Does Climate Change Hinder Women's Financial Inclusion? Evidence from Rural India

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Abstract

This paper studies whether climate change affects women's financial inclusion. Using geocoded microdata from the National Family Health Survey of India, I document that women living in rural areas affected by droughts are less likely to have their own bank accounts. This finding reflects both a direct income effect and an indirect health effect. Further investigation reveals the important roles of risk sharing between households, intrahousehold bargaining, and religion in mediating the hindering effect of droughts on women's access to finance. I conclude with evidence that women are more vulnerable than men to the impact of climate change.

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1. Introduction

Having a bank account is a first step toward broader financial inclusion. While great progress has been made over the past decade, nearly a quarter of the world's adult population, or 1.4 billion people, remain unbanked (Demirgüç-Kunt et al., 2021). They are predominantly from developing economies, mostly with low socioeconomic status, and commonly live in rural areas.

Moreover, the majority of the unbanked are women. The sizable gender gap in financial inclusion, if not addressed, is likely to exacerbate global gender inequality. This is because without access to finance, women are missing out on the benefits of financial inclusion, including poverty alleviation, increases in savings and investment, better job opportunities and wage growth, wealth accumulation, entrepreneurship entry, among others (e.g., Dupas and Robinson, 2013; Bruhn and Love, 2014; Célerier and Matray, 2019; Stein and Yannelis, 2020; Fonseca and Matray, 2024). Despite the importance of women's financial inclusion, it is far from fully understood why some women have access to finance while many others do not.

This paper is the first to investigate whether climate change affects financial inclusion, with a particular focus on women's access to finance. Climate change is one of the most pressing problems of our time, with disparate impacts across countries and people (Carleton et al., 2022). Estimates from 103 countries show that 1.2 billion people, especially those from developing economies, face life-changing risks through exposure to climate-related hazards (World Bank Group, 2024). To investigate the impact of climate change on women's financial inclusion, I draw on geocoded microdata from the two most recent rounds of the National Family Health Survey (NFHS) of India, the country with the largest unbanked population in the world, with a sample of 142,682 women aged 18 and above living in rural areas.

I focus on droughts, as they are one of the climate-related hazards with the most far-

reaching impacts (e.g., Wilhite and Pulwarty, 2017). In particular, India has long been prone to droughts and its vast rural population are highly vulnerable due to their heavy dependence on rain-fed agriculture. To characterize drought events, I use the Standardized Precipitation Evapotranspiration Index proposed by Vicente-Serrano, Beguería, and López-Moreno (2010). A key advantage of this index over other commonly used drought indices that are based solely on precipitation data is that it takes into account evaporation and transpiration of organisms as a function of temperature. Local drought is defined as dryness more than 1.5 standard deviations away from the long-term historical average observed in a given $0.5^\circ \times 0.5^\circ$ grid cell (approximately 2,500 square kilometers), where dryness is the difference between actual precipitation and potential evapotranspiration.

I document a strong hindering effect of droughts on women's financial inclusion. After absorbing all time-varying aggregate shocks at the monthly level and controlling for time-invariant heterogeneity across grid cells as well as age patterns in financial inclusion, women who experienced a drought event in the past year are less likely to have their own bank accounts than those who did not by 4.2 percentage points, or 6.5 percent relative to the sample average. The hindering effect of droughts on women's financial inclusion is comparable in economic magnitude to the effect of having 2.3 fewer years of education.

My baseline finding is robust to a series of sensitivity tests, such as excluding women interviewed after the nationwide lockdown in India due to the Covid-19 pandemic, using alternative definitions of drought, adopting various clustering approaches, limiting the sample to nonmigrants, and controlling for supply-side factors such as presence of local bank branches.

To investigate the potential mechanisms underlying the hindering effect of droughts on women's financial inclusion, I first evaluate a direct-income-effect hypothesis, which is motivated by the well-documented relationship between climate shocks and agricultural output (see Dell, Jones, and Olken, 2014, for a review). This hypothesis posits that women living in rural areas affected by droughts are less likely to have their own bank accounts

because droughts significantly reduce household income.

To test this hypothesis, I perform two analyses. First, I conduct a placebo test focusing on a sample of women living in urban areas, who do not rely heavily on rain-fed agriculture for their economic livelihood as those living in rural areas. I find no significant effect of droughts on women's financial inclusion in this urban sample. Moreover, in the rural sample, I find that women who experienced a drought event in the past year currently have a substantially lower standard of living than those who did not. No such pattern is observed in the urban sample.

Second, I examine the heterogeneity in the hindering effect of droughts on women's financial inclusion. In particular, I find that the hindering effect becomes more pronounced as the proportion of cropland in a given grid cell increases. This finding provides further support for the direct-income-effect hypothesis, which is based on the fact that droughts can have deleterious effects on rural households' income by suppressing agricultural output.

I proceed to explore an indirect-health-effect hypothesis, which is motivated by the the growing literature on health effects of droughts (e.g., Stanke et al., 2013; Dinkelman, 2017; Hyland and Russ, 2019). This hypothesis posits that women living in rural areas affected by droughts are less likely to have their own bank accounts because droughts significantly increase the risks of adverse health outcomes and hospitalizations.

I present a set of findings that, collectively, are consistent with the indirect-health-effect hypothesis. First, I find that the hindering effect of droughts on women's financial inclusion is attenuated among women who appropriately treat drinking water before consumption. This finding is consistent with droughts hindering women's financial inclusion through waterborne diseases such as cholera, diarrhoea, typhoid, and viral hepatitis, as droughts increase the risk of such diseases through their impact on water availability and quality (e.g., Funari, Manganelli, and Sinisi, 2012).

Second, I find that droughts greatly increase women's likelihood of having asthma.

This finding is consistent with droughts hindering women's financial inclusion through respiratory diseases, as droughts increase the concentration of dust and other particles in the air (e.g., Bell et al., 2018). On the contrary, I do not find an increased risk of women having a goiter, the enlargement of the thyroid gland, among those who experienced a drought event in the past year. This null result is reassuring because there is no obvious link between droughts and thyroid disorders.

Third, I find that the relationship between droughts and women's financial inclusion is weaker among those who are covered by health insurance. This finding is consistent with droughts hindering women's financial inclusion through increased risks of worsened health outcomes as well as out-of-pocket medical expenditures due to hospitalizations.

To further investigate the underlying mechanisms, I explore a number of mediating factors for the relationship between droughts and women's financial inclusion. First, I consider risk sharing between households, motivated by the key roles that family and kinship networks play in sharing risk, especially in developing countries (Fafchamps, 2011). Consistent with the importance of risk sharing between households for mediating the hindering effect of droughts on women's financial inclusion, the hindering effect is muted among women who have children living away from home, whose earnings can help offset drought-induced negative income shocks.

Second, I find that the hindering effect of droughts on women's financial inclusion is attenuated among those who participate in the labor market. I also find that the hindering effect increases as the husband has more say over intrahousehold decision-making. Both findings highlight the important role of intrahousehold bargaining in mediating the hindering effect of droughts on women's access to finance.

Third, I evaluate the role of religion, which pervades every aspect of life in India. In particular, I explore heterogeneity in gender norms across denominations, motivated by the survey evidence that Christians in India are less likely than Hindus and Muslims to

hold traditional gender role attitudes (Pew Research Center, 2022). Consistent with the survey evidence, the development economics literature has documented that Christians in India have lower gaps between genders in education and employment, and that Christian girls are significantly less likely to be stunted (e.g., Menon and McQueeney, 2020). I find in the NFHS sample that the hindering effect of droughts on women's financial inclusion is muted among Christian women, suggesting religion as an important mediating factor.

I conclude by investigating whether women are more vulnerable than men to the impact of climate change. While the NFHS does not contain individual-level data on bank account ownership of male household members, it does collect information on whether at least one member of the woman's household has a bank account. I show that the economic magnitude of the hindering effect of droughts on households' financial inclusion is less than half of that on women's financial inclusion. Furthermore, I find that controlling for the number of adults in the household, the hindering effect of droughts on financial inclusion at the household level becomes weaker as the within-household sex ratio—the ratio of the number of male adults to the number of female adults—increases. These findings suggest the gendered impact of climate change on financial inclusion.

This paper connects and contributes to several strands of the finance literature. First, I build on an emerging literature on financial inclusion, especially in developing countries (see Karlan and Morduch, 2010, for an earlier review). Much of the recent work in this literature focuses on the various beneficial effects of financial inclusion (e.g., Dupas and Robinson, 2013; Bruhn and Love, 2014; Célerier and Matray, 2019; Stein and Yannelis, 2020; Fonseca and Matray, 2024). Instead, I shed light on factors that underpin financial inclusion. The central contribution of this paper is that it is the first to propose climate change as an important determinant of financial inclusion, with a particular focus on women's access to finance.

Second, more broadly, this paper relates to the household finance literature (see Gomes,

Haliassos, and Ramadorai, 2021, for a recent review). The vast majority of research in this field has been on financial behavior of households in developed countries. By contrast, this paper studies households in the developing world. Moreover, my findings highlight the roles of climate change, risk sharing between households, and religion, all of which are arguably more relevant for household financial decision-making in developing countries than in developed ones.

Third, this paper also relates to the burgeoning climate finance literature (see Giglio, Kelly, and Stroebel, 2021, for a recent review). The focus of this literature has been on interactions between climate change and financial markets. There is much less work on direct links between climate change and household financial behavior, and such work predominantly uses the U.S. setting (e.g., Gallagher and Hartley, 2017; Bernstein et al., 2022; Billings, Gallagher, and Ricketts, 2022). My paper joins this nascent strand of the literature and documents the impact of climate change on financial inclusion in the developing world.

Lastly, this paper connects to the literature on women's financial behavior and outcomes. The pioneering work of Barber and Odean (2001) documents that female investors at a large U.S. discount brokerage firm trade stocks less frequently than male investors. More recently, Goldsmith-Pinkham and Shue (2023) find that women in the United States earn lower returns on housing relative to men. Ke (2018, 2021, 2024) shows that women's influence over intrahousehold financial decision-making is often constrained in the United States as well as in other developed economies. In a field experiment in Hong Kong, Bhattacharya et al. (2024) find that women tend to receive worse financial advice than men. Unlike the papers mentioned here, this paper offers evidence from the developing world and contributes to this literature by establishing the gendered impact of climate change on financial inclusion.

The rest of this paper is organized as follows. Section 2 describes the data and empirical approach. Section 3 presents the main findings. Section 4 concludes.

2. Data and Methodology

2.1 Data

I use microdata from the National Family Health Survey (NFHS) of India, a series of nationally representative, cross-sectional surveys with an emphasis on women and young children. The NFHS was initiated in the early 1990s and all five rounds were conducted under the stewardship of the Ministry of Health and Family Welfare, Government of India. For the purpose of my analysis, I use the fourth and fifth rounds of the NFHS—one conducted in 2015 through 2016 and the other in 2019 through 2021—because information on whether a woman has her own bank account and her detailed geographical location is available only in the two most recent rounds.[1]

The NFHS collects information on a standard set of demographic characteristics, including the age, years of schooling, marital status, and employment status of the woman, as well as number of children at home and household wealth. To measure women's financial inclusion, the dependent variable of interest, I use the following question: "Do you have a bank or savings account that you yourself use?" In addition, the NFHS gathers information on a wide array of characteristics at both the individual and household levels, including the religion, intrahousehold bargaining power, health outcomes, and health insurance coverage status of the woman, as well as number of children living away from home and whether the household appropriately treats drinking water before consumption, all of which play important roles in interpreting my findings.

The GPS data available in the fourth and fifth rounds of the NFHS consist of the geographic coordinates of each sampling cluster (a village or neighborhood), which is crucial for my analysis to identify women affected by local droughts. To construct a measure of drought events, I use the Standardized Precipitation Evapotranspiration Index (SPEI)

[1] My findings are robust to dropping observations during the Covid-19 pandemic, as is shown in Section 3.2.

proposed by Vicente-Serrano, Beguería, and López-Moreno (2010). This index measures standard deviations of dryness relative to the long-term historical average observed in a given locality, where dryness is defined as the difference between actual precipitation and potential evapotranspiration, or the potential evaporation and transpiration of organisms as a function of temperature. It is now widely accepted in the climatological literature that precipitation is not the only driving force behind drought events. An important advantage of the SPEI over other commonly used drought indices that are based solely on rainfall data is that it takes into account interactions between temperature and precipitation.

I obtain gridded SPEI data from the Global SPEI database, which provides information about drought conditions at the global scale with a $0.5^\circ \times 0.5^\circ$ spatial resolution from 1901 to 2023. Following Vicente-Serrano et al. (2010), I use the 12-month SPEI to identify droughts from water deficits in a rolling 12-month period, which allows for an accurate characterization of drought events and their temporal variability across localities in rural India. To measure a woman's exposure to a local drought event, I use the GPS information available in the NFHS to match the sampling cluster where she resides to the corresponding climate grid cell. My key explanatory variable is constructed as an indicator indicating whether the SPEI of the grid cell for the past year is below -1.5, including both severe and extreme drought events.[2] I evaluate the robustness of my findings to alternative cutoff levels in Section 3.2.

