilibria. The reason for this result is that when a_f increases, the wife both obtains a higher effective wage and controls a higher fraction of unearned income, that is, she obtains $a_f(w_f e_f + R_f)$. The higher effective wage makes her work more, and the higher unearned income makes her work less. With the log linear utility function, these two effects exactly cancel each other. In addition to the increase in a_f , there is an increase in R_f , which makes her work less.

While we show in appendix B.2 that our main results do not depend on the structure of the utility function, the structure indeed has an effect in the case of only one spouse contributing to the public good. In particular, we claim that the tradeoff between

the autonomy effect and the income effect depends on the concavity of the utility function. Intuitively, consider a general utility function that depends on the wife's budget, $u_f(a_f(w_f e_f + R_f))$. Let $\Delta = u_f(a_f(w_f E_f + R_f)) - u_f(a_f R_f)$ be the difference in utilities between whether she works or not. As R_f (and thus a_f) increases, the change in Δ faces two opposite forces: one is the income effect, that $a_f R_f$ is higher, so Δ decreases due to the concavity of $u_f(\cdot)$; the other is the autonomy effect, that $a_f w_f E_f$ is higher, so Δ increases. If the utility function is more concave than the log function (the derivative is $\partial \ln x / \partial x = 1/x$), then the income effect dominates, as in Proposition B.7. If the utility function is less concave, for instance, in the example below, then the autonomy effect could dominate the income effect.

Example B.8. Consider the wife's utility is in (22) and $p_f = 1$. Then, holding $R_m + R_f$ constant, an increase in R_f will weakly increase the wife's labor supply in wife-solo-contributing equilibria.

$$\sqrt{x_f/2} + \sqrt{z/2} + \sqrt{l_f}. \quad (22)$$

First, the wife chooses the optimal y_f to contribute, which is $y_f = a_f(w_f e_f + R_f)/2$. Thus, her utility with this optimal contribution is

$$\sqrt{a_f(w_f e_f + R_f)} + \sqrt{1 - e_f}.$$

Thus,

$$u_f(e_f = E_f) - u_f(e_f = 0) = \sqrt{a_f(w_f E_f + R_f)} - \sqrt{a_f R_f} + \sqrt{1 - E_f} - 1. \quad (23)$$

Recall that $a_f = R_f/(R_f + R_m)$; then, some simple calculation will reveal that (23) increases in R_f . It implies that $e_f = E_f$ is more likely to be optimal when R_f increases.

◇

B.8 Graphical illustrations

The following example visualizes the results in Proposition 2.3 and its claim.

Example B.9. An example illustrating the changes in female labor supply when the wife's unearned income increases, holding the total unearned income constant.⁴⁶

⁴⁶Parameters can be freely chosen as long as the Nash equilibrium is interior and (A1) holds. For example, in the figure, $\beta_f = 1/11$, $\gamma_f = 10/11$, $\delta_f = 1/2$, $\beta_m = 11/21$, $\gamma_m = 10/21$, δ_m ensures (A1), $w_m = 3$, $E_m = 1/3$, $E_f = 11/36$, $R_m + R_f = 6$, and $\alpha_f = 1$. Low wage is 3.44, medium wage is 4.58 and high wage is 6.87.

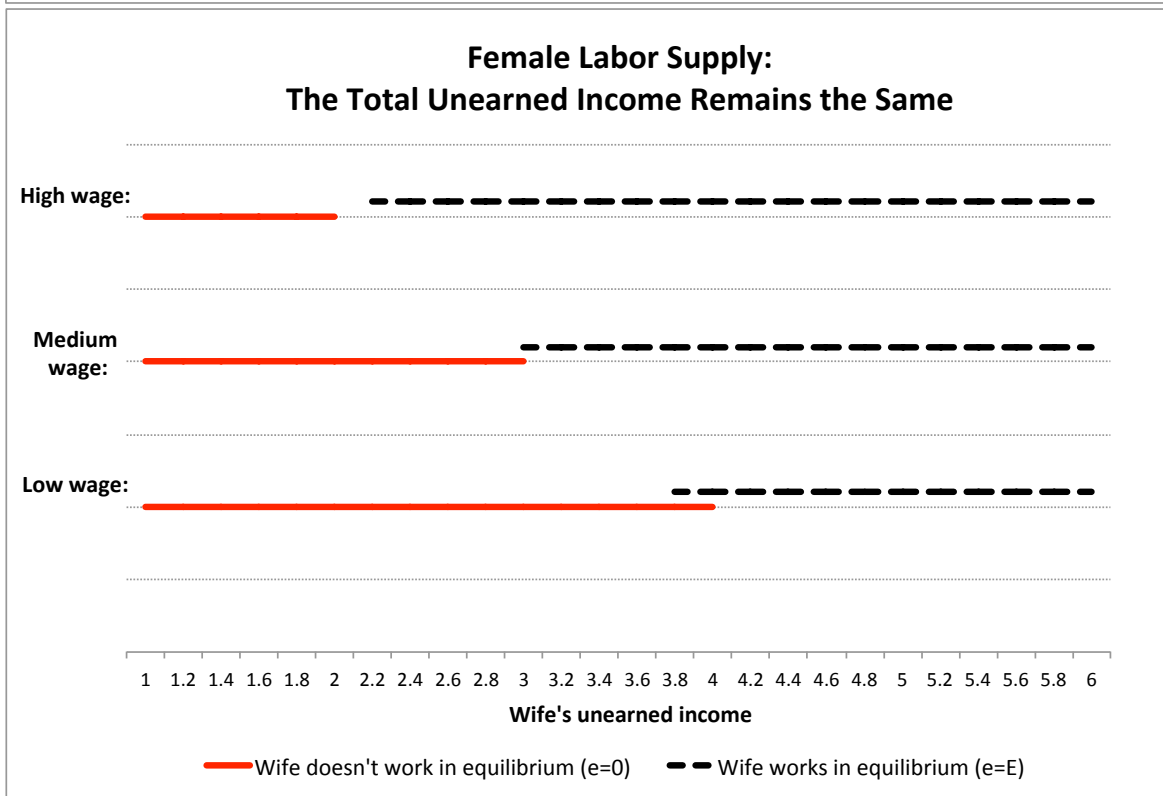
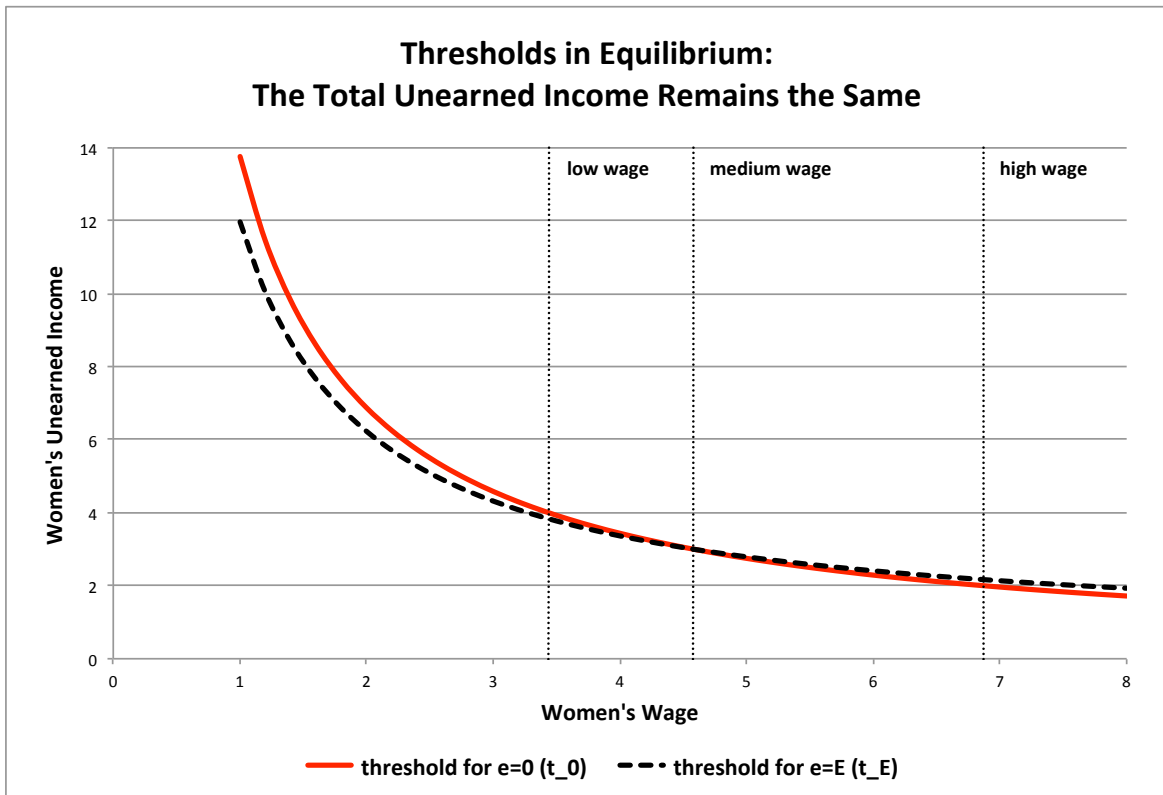


Figure A2: Changes in female labor supply and the thresholds when the wife's unearned income increases and the total unearned income is constant.

**Female Labor Supply Change (High Wage vs. Low Wage):
Total Unearned Income Remains the Same**

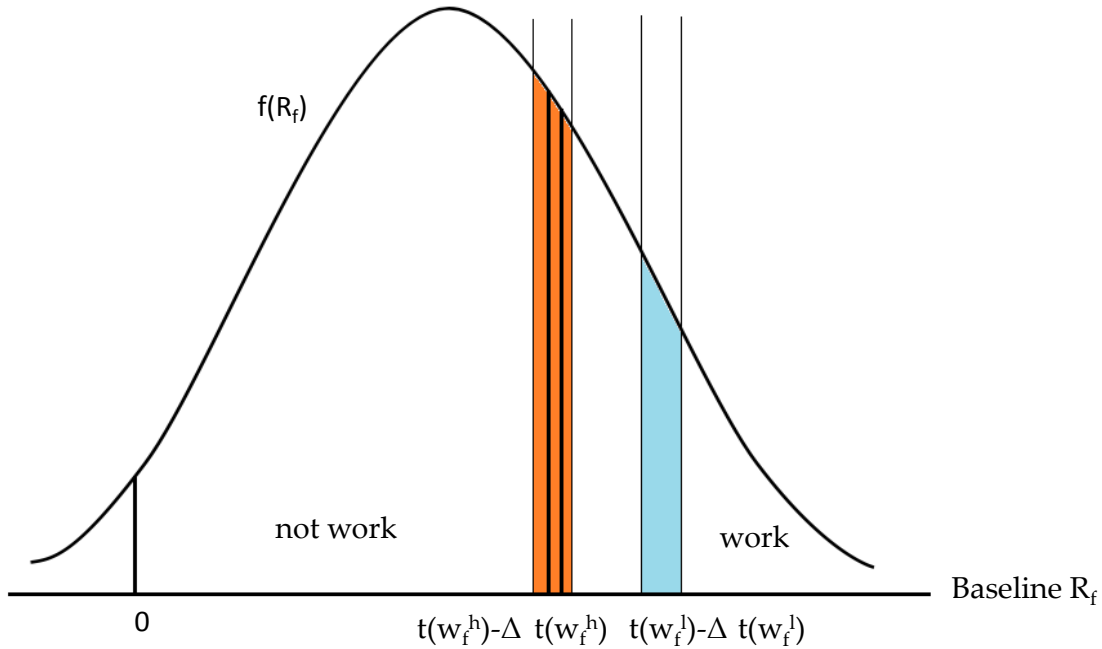


Figure A3: Aggregate female labor supply change in the population: comparing high-paying jobs versus low-paying jobs when the total unearned income remains the same. The left (orange) bar is the increase in the female labor supply for high-paying jobs, and the right (blue) bar is the increase for low-paying jobs.

Figure A2 shows the following patterns of the equilibrium. Recall that given the wage w_f , if the wife's unearned income is lower than some threshold $t_0(w_f)$, there is an equilibrium where she does not work, and if it is higher than some other threshold $t_E(w_f)$, there is an equilibrium where she works. The top panel of Figure A2 shows these two thresholds as a function of a woman's wage. The bottom panel illustrates how the equilibrium female labor supply varies with unearned income for three specific wage levels indicated in the top panel with vertical lines. In particular, for each wage level, the solid (red) line represents when not working is an equilibrium and the dashed (black) line represents when working is an equilibrium. The areas where both lines coexist represent the regions with multiple equilibria ($t_0 > t_E$ in the top panel) and the areas with neither line represent the regions with no equilibrium ($t_E > t_0$ in the top panel). Then, Figure A3 shows that if the wife's unearned income increases by Δ , the fraction of women who start to work outside the home is $F(t) - F(t - \Delta)$. Clearly, when the wage is higher, more women's labor supply increases (i.e., the orange/stripped area is larger than the blue area).

Then, we illustrate Proposition 2.4 and its claim with the following example:

Example B.10. *An example illustrating the changes in female labor supply when the wife's unearned income increases, holding the husband's unearned income constant.*⁴⁷

Figure A4 shows the following patterns of the equilibrium. If the wage is sufficiently low, the wife never works in equilibrium. Otherwise, her labor supply exhibits an inverse U shape: She does not work when her unearned income is low or high ($R_f < t_{0L}$ or $R_f > t_{0H}$), and she works when it is mid-level ($R_f \in (t_{EL}, t_{EH})$). As in Figure A5, the aggregate change in female labor supply is

$$(F(t_L) - F(t_L - \Delta)) - (F(t_H) - F(t_H - \Delta)),$$

where $F(t_L) - F(t_L - \Delta)$ is the fraction of women who begin working due to an increase in R_f , and $F(t_H) - F(t_H - \Delta)$ is the fraction of women who stop working due to the increase. Since $t_H \geq t_L \geq \mu + \Delta$, $F(t_L) - F(t_L - \Delta) \geq F(t_H) - F(t_H - \Delta)$, the aggregate change is non-negative. From Figure A4, t_L decreases with her wage and t_H increases with her wage. When her wage is higher, t_L is lower, implying that $F(t_L) - F(t_L - \Delta)$ is higher, and t_H is higher, implying that $F(t_H) - F(t_H - \Delta)$ is lower; thus, the overall increase is higher.

⁴⁷Same as Example B.9, except $R_m = 2$ replaces $R_f + R_m = 6$. Low wage is 2, medium wage is 3.27 and high wage is 3.6.

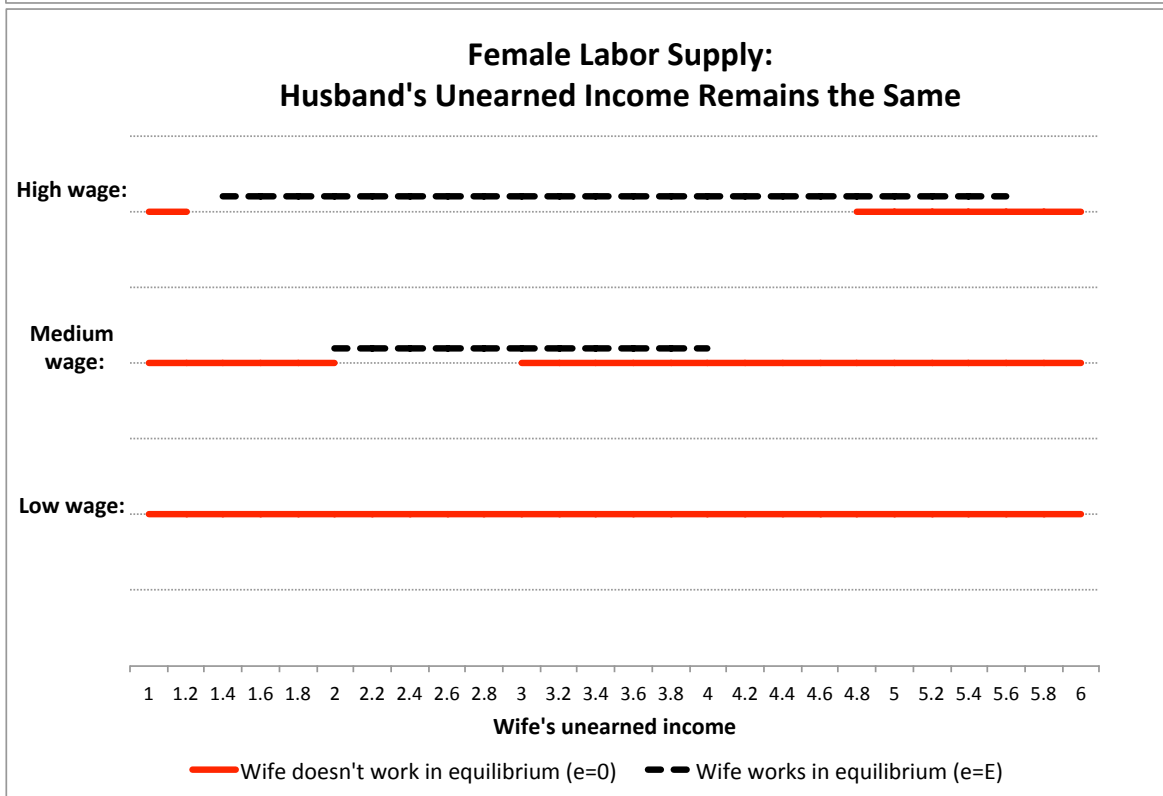
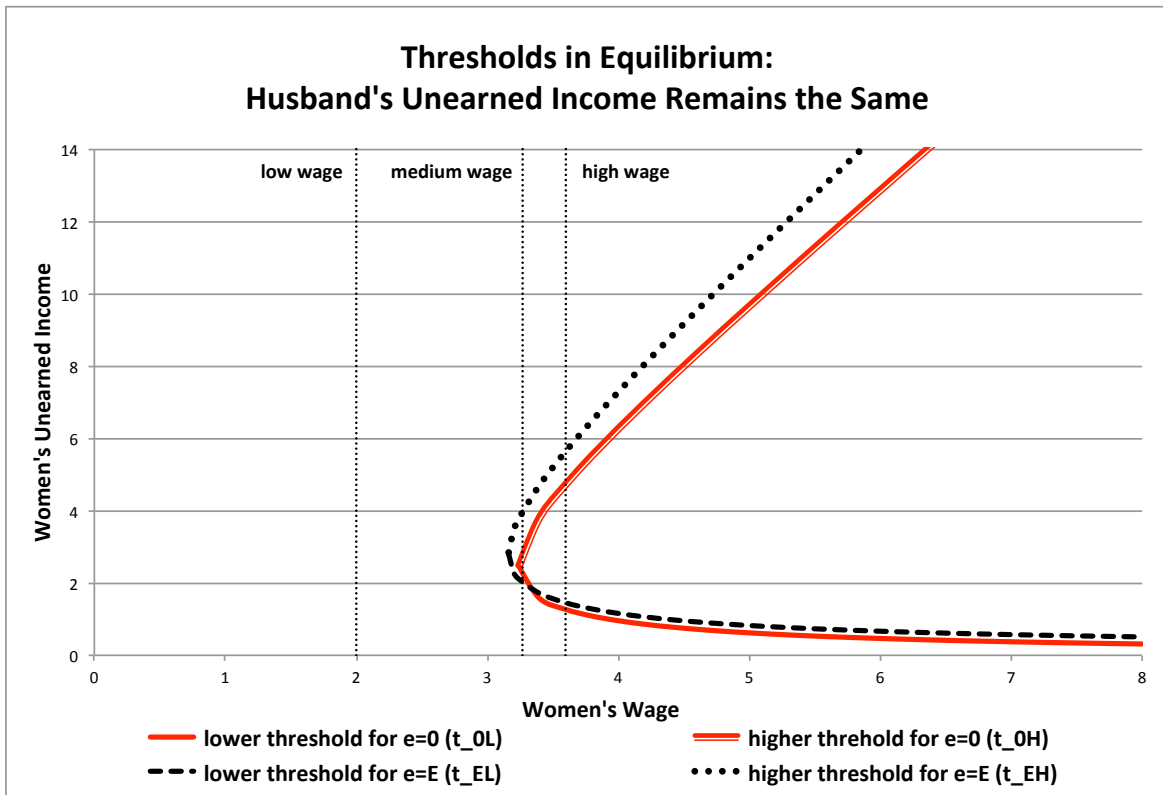


Figure A4: Changes in female labor supply and the thresholds when the wife's unearned income increases and the husband's unearned income remains the same.

**Female Labor Supply Change (High Wage vs. Low Wage):
Husband's Unearned Income Remains the Same**

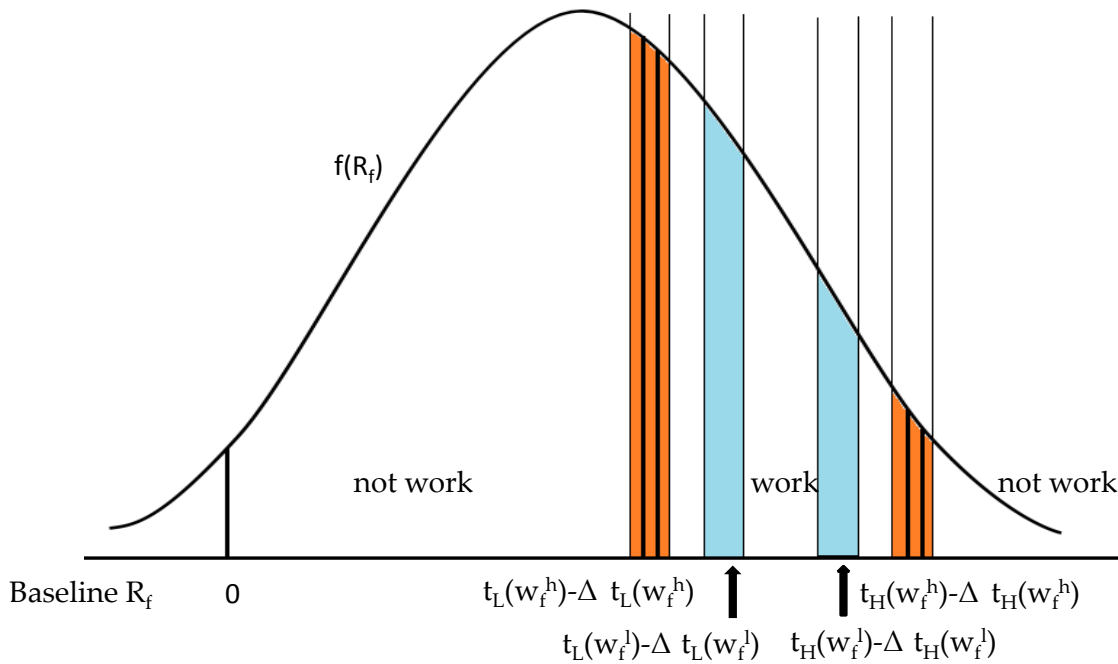


Figure A5: Aggregate female labor supply change in the population: comparing high-paying jobs versus low-paying jobs when the husband's unearned income remains the same. The left two bars are the fractions of women who begin working, with the left (orange) bar representing high-paying jobs and the middle (blue) bar representing low-paying jobs; the right two bars are the fractions of women who stop working, with the right (orange) bar for high-paying jobs and the middle (blue) bar for low-paying jobs.