

# Women at Work

Evidence from a Randomized Experiment in Urban Djibouti

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## Abstract

In some developing countries, women's labor force participation remains persistently low. This gives rise to questions regarding what types of employment opportunities or interventions can draw women into work in such contexts. In this study in urban Djibouti, with restrictive gender norms and very low female employment rates, women were randomly offered the opportunity to be employed in a public works program designed specifically to facilitate their participation. Program take-up is very high, and

most participants do not delegate their work opportunity to another adult. However, in the medium term after the program ends, women who receive the temporary employment offer revert back to non participation in the labor market. These results suggest that while social norms can be a deterrent to women's work in settings with very low employment rates, women will participate in work opportunities when they are offered and suitable.

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# Women at Work: Evidence from a Randomized Experiment in Urban Djibouti

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## 1. Introduction

Women's labor market participation has remained stubbornly flat or is even declining in some parts of the world. In such countries, low female employment presents a persistent policy challenge. Although the prevalent U-shape hypothesis posits that women's work first declines and then increases with economic development (Goldin, 1995, among many others), this hypothesis has mixed empirical support (Gaddis & Klasen, 2014; Verme, 2015). In fact, substantial heterogeneity in women's work across countries suggests that economic growth is but one of many factors that explain female labor force participation. Other factors, such as initial economic structure and social norms also are posited to play a major role in explaining women's persistently low economic participation (Boserup, 1970; Heath & Jayachandran, 2017; Klasen, 2019). These issues influence women's willingness and ability to work outside the home, and they may limit women's pursuit of wage work and constrain their entrepreneurial choices (Jayachandran, 2021; Jayachandran, 2015; Field et al., 2021).

Many questions remain regarding what types of employment opportunities and interventions draw women into the labor force, especially in settings with persistently low levels of participation. Recent examples of such policies include wage subsidies for female graduates in Jordan, which led to short-term increases in employment that faded after the subsidy expired (Groh et al., 2016). Other interventions have addressed social norms by directly shifting men's attitudes about women working by providing them with information to correct their misperception of their peers' disapproval of female employment in Saudi Arabia (Bursztyn et al., 2020) and changing family attitudes about women working in India (Dean & Jayachandran, 2019; McKelway, 2023). Alternatively, in Tunisia efforts were successfully made to foster women's self-employment opportunities at home, since social norms limit women's physical mobility (Gazeaud et al., 2022).

In this study, we leveraged a unique intervention in urban Djibouti that randomized access to a short-term and targeted employment opportunity in the form of public works for women in an economically and socially constrained environment. This intervention was designed to address two research questions. First, we study the short-term effects of this job offer on unskilled women with limited labor market ties and foundational social constraints. Second, we ask whether this short-term employment opportunity induced them to stay in the labor force after the program ended. Public works participation may not only provide short-term income, but also serve as a gateway to future employment (Ho et al., 2024), so we also look at the intervention's contemporaneous effects and medium-term impacts to document whether it ultimately increases labor force participation.

Drawing on data on the labor supply of the female beneficiaries, their husbands, and other adult household members, we measure the labor supply response to the short-term public works offer. We also consider how the job offer and uptake affects women's decision-making power, time use, and intra-household resource allocation decisions, as well as their and their

husbands' well-being. We measure these effects both during implementation and nine months after the program ceased.

The Djiboutian public works program stands out due to its explicit gender focus: women, but particularly constrained pregnant women or mothers of young children, were the principal recipients. The program offered eligible women 50 consecutive days of work within the boundaries of their neighborhoods, thereby overcoming any geographic barriers that might limit their participation (Tucker, 2008). The works themselves entailed anything from cleaning services (e.g. garbage collection, particularly plastic bags), light labor-intensive community activities, to small artisanal projects. Participants were paid wages equivalent to 80 percent of Djibouti's official minimum wage. Women in eligible households who could not or did not wish to participate in the program could delegate their offer to any other adult member of their household, male or female. In specific cases, delegation to adults outside a woman's household was permitted.

Our analysis yields six main findings. First, the program has almost universal take-up: we estimate that 92% of the households that were offered the opportunity to participate in program accept it. Surprisingly, more than three-quarters of the women in participating households choose to work themselves, rather than delegating the offer to a household member or outside family member or friend. This result is notable, given that the target population has high care burdens (i.e., female participants with young or in utero children). In addition, almost all the women who do not accept the public works offer delegate the opportunity and the corresponding direct income payment to another adult. Interestingly, in a setting where marriage is almost universal, the women who delegate their offer do so to someone outside of their household, and not to their husbands or even to another household member.