In addition, I use quarterly data on the number of bank branches at the district level from the publications of the Reserve Bank of India to evaluate if my findings are driven by presence of local bank branches, which is described in detail in Section 3.2.

My main sample consists of 142,682 women aged 18 and above and matches to 1,168 unique grid cells across rural India, each of which is approximately 2,500 square kilometers (i.e., 50 km $\times$ 50 km). Table 1 reports the summary statistics. Sixty-four percent

[2]The SPEI standardized scale defines moderate droughts as having a SPEI between -0.9 and -1.5, severe droughts as having a SPEI between -1.5 and -2, and extreme droughts as having a SPEI below -2.

of these women in rural areas have a bank or savings account that they themselves use. Eight percent of them experienced a drought event in the past year. The average age of the women is 32 and the average years of schooling is 6. Eighty percent of the women are married and they have fewer than two children living at home on average. Twenty-eight percent of the women participate in the labor market and the median woman lives in a poor household.

2.2 Methodology

To examine the effect of droughts on women's financial inclusion, I estimate the following empirical model:

$$y_{i,a,g,t} = \beta \cdot Drought_{g,t} + \theta_t + \gamma_g + \eta_a + \varepsilon_{i,a,g,t}. \tag{1}$$

The dependent variable, $y_{i,a,g,t}$, denotes whether woman i of age a living in grid cell g has a bank or savings account that she herself uses. The key explanatory variable, $Drought_{g,t}$, indicates whether she experienced a drought event in the past year, where drought is defined and measured in the previous subsection. I include year-month fixed effects, θ_t, to control for time-varying aggregate shocks at the monthly level. More importantly, I include grid cell fixed effects, γ_g, to absorb any time-invariant heterogeneity across grid cells over the sample period, including unobserved local geographical, economic, and cultural factors. In addition, I control for age patterns in financial inclusion by including age fixed effects, η_a. Following Dell, Jones, and Olken (2014), I do not further control for individual or household characteristics, which may well be outcomes of drought events, to avoid the so-called "over-controlling problem." The coefficient of interest, β, captures the relationship between droughts and women's financial inclusion, which is primarily identified from within-grid-cell variation in exogenous climate shocks. Given that the unit of geography for such shocks is the grid cell, I cluster standard errors at that level. In

Section 3.2, I show that my findings are robust to alternative clustering choices.

3. Results

3.1 Baseline

Before examining the regression results, I plot in Figure 1 the financial inclusion rates for women who did not experience a drought event in the past year and those who did, respectively. Among women living in rural areas not affected by droughts, 65 percent of them have a bank or savings account that they themselves use, whereas only 52 percent of those who experienced a drought event have their own bank accounts. In other words, in this univariate case, droughts hinder women's financial inclusion by over 20 percent of the sample average. Figure 1 thus provides initial support for a hindering effect of droughts on women's financial inclusion.

The sizable gap in financial inclusion between women who did not experience a drought event in the past year and those who did, as illustrated in Figure 1, could reflect many factors. For example, the financial inclusion gap may simply reflect the increasing efforts by the Indian government to foster financial inclusion over the sample period. For another example, the gap may as well reflect that women in better financial situations choose to live in areas that are less exposed to droughts.

I further examine the relationship between droughts and women's financial inclusion by estimating Equation 1, and Table 2 reports the regression results. The first column represents Figure 1 by running a univariate regression of women's financial inclusion on the drought indicator. In the next three columns, I sequentially add year-month, grid cell, and age fixed effects. After absorbing all time-varying aggregate shocks at the monthly level, I find in column (2) that the gap in financial inclusion between women who did not experience a drought event in the past year and those who did is 7.4 percentage points. Column (3) shows that after additionally controlling for time-invariant heterogeneity across grid

cells, the financial inclusion gap is 4.2 percentage points. This size of this gap remains the same after age fixed effects are included, as shown in the last column.

Given that 64 percent of the women in my sample have a bank or savings account that they themselves use, my baseline estimate with the full set of fixed effects suggests that droughts hinder women's access to finance by 6.5 percent. To put this hindering effect of droughts on women's financial inclusion into perspective, I compare it with the effect of educational attainment, one of the most important determinants of financial inclusion in developing economies (e.g., Dupas et al., 2018). Table IA1 in the Internet Appendix shows that an additional year of schooling is associated with a 1.9 percentage point increase in the probability of a woman having her own bank account. Hence, the hindering effect of droughts on women's financial inclusion is comparable in economic magnitude to the effect of having 2.3 fewer years of education.

3.2 Robustness

I conduct a set of tests in the Internet Appendix to assess the robustness of the hindering effect of droughts on women's financial inclusion. First, the fifth round of the NFHS was initiated in June 2019 and data collection was interrupted by the Covid-19 pandemic, with a portion of the data collected after the nationwide lockdown in India. While I control for all time-varying economy-wide shocks at the monthly level in my baseline regression specification, a potential concern is that the hindering effect of droughts could be driven by the Covid-19 pandemic differentially impacting financial inclusion of women living in different rural areas. To explicitly address this concern, I rerun the baseline regression with the full set of fixed effects using observations up to March 2020. Table IA2 shows that, if anything, the hindering effect of droughts on financial inclusion is slightly stronger in this subsample. This result suggests that the Covid-19 pandemic is unlikely to drive my findings.

Second, in my main analyses, I define drought as the SPEI below -1.5, that is, dryness

more than 1.5 standard deviations away from the long-term historical average observed in a given grid cell. The cutoff level of -1.5 is used because it is the threshold where droughts switch from moderate to severe according to the definitions by the SPEI standardized scale. Here I evaluate the robustness of my findings to alternative cutoff levels. Specifically, I rerun the baseline regression with the full set of fixed effects, varying the cutoff level of the drought definition. Table IA3 presents the regression results. If drought is alternatively defined as the SPEI below -1.3, -1.4, -1.6, and -1.7, droughts hinder women's financial inclusion by 2.9, 3.9, 4.2, and 3.5 percentage points, respectively. All these estimates remain both statically and economically significant.

Third, in my baseline specification, I correct for location-specific serial correlation by clustering standard errors at the level of $0.5^\circ \times 0.5^\circ$ grid cell, the unit of geography for climate shocks. Here I examine whether my findings are robust to alternative clustering approaches. In the first column of Table IA4, I cluster standard errors at the level of $1^\circ \times 1^\circ$ grid cell, allowing for a greater degree of spatial correlation. The estimated coefficient on the drought indicator is statistically significant at the 1 percent level. In the next column, I cluster standard errors at the level of $2^\circ \times 2^\circ$ grid cell, which spans approximately 50,000 square kilometers. Under this more conservative approach, the estimated coefficient remains statistically significant, with a p-value of 0.027. In column (3), I cluster standard errors at the year-month level to broadly allow for cross-sectional spatial correlation across grid cells. In the last column, I cluster standard errors at the $0.5^\circ \times 0.5^\circ$ grid cell and year-month levels, allowing for both serial correlation within grid cells and spatial correlation across grid cells. In both columns, the estimated coefficients on the drought indicator are statistically significant at the 1 percent level.

Fourth, given that I measure local droughts based on dryness of grid cells for the past year, an implicit assumption behind my analysis is that women in my sample have been living in their current places of residence for at least a year. A potential concern is that the estimated hindering effect of droughts could be biased because of women who have

recently migrated to their current places of residence. To evaluate this concern, I leverage the information collected by the NFHS on migration activity. I find that over 97 percent of the women in my sample having been living in their current places of residence for at least a year. In this subsample, the estimated hindering effect of droughts on women's financial inclusion is identical to my baseline estimate, as shown in the first column of Table IA5. The remaining two columns show that results are very similar if I limit the sample to women who have been living in their current places of residence for at least three or five years. The evidence in this table suggests that my findings are unlikely to be driven by either women's migration patterns or their sorting into locations based latent factors.

Finally, one might be concerned that my findings may be confounded by supply-side factors, and in particular presence of local bank branches, one of the key determinants of financial inclusion documented in the literature (e.g., Célerier and Matray, 2019). To explicitly address this concern, I draw on data from the Reserve Bank of India, which reports the number of bank branches at the district level in its quarterly publications of time-series statistics. I rerun the baseline regression with the full set of fixed effects and additionally control for presence of local bank branches, defined as the logarithm of the number of bank branches in the woman's district of residence. Table IA6 presents the regression results. The second column shows that as expected, presence of local bank branches is strongly associated with women's financial inclusion. In particular, a one standard deviation increase in the number of local bank branches is associated with a 1.4 percentage point, or 2.2 percent, increase in the probability of women having their own bank accounts. Importantly, the estimated hindering effect of droughts on women's financial inclusion is identical to my baseline estimate, which is re-presented in the first column. Therefore, my findings are unlikely to be driven by supply-side factors such as presence of local bank branches.

3.3 Direct Income Effect

So far, I have documented the hindering effect of droughts on women's financial inclusion. A natural question to ask is why droughts would hinder women's access to finance. To investigate this question, I first evaluate a direct-income-effect hypothesis. That is, women living in rural areas affected by droughts are less likely to have their own bank accounts because droughts significantly reduce household income. This hypothesis is motivated by the well-documented relationship between climate shocks and agricultural output (see Dell, Jones, and Olken, 2014, for a review). In particular, rural households in India rely heavily on rain-fed agriculture for income and survival. Therefore, by suppressing agricultural output, droughts can have deleterious effects on rural households' income.

To evaluate the direct-income-effect hypothesis, I first conduct a placebo test in which I examine the effect of droughts on financial inclusion of women living in urban areas. The rationale behind this analysis is the following: if the direct income effect is important in explaining the hindering effect of droughts on financial inclusion of women living in rural areas, the effect of droughts on financial inclusion of women living in urban areas is expected to be much more muted because urban households in India rely much less on rain-fed agriculture for their economic livelihood.

To construct an urban sample for the placebo analysis, I include women aged 18 and above living in urban areas interviewed in the fourth and fifth rounds of the NFHS. Table IA7 in the Internet Appendix reports the summary statistics for this sample. Compared with those living in rural areas, women living in urban areas are on average more educated, wealthier, and more likely to have their own bank accounts.

Table 3 presents the placebo test results. Consistent with expectations, the first column shows that the effect of droughts on financial inclusion of women living in urban areas is not statistically significant. This is in sharp contrast to the strong hindering effect

of droughts on financial inclusion of women living in rural areas, which is my baseline finding and is re-presented in the second column. Consistent with the insignificant effect of droughts on women's access to finance in the urban sample, household wealth does not statistically differ between women who experienced a drought event in the past year and those who did not, as shown in column (3). In the rural sample, on the contrary, women who experienced a drought event in the past year have a substantially lower standard of living than those who did not. Specifically, the last column shows that compared with those who did not experience a drought event in the past year, women who did are more likely to be in a lower wealth quintile by 11.9 percentage points, or about 5 percent relative to the sample average. The evidence in this table strongly supports the direct-income-effect hypothesis.

To further evaluate the direct-income-effect hypothesis, I explore the heterogeneity in the hindering effect of droughts on women's financial inclusion by the proportion of cropland in the local area. If droughts indeed hinder women's financial inclusion directly through their deleterious impact on household income from agricultural sources, the hindering effect of droughts on women's access to finance is expected to become stronger as the proportion of cropland in the local area increases. I therefore examine the interaction effect of droughts with the proportion of cropland on women's financial inclusion. Statistics on the proportion of cropland in a given grid cell are based on India's Agricultural Census and remotely sensed imagery circa 2000.

Table 4 reports the regression results. In the first column, I rerun the baseline regression with the full set of fixed effects. Because of missing data on the proportion of cropland in the local area, the sample size is reduced by less than 2 percent and the estimated hindering effect of droughts on women's inclusion is only slightly lower than the baseline estimate. Importantly, the second column shows that the hindering effect becomes more pronounced as the proportion of cropland in a given grid cell increases. That is, the coefficient estimate on the interaction term is negative and statistically significant. In par-

ticular, the point estimate implies that a one standard deviation increase in the proportion of cropland increases the hindering effect of droughts on women's financial inclusion by 1.8 percentage points, or 43 percent of the average hindering effect.

3.4 Indirect Health Effect

I proceed to assess an indirect-health-effect hypothesis. That is, women living in rural areas affected by droughts are less likely to have their own bank accounts because droughts significantly increase the risks of adverse health outcomes and hospitalizations. This hypothesis is motivated by the growing literature on health effects of droughts (e.g., Stanke et al., 2013; Dinkelman, 2017; Hyland and Russ, 2019). In particular, droughts increase the risk of waterborne diseases such as cholera, diarrhoea, typhoid, and viral hepatitis through their impact on water availability and quality (e.g., Funari, Manganelli, and Sinisi, 2012). In addition, droughts increase the concentration of dust and other particles in the air, which leads to an increased risk of respiratory diseases (e.g., Bell et al., 2018). Hence, droughts can have an indirect effect on women's financial inclusion through worsened health outcomes as well as out-of-pocket medical expenditures due to hospitalizations.

To test this hypothesis, I first examine whether droughts hinder women's financial inclusion through waterborne diseases. While the NFHS does not contain information on whether women suffer from such diseases, a testable implication of this channel is that the hindering effect of droughts on women's financial inclusion should be attenuated among women who appropriately treat drinking water before consumption. To test this implication, I leverage the information collected by the NFHS on appropriate water treatment before assumption, where the survey question asks whether the woman's household boils water, add bleach or chlorine, uses a water filter, or uses solar disinfection to make water safer to drink.

Table 5 reports the interaction effect of droughts with appropriate water treatment be-

fore consumption on women's financial inclusion, with wealth quintile fixed effects additionally included in the regression specification. The first column shows that appropriate water treatment is strongly associated with women's access to finance. In particular, women who appropriately treat drinking water before consumption are 3.6 percentage points, or 6 percent, more likely to have their own bank accounts. Importantly, the hindering effect of droughts on women's financial inclusion is attenuated among those who appropriately treat drinking water before consumption, as shown in the next column. That is, the coefficient estimate on the interaction term is positive and statistically significant. Specifically, the point estimate implies that appropriate water treatment before consumption reduces the hindering effect of droughts on women's financial inclusion by 3.6 percentage points, which is the same in magnitude as the average hindering effect.

Next, I explore whether droughts hinder women's financial inclusion through respiratory diseases. Column (1) of Table 6 shows that droughts increase women's likelihood of having asthma by 0.4 percentage points. Given that 1.5 percent of the women in my sample currently have asthma, this represents an increase of 14 percent, which is economically material. In the next column, I find that the effect of droughts on women's likelihood of having a goiter, the enlargement of the thyroid gland, is statistically indistinguishable from zero. This null result is reassuring because there is no obvious link between droughts and thyroid disorders.

Lastly, I test the indirect-health-effect hypothesis by examining the interaction effect of droughts with women's health insurance coverage on their financial inclusion. If droughts indeed hinder women's financial inclusion indirectly through increased risks of worsened health outcomes and hospitalizations, the hindering effect of droughts on women's access to finance is expected to be attenuated among those who are covered by health insurance.

Table 7 reports the regression results. Column (1) shows that women's health insurance coverage is strongly associated with their financial inclusion. In particular, women

who are covered by health insurance are 7.5 percentage points, or 12 percent, more likely to have their own bank accounts. Importantly, the hindering effect of droughts on women's financial inclusion is attenuated among those who are covered by health insurance, as shown in column (2). That is, the coefficient estimate on the interaction term is positive and statistically significant. Specifically, the point estimate implies that health insurance coverage reduces the hindering effect of droughts on women's financial inclusion by 4.8 percentage points, which is even larger than the average hindering effect. Collectively, evidence in Tables 5 through 7 is consistent with the indirect-health-effect hypothesis.

3.5 Mediating Factors

To further investigate the mechanisms underlying the hindering effect of droughts on women's financial inclusion, I explore a number of mediating factors for the relationship between droughts and women's access to finance.

3.5.1 Risk sharing between households. First, I examine the role of risk sharing between households in mediating the hindering effect of droughts on women's financial inclusion. This examination is motivated by the important roles that family and kinship networks play in sharing risk, especially in developing economies (Fafchamps, 2011). In particular, I leverage the information collected by the NFHS on number of children living away from home and hypothesize that having children away from home should attenuate the hindering effect of droughts, as their earnings can help offset drought-induced negative income shocks.

To test this hypothesis, I analyze the interaction effect of droughts with whether women have at least a child living away from home on their financial inclusion. Table 8 reports the regression results. Column (1) shows that having children living away from home is not associated with whether women have their own bank accounts. Importantly, column (2) shows that the hindering effect of droughts is muted among women who have chil-

dren living away from home. That is, the coefficient estimate on the interaction term is positive and statistically significant, with its magnitude even slightly larger than the coefficient estimate on the drought indicator. This evidence is consistent with my hypothesis that risk sharing between households plays an important role in mediating the hindering effect of droughts on women's financial inclusion.

3.5.2 Intrahousehold bargaining. Next, I explore the role of intrahousehold bargaining in mediating the hindering effect of droughts on women's access to finance. I hypothesize that the hindering effect of droughts should be attenuated among women who have more power in intrahousehold bargaining.

To test this hypothesis, I first investigate the role of female labor market participation, which is commonly used as a proxy for women's intrahousehold bargaining power in the family economics literature (Browning, Chiappori, and Weiss, 2014). Specifically, I examine the interaction effect of droughts with women's labor market participation on their financial inclusion.

Table 9 presents the regression results. The first columns shows that as expected, female labor market participation is strongly associated with women's access to finance. In particular, women who participate in the labor market are 6.9 percentage points, or about 11 percent, more likely to have their own bank accounts. Importantly, the hindering effect of droughts on women's financial inclusion is attenuated among those who participate in the labor market, as shown in the second column. That is, the coefficient estimate on the interaction term is positive and statistically significant. Specifically, the point estimate implies that female labor market participation reduces the hindering effect of droughts on women's financial inclusion by 3.9 percentage points, which is even larger than the average hindering effect.

To offer more direct evidence for the important role of intrahousehold bargaining, I take advantage of a set of survey questions from the NFHS about intrahousehold decision-

making. In particular, the questions ask (i) who usually makes decisions about making major household purchases; (ii) who usually makes decisions about visits to the woman's family or relatives; (iii) who decides how the woman's husband's earnings will be used; and (iv) who usually makes decisions about health care for the woman. To characterize the husband's say in intrahousehold decision-making, I calculate the average of four dummy variables indicating whether the husband usually makes the aforementioned decisions.

Table 10 reports the interaction effect of droughts with the husband's intrahousehold bargaining power on women's financial inclusion. As expected, the husband's bargaining power is strongly negatively correlated with bank account ownership of the wife. In particular, as shown in the first column, a one standard deviation increase in the husband's intrahousehold bargaining power is associated with a 4.5 percentage point, or 7 percent, decrease in the probability of the wife having her own bank account. Importantly, the second column shows that the hindering effect of droughts on women's financial inclusion becomes stronger as the husband's intrahousehold bargaining power increases. That is, the coefficient estimate on the interaction term is negative and statistically significant. Specifically, the point estimate implies that a one standard deviation increase in the husband's intrahousehold bargaining power increases the hindering effect of droughts on women's financial inclusion by 1.6 percentage points, or more than half of the average hindering effect.

3.5.3 Religion. Lastly, I investigate the role of religion in mediating the hindering effect of droughts on women's financial inclusion. Religion pervades every aspect of life in India, with Hindus and Muslims as the main religious communities and Christians as the second largest minority group. I explore heterogeneity in gender norms across denominations and hypothesize that the relationship between climate change and financial inclusion should be weaker among Christian women. This hypothesis is motivated by the

survey evidence that Christians in India are less likely than Hindus and Muslims to hold a variety of traditional views toward gender roles (Pew Research Center, 2022). The survey evidence is consistent with the finding in the development economics literature that Christians in India have lower gaps between genders in education and employment, and that Christian girls are significantly less likely to be stunted (e.g., Menon and McQueeney, 2020).

To test the above hypothesis, I limit the sample to Hindus, Muslims, and Christians and analyze the interaction effect of droughts with the Christian indicator on women's financial inclusion. Table 11 reports the regression results. Column (1) shows that being a Christian is not associated with whether women have their own bank accounts. Importantly, column (2) shows that the hindering effect of droughts is muted among Christian women. That is, the coefficient estimate on the interaction term is positive and statistically significant, with its magnitude comparable to the coefficient estimate on the drought indicator. This result highlights the important role of religion in mediating the hindering effect of droughts on women's financial inclusion.

3.6 Gendered Impact of Climate Change

In this last part of this paper, I investigate whether women are more vulnerable than men to the impact of climate change. Because of its focus on women and young children, the NFHS does not collect data on whether each male member of the woman's household has his own bank account. Nevertheless, it does contain information on bank account ownership at the household level, that is, whether at least one member of the woman's household has a bank account. To examine the effect of droughts on households' financial inclusion, I rerun the baseline regression with the full set of fixed effects, replacing the dependent variable with financial inclusion at the household level.

The second column of Table 12 presents the regression result. Households that experienced a drought event in the past year are 2.8 percentage points less likely to own a bank

account. Given that 94 percent of the households have access to finance, this implies a decrease of 3 percent relative to the sample average. Since droughts hinder women's financial inclusion by 6.5 percent relative to the sample mean, as is re-presented in the first column, the economic significance of the hindering effect of droughts on households' financial inclusion is less than half of that on women's financial inclusion.

To provide more direct evidence on the gendered impact of climate change, I explore the heterogeneity in the hindering effect of droughts on households' financial inclusion by the sex ratio of the woman's household, defined as the ratio of the number of male adults to the number of female adults in the household. If women are indeed more vulnerable than men to the impact of climate change, controlling for the number of adults in the household, the hindering effect of droughts on households' financial inclusion is expected to become weaker as the within-household sex ratio increases. I thus analyze the interaction effect of droughts with the within-household sex ratio on households' financial inclusion.

The last column of Table 12 reports the regression result. Not surprisingly, the number of adults in the household is strongly associated with financial inclusion at the household level. Importantly, the hindering effect of droughts on households' financial inclusion becomes weaker as the within-household sex ratio increases. That is, the coefficient estimate on the interaction term is positive and statistically significant. Specifically, the point estimate implies that a one standard deviation increase in the within-household sex ratio reduces the hindering effect of droughts on households' financial inclusion by 0.9 percentage points, or approximately one third of the average hindering effect.

4. Conclusion

In this paper, I offer evidence that climate change hinders women's financial inclusion. Analyzing geocoded microdata from the National Family Health Survey of India, I docu-

ment that women living in rural areas affected by droughts are 4.2 percentage points, or 6.5 percent, less likely to have their own bank accounts. I hypothesize that the hindering effect of droughts on women's financial inclusion operates through not only a direct income effect, as droughts can have deleterious effects on rural households' income by suppressing agricultural output, but also an indirect health effect, as droughts increase the risks of waterborne and respiratory diseases as well as hospitalizations. I find supporting evidence for both effects. Additional analyses highlight risk sharing between households, intrahousehold bargaining, and religion as important mediating factors for the relationship between droughts and women's financial inclusion. I conclude with evidence on the gendered impact of climate change on financial inclusion.

These findings open up several avenues for future research. First, further investigating whether and how climate shocks affect aspects of financial inclusion other than bank account ownership—such as access to business loans and insurance products—would be a promising avenue to advance our understanding of the relationship between climate change and financial inclusion. Second, while the focus of this paper is on India, which has the largest unbanked population in the world, studies of other parts of the world will provide a comparative perspective on whether and how climate change shapes financial inclusion and, more broadly, enhance our understanding of the cross-country differences in household financial behavior (Badarinza, Campbell, and Ramadorai, 2016). Finally, in recent years, digital technologies have revolutionized the way financial services are provided. Thoroughly examining factors underpinning financial inclusion in this climate and digital era can guide regulators and organizations around the world on financial inclusion interventions and initiatives.

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Table 1. Summary Statistics

This table presents summary statistics for women aged 18 and above living in rural areas interviewed in the fourth and fifth rounds of the National Family Health Survey of India. Financial inclusion indicates whether the woman has a bank or savings account that she herself uses. Drought indicates whether the woman experienced a drought event in the past year, where drought is defined as the 12-month Standardized Precipitation Evapotranspiration Index below -1.5. Age is age in years. Education is years of schooling. Married indicates whether the woman is married. Number of children is the total number of children living at home. Working indicates whether the woman is currently working. Wealth quintile is the relative wealth of the woman's household, divided into quintiles from one ("the poorest") to five ("the richest").

	N	Mean	SD	P25	P50	P75
Financial inclusion	142,682	0.64	0.48	0	1	1
Drought	142,682	0.08	0.28	0	0	0
Age	142,682	31.85	9.09	24	31	40
Education	142,682	6.09	5.19	0	7	10
Married	142,682	0.80	0.40	1	1	1
Number of children	142,682	1.67	1.41	0	2	3
Working	142,682	0.28	0.45	0	0	1
Wealth quintile	142,682	2.60	1.28	2	2	4

Table 2. Effect of Droughts on Women's Financial Inclusion

This table analyzes the effect of droughts on women's financial inclusion using OLS regressions. Variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion			
	(1)	(2)	(3)	(4)
Drought	-0.129^{***}	-0.074^{***}	-0.042^{***}	-0.042^{***}
	(0.022)	(0.015)	(0.011)	(0.011)
Year-month FE	No	Yes	Yes	Yes
Grid cell FE	No	No	Yes	Yes
Age FE	No	No	No	Yes
Observations	142,682	142,682	142,682	142,682
R^2	0.006	0.105	0.162	0.169

Table 3. Direct Income Effect: A Placebo Analysis

This table analyzes the effects of droughts on women's financial inclusion and household wealth for both the urban and rural samples using OLS regressions. The urban sample includes women aged 18 and above living in urban areas interviewed in the fourth and fifth rounds of the National Family Health Survey of India. Variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion		Wealth quintile	
	Urban	Rural	Urban	Rural
	(1)	(2)	(3)	(4)
Drought	−0.025	−0.042***	0.079	−0.119***
	(0.019)	(0.011)	(0.056)	(0.028)
Year-month FE	Yes	Yes	Yes	Yes
Grid cell FE	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes
Observations	56,277	142,682	56,277	142,682
R^2	0.124	0.169	0.240	0.342

Table 4. Direct Income Effect: Proportion of Cropland

This table analyzes the interaction effect of droughts with proportion of cropland on women's financial inclusion using OLS regressions. Proportion of cropland is the proportion of land in a given grid cell that is planted in crops. The statistics are based on India's Agricultural Census and remotely sensed imagery circa 2000. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.041***	0.005
	(0.011)	(0.022)
Drought × Proportion of cropland		−0.091**
		(0.043)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Observations	140,698	140,698
R^2	0.169	0.169

Table 5. Indirect Health Effect: Waterborne Diseases

This table analyzes the interaction effect of droughts with appropriate water treatment on women's financial inclusion using OLS regressions. Appropriate water treatment indicates whether the woman's household appropriately treats drinking water before consumption. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.036**	−0.046***
	(0.011)	(0.012)
Appropriate water treatment	0.036***	0.033***
	(0.004)	(0.004)
Drought × Appropriate water treatment		0.036**
		(0.015)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	142,682	142,682
R^2	0.182	0.182

Table 6. Indirect Health Effect: Respiratory Diseases

This table analyzes the effects of droughts on women's likelihood of (i) having asthma in the first column and (ii) having a goiter in the second column using OLS regressions. Asthma indicates whether the woman currently has asthma. Goiter indicates whether the woman currently has a goiter or other thyroid disorder. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Asthma	Goiter
	(1)	(2)
Drought	0.004**	0.001
	(0.002)	(0.002)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	142,682	142,682
R^2	0.021	0.030

Table 7. Indirect Health Effect: Health Insurance Coverage

This table analyzes the interaction effect of droughts with health insurance coverage on women's financial inclusion using OLS regressions. Health insurance coverage indicates whether the woman is covered by health insurance. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.041***	−0.052***
	(0.011)	(0.012)
Health insurance coverage	0.075***	0.071***
	(0.004)	(0.004)
Drought × Health insurance coverage		0.048***
		(0.016)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	142,682	142,682
R^2	0.185	0.185

Table 8. Role of Risk Sharing Between Households

This table explores the role of risk sharing between households in mediating the effect of droughts on women's financial inclusion using OLS regressions. Having children living away indicates whether the woman has at least a child who is living away from home. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.035***	−0.046***
	(0.011)	(0.012)
Having children living away	0.004	0.000
	(0.004)	(0.004)
Drought × Having children living away		0.049***
		(0.012)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	142,682	142,682
R^2	0.182	0.182

Table 9. Role of Female Labor Market Participation

This table explores the role of female labor market participation in mediating the effect of droughts on women's financial inclusion using OLS regressions. Variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.037***	−0.046***
	(0.011)	(0.012)
Working	0.069***	0.066***
	(0.003)	(0.003)
Drought × Working		0.039***
		(0.012)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	142,682	142,682
R^2	0.185	0.185

Table 10. Role of Intrahousehold Bargaining Power

This table explores the role of intrahousehold bargaining power in mediating the effect of droughts on women's financial inclusion using OLS regressions. Final say by husband is the average of four dummy variables indicating whether the husband usually makes decisions about (i) making major household purchases; (ii) visits to the woman's family or relatives; (iii) how the husband's earnings will be used; and (iv) the woman's health care. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.030**	−0.019
	(0.012)	(0.015)
Final say by husband	−0.133***	−0.129***
	(0.005)	(0.005)
Drought × Final say by husband		−0.047***
		(0.015)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	106,287	106,287
R^2	0.204	0.204

Table 11. Role of Religion

This table explores the role of religion in mediating the effect of droughts on women's financial inclusion using OLS regressions. The sample is limited to Hindus, Muslims, and Christians. Christian indicates whether the woman is a Christian. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.036***	−0.042***
	(0.011)	(0.012)
Christian	−0.008	−0.013
	(0.010)	(0.010)
Drought × Christian		0.042*
		(0.023)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Wealth quintile FE	Yes	Yes
Observations	135,073	135,073
R^2	0.183	0.183

Table 12. Gendered Impact of Climate Change on Financial Inclusion

This table documents the gendered impact of climate change on financial inclusion using OLS regressions. Financial inclusion at the household level indicates whether any member of the woman's household has a bank account. Number of adults is the number of adults in the woman's household. Sex ratio is the ratio of the number of male adults to the number of female adults in the woman's household. Other variables are defined in Table 1. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	Financial inclusion at the household level	
	(1)	(2)	(3)
Drought	−0.042***	−0.028***	−0.043***
	(0.011)	(0.010)	(0.013)
Number of adults			0.013***
			(0.001)
Sex ratio			−0.002
			(0.001)
Drought × Sex ratio			0.016**
			(0.007)
Year-month FE	Yes	Yes	Yes
Grid cell FE	Yes	Yes	Yes
Age FE	Yes	Yes	Yes
Observations	142,671	142,671	142,671
R^2	0.169	0.067	0.074

Figure 1. Droughts and Women's Financial Inclusion

This figure plots the financial inclusion rates for women who did not experience a drought event in the past year and those who did, respectively. Variables are defined in Table 1. Data are from the fourth and fifth rounds of the National Family Health Survey of India. The sample is limited to adult women in rural areas.

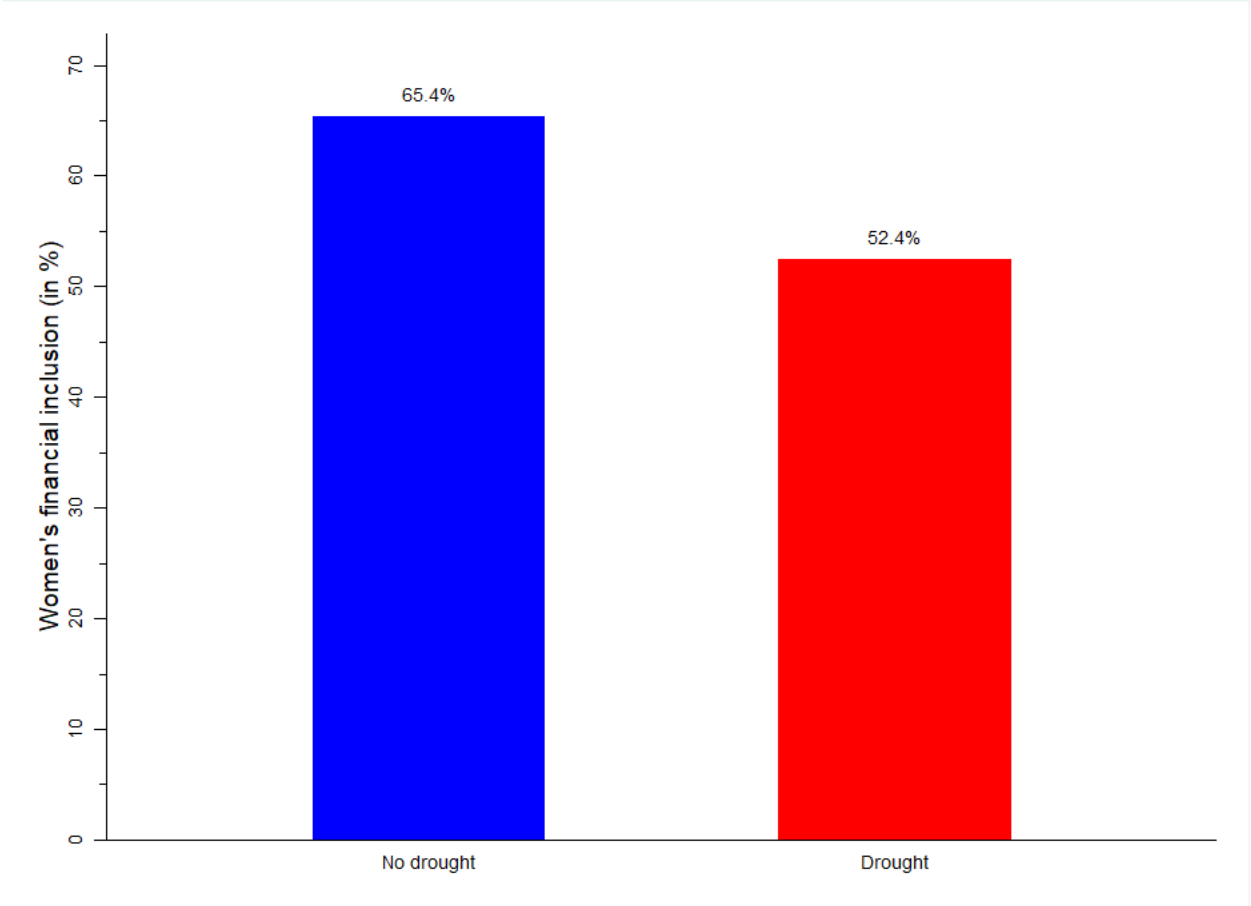


Table IA1. Droughts and Women's Financial Inclusion: Controlling for Education

This table reruns the baseline regression with the full set of fixed effects in Table 2 in the first column and additionally controls for years of schooling in the second column. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.042***	−0.042***
	(0.011)	(0.011)
Education		0.019***
		(0.000)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Observations	142,682	142,682
R^2	0.169	0.196

Table IA2. Robustness: Excluding the COVID Period

This table reruns the baseline regression with the full set of fixed effects in Table 2 using the full sample in the first column and observations up to March 2020 in the second column. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	Full sample	Excluding COVID period
	(1)	(2)
Drought	−0.042***	−0.048***
	(0.011)	(0.012)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Observations	142,682	120,370
R^2	0.169	0.166

Table IA3. Robustness: Alternative Definitions of Drought

This table uses alternative definitions of drought and reruns the baseline regression with the full set of fixed effects in Table 2. Drought is alternatively defined as the 12-month Standardized Precipitation Evapotranspiration Index (SPEI) below −1.3, −1.4, −1.6, or −1.7. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion			
	SPEI < -1.3	SPEI < -1.4	SPEI < -1.6	SPEI < -1.7
	(1)	(2)	(3)	(4)
Drought	−0.029***	−0.039***	−0.042***	−0.035***
	(0.011)	(0.011)	(0.013)	(0.013)
Year-month FE	Yes	Yes	Yes	Yes
Grid cell FE	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes
Observations	142,682	142,682	142,682	142,682
R^2	0.169	0.169	0.169	0.169

Table IA4. Robustness: Alternative Clustering Choices

This table reruns the baseline regression with the full set of fixed effects in Table 2 using alternative clustering choices. Levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion			
	(1)	(2)	(3)	(4)
Drought	−0.042***	−0.042**	−0.042***	−0.042***
	(0.015)	(0.019)	(0.012)	(0.014)
Year-month FE	Yes	Yes	Yes	Yes
Grid cell FE	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes
Clustering level	$1^\circ \times 1^\circ$ grid	$2^\circ \times 2^\circ$ grid	Year-month	Grid cell and year-month
Observations	142,682	142,682	142,682	142,682
R^2	0.169	0.169	0.169	0.169

Table IA5. Robustness: Evidence from Nonmigrants

This table limits the sample to women who have been living in their current places of residence for one to five years and reruns the baseline regression with the full set of fixed effects in Table 2. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion		
	$\geq$ 1 year	$\geq$ 3 years	$\geq$ 5 years
	(1)	(2)	(3)
Drought	−0.042***	−0.043***	−0.042***
	(0.012)	(0.012)	(0.012)
Year-month FE	Yes	Yes	Yes
Grid cell FE	Yes	Yes	Yes
Age FE	Yes	Yes	Yes
Observations	138,806	129,233	119,439
R^2	0.169	0.167	0.165

Table IA6. Robustness: Controlling for Presence of Local Bank Branches

This table reruns the baseline regression with the full set of fixed effects in Table 2 in the first column and additionally controls for presence of local bank branches in the second column. Local bank branches is the logarithm of the number of bank branches in the woman's district of residence. Bank branch statistics are from the quarterly publications of the Reserve Bank of India. Standard errors in parentheses are clustered at the grid cell level and levels of significance are denoted as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Financial inclusion	
	(1)	(2)
Drought	−0.042***	−0.042***
	(0.011)	(0.011)
Local bank branches		0.012***
		(0.005)
Year-month FE	Yes	Yes
Grid cell FE	Yes	Yes
Age FE	Yes	Yes
Observations	142,682	142,682
R^2	0.169	0.170

Table IA7. Summary Statistics for the Urban Sample

This table presents summary statistics for women aged 18 and above living in urban areas interviewed in the fourth and fifth rounds of the National Family Health Survey of India. Variables are defined in Table 1.

	N	Mean	SD	P25	P50	P75
Financial inclusion	56,279	0.71	0.45	0	1	1
Drought	56,279	0.06	0.23	0	0	0
Age	56,279	32.24	8.97	25	32	40
Years of education	56,279	8.99	5.28	5	10	13
Married	56,279	0.74	0.44	0	1	1
Number of children	56,279	1.46	1.30	0	1	2
Working	56,279	0.23	0.42	0	0	0
Wealth quintile	56,279	4.02	1.08	3	4	5