Second, the near universal program take-up results in a 55-percentage-point increase in women's employment, after accounting for incomplete take-up, delegation, and limited crowding out of self-employment. There is no labor response from husbands (mainly limited to instances of delegation) or other household members. After the short-term employment opportunity ended, women either revert to remaining unemployed or to searching for employment.

Third, based on detailed time-use data, we document that beneficiary women accommodate the additional outside earning opportunity by assigning some of their household chores to other household members and entrusting the care of their children to other women, including female neighbors.

Fourth, we estimate the average participant's net income gains during the program and find that it was very close to the gross wage weekly transfer (with an estimated 16 percent of foregone income). These net income gains correspond to a 30 percent increase in household labor income. In line with the temporary nature of the program, women save most of their

income gains, consuming only a small share. Among participating households, we also find a 9 percent increase in per capita expenditure and a 12 percent increase in per capita food expenditure. The consumption gains are reflected in modest improvements in food diversity for young children at midline, suggesting that the program enables some mothers to act on the nutrition education that they receive during their local nutrition and health sessions.

Fifth, most of the women who accept the public works offer report maintaining control over their earnings. Only a small portion of women give their earnings to their husbands. Drawing on our unique and intensive intra-household transfers weekly survey data, we also show that the transfers that husbands make to their participating wives to manage household expenditures are substantial and remain unaffected.

Finally, we do not find that program participants sustain labor market attachment after the short-term income opportunity. Although the intervention substantially increases women's employment for its duration and, thereby, might act as an incentive to future employment, we find that the program has neither a positive effect on women's employment nor an impact on their willingness to search for a job or start a self-employment in the near future. However, we do observe a marginal improvement in women's decision-making power, which we proxied by women's self-reported perceived participation in household decisions, 9 months after the program ended.

Beyond the average effects, an important angle that we studied is whether specific subgroups benefit the most (or the least) from the intervention. To this end, we use machine learning methods to test for the extent of such heterogeneity. We find that women who were employed at baseline (and thus with a potentially higher opportunity cost for their time) are less likely to benefit from the program. The bulk of employment at baseline is accounted for by women engaged in self-employment activities who were marginally poorer than women with no employment, conditional on both having very low literacy rates.

Interestingly, the heterogeneity analysis also shows that women with more mobility constraints at baseline are least likely to take up the employment offer, although they still accept the public works offer, with one-third of the women being employed. This suggests that social norms are partially binding and that they mediate the labor supply response. We observe the drop-off in employment at endline across the board, with no detected heterogeneity after the program ended.

Our results speak to the broad literature on public works inspired by the seminal and pioneering work of Martin Ravallion (1990, 1991, and 1999) and the role of public works in poverty reduction and income stabilization. The direct effects on participating households hinge on determining a wage rate that screens for the beneficiaries who needed the program the most. Women, on average, generally have lower opportunity costs/potential foregone income and, thus, stand to gain relatively more. Other public works programs have documented larger income gains for women in Argentina (Jalan & Ravallion, 2003; Galasso

& Ravallion, 2004) and Côte d'Ivoire (Bertrand et al., 2021). Importantly, the wage rate did not operate as a self-targeting mechanism in our setting, possibly because of the generous wage rate coupled with the targeted population's limited potential foregone income (see also Goldberg, 2016). Contrary to other studies (Datt & Ravallion, 1994), we find neither labor supply reallocation within the household nor intrahousehold income transfers among beneficiaries in response to the public works program offer. The female labor response and the earning gains are additional, and, therefore, not compensated by other members' behavioral responses.

Our paper also contributes to the growing literature on policies that aim to overcome barriers to female labor force participation in low- and middle-income countries. The intervention we study explicitly targeted unskilled women in a setting with substantial gender norms. These women are willing and able to enter the labor market when offered. When they work, they also have control over their earnings. The impact of the intervention is, however, short-lived, and the intervention itself results in neither shifts in household decision making nor persistence in labor force attachment. In contrast, Afridi et al. (2016) find that working mothers played a greater role in decision making as a result of the NREGA public employment guarantee in India. Likewise, Field et al. (2021) show that enhancing Indian women's control over their income by teaching them how to open and manage bank accounts and make direct deposits increased not only female labor participation in public works, but also labor market engagement in private sector jobs. In their study, financial control over one's earnings along with the option value of working outside the home (within the context of a job guarantee program) helped shift the perceptions of communities with long-held views about female employment. Our results suggest that, while social norms about work and time use are relevant, the absence of "adequate" work plays a greater role in constraining women's work. Providing suitable employment options in local labor markets that are tailored to women's needs (e.g., part-time work, close proximity to home and family, etc.) may be important policy dimensions to consider when seeking to bolster female labor force participation in similar settings. Of course, these "needs" are themselves a product of norms, especially who is responsible for childcare and household chores.

The remainder of this paper is structured as follows: In Section 2, we present the context and intervention. Section 3 includes a description of our experimental design. Section 4 details our data collection and the empirical methods. Section 5 presents our main results. Section 6 analyzes the heterogeneity of the effects. Section 7 concludes the study.

## **2. Context and Intervention**

Djibouti is a small country in East Africa with limited economic diversification. In the last two decades, economic growth in Djibouti has been driven by direct foreign investment and public sector-led infrastructure investment, both of which have had limited trickle down effects on job creation and poverty reduction among large portions of the population. Based on the international poverty line for lower-middle-income economies with a daily wage of \$3.20 (in USD 2011 PPPs; World Bank, 2019), approximately one-third of Djibouti's population lives in poverty. The country also suffers from a high level of food insecurity (World Food Program, 2022) and very low human development outcomes compared to other lower middle-income countries. One-third of Djiboutian children are underweight or stunted, and maternal mortality and child mortality are higher than in neighboring and economically comparable countries (World Bank, 2018). Only 60 percent of the population aged 15 years and older is literate, and net enrollment in primary school is only 66 percent (from the 2019 World Development Indicators).

In Djibouti, both women and men have extremely low literacy levels, but the former are less literate than the latter (43 and 60 percent, respectively; World Bank, 2019). Although safety nets exist, their coverage is limited. According to the 2017 Djiboutian Household Survey (Enquête Djiboutienne Auprès des Ménages [EDAM]), only 11 percent of all adult women are employed. Women with some post-primary education are marginally more likely (13 percent) to be working than their peers with less schooling. Working women with more education are also much more likely to be employed within the public sector (73 percent with any post-primary education and 19 percent with only primary education). The same is also true for men. Overall, the public sector employs 78 percent of working adults with at least some senior secondary education (EDAM 2017, authors' calculation).

Within the poor and highly food insecure context described above, a drought that occurred in late 2011 and into 2012 resulted in significant loss of Djibouti's population's livelihood and food security. In response, the government shifted its focus toward developing an emergency response system to provide short-term income support to poor households facing unemployment shocks and high food insecurity, while simultaneously promoting short- and long-term human capital formation. Part of this effort entailed the public works program we study here, which was rolled-out in select poor neighborhoods of Djibouti City first and then successively expanded to other urban and rural areas. The primary target population for this program was all households with pregnant women and mothers of children aged 0-2 years.

In the first part of the program, eligible women from participating households joined community-based child and maternal nutrition sessions. Each session included a maximum of 20 women, was held within walking distance from the participants' homes, and was led



by a local trained volunteer.<sup>1</sup> The sessions educated women on optimal nutrition practices and prevented malnutrition through growth monitoring. Women started attending the monthly group sessions in September 2012.

The second part of the program entailed public works. All households participating in the nutrition sessions were eligible for public works and eligibility was not targeted based on income or assets. In the absence of a national poverty targeting mechanism and very limited social assistance programs, the government rolled out a public works program that, in theory, would reach the poorest households through self-targeting. In practice, however, self-targeting does not occur due to the wage rate, the low rate of the participants' other foregone income, and the work site's design features (discussed below).

The public works program included labor-intensive services (e.g., garbage collection, particularly plastic bags), light labor-intensive community works (e.g., street rehabilitation to improve traffic and expand access to surrounding areas), and small group-based artisanal projects. Communities were assigned to the type of project based on the preferences that their community leaders reported. The public works projects commenced, on average, within two weeks of the offer to households. This emergency support project also laid the foundations for developing a social registry system that could be used to identify the beneficiaries of future social assistance programs.

For equity reasons, public works programs often include gender quotas. For example, India's NREGA reserves one-third of the work opportunities for women and offers equal wages to both men and women (Afridi et al., 2016). Ghana's labor-intensive public works (LIPW) program requires at least half of the beneficiaries to be women (Dadzie & Ofei-Aboagye, 2021). In both programs, however, the share of participating women has exceeded these quotas. The program in Djibouti had an even more aggressive gender target: women in the first 1,000 days of pregnancy and motherhood. Employment offers in the public works program were eventually made to all women enrolled in the nutrition sessions. Participation, however, could not be offered to all women simultaneously due to capacity constraints for the rollout. Instead, female facilitators who ran the nutrition sessions invited women to participate in the public works program on a rolling basis across locations. By the end of the meetings that announced the program, each woman had to decide whether to accept the offer or delegate the opportunity to any other adult, male or female, who would then perform the work. Although the program was envisioned to be delegated to another household

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<sup>1</sup> At the beginning of each session, a community worker measured and weighed the participants and their children. Pregnant women and those with children aged 0-2 years were enrolled in separate groups. The community-based program followed a standard growth promotion package: sessions lasted about two hours and included nutrition education, growth promotion, cooking sessions, and the distribution of nutritional supplements. If a problem was detected during a session, then the community worker visited the family separately in order to provide more individualized counseling and/or a referral to the nearest health clinic.

member, in practice women sometimes designate non-household members to take their place.

The nutrition sessions and public works interventions were linked intentionally in order to protect human capital investments during the critical window of the first 1,000 days. The income opportunity was offered directly to women specifically with the expectation that the increased income would have a larger positive impact on both the women and their small children's nutritional outcomes. And it also hoped that exposure to paid employment in a setting with very low work rates for women would potentially catapult women into the workforce after the program ended. In this way, the program could act as a gateway to future work for women with very little—if any—work experience. For many female participants, the public works program was their first experience of paid employment.

Offering work opportunities to pregnant women and mothers of young children places on them the additional burden of trying to manage both their domestic and work duties simultaneously while breastfeeding and childrearing. In light of these concerns, the public works were implemented within the participants' neighborhoods to overcome any geographic barriers to participation and to address childcare concerns. The project also limited the workday to four hours per day and adapted the work schedule to account for the participants' household chores.<sup>2</sup> In addition, the public works were designed to minimize the women's risk of exposure to health hazards and avoid a crowding-out effect due to time spent on nurturing care and breastfeeding. To these ends, the implementing agency strictly enforced the use of protective gear as well as breastfeeding and water breaks during the public works activities. Moreover, women in their last trimester of pregnancy as well as women with children younger than 40 days were ineligible to participate in public works. However, they could delegate the offer to another household member.<sup>3</sup>

Unlike public works programs such as NREGA in India (Afridi et al., 2016), LIPW in Ghana (Dadzie & Ofei-Aboagye, 2021), and the PSNP in Ethiopia (Haddock et al., 2019), the public works program in Djibouti did not offer on-site childcare. Therefore, mothers were responsible for delegating childcare to someone else. A growing body of evidence from low- and middle-income countries has established that institutional childcare has positive effects on the extensive or intensive margin of employment for mothers (Halim et al., 2022). Ajayi et al. (2022) find improved financial outcomes for women when public works sites had

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<sup>2</sup> Maity (2020) notes that, on occasion, the starting time for NREGA work in India is deferred by an hour in the morning to enable women to perform household chores.

<sup>3</sup> In the first 40 days after giving birth, women were supposed to stay home and not permitted to participate in the public works program. In addition, women in the first trimester of pregnancy (in group 3) and lactating mothers in the first 6 months after giving birth (in group 4) were offered artisanal work that could be performed while sitting.

childcare, but these authors were unable to examine effects on uptake. Whether on-site childcare increases the chances of uptake of public works has not yet been studied.<sup>4</sup>

Participants in the public works component were paid by direct deposit into bank accounts that they opened in their names. In some contexts where women have low bargaining power, lack of control over their earnings is one potential reason why they have chosen not to enter the labor market (Field et al., 2021). Therefore, by having participants open bank accounts in their own name, the public works program aimed to ensure that the women were free to exercise control over their own earnings.

The public works program entailed 50 days of work for four hours per day over the course of 2.5 months. At midline, women report working 4.8 hours per day, on average, which includes breaks. The program participants earned a daily wage of 1,000 FDJ (Djiboutian francs), which corresponds to approximately 80 percent of the official minimum wage, or 5.6 USD, or 9.9 USD 2021 PPP. Compared to the EDAM 2017 data, this wage is below the 25<sup>th</sup> percentile of the hourly wage rate for all workers in Djibouti. As noted previously, the public sector employs primarily skilled laborers and constitutes a high share of all wage work in Djibouti. Compared to private sector wages specifically, the public works program pays closer to the 30<sup>th</sup> percentile of the wage distribution in 2017. For workers with a primary education at most, the program pays at the 25<sup>th</sup> percentile, and for women without any education, wages are closer to the 40<sup>th</sup> percentile in 2017.<sup>5</sup>

The potential income gains from the public works program are substantial in the context of low employment, even if the wage rate is not very high compared to those who were employed in the public or private sector at that time. Recall that only 10 percent of women in our study have any labor income at baseline. This income came mostly from self-employment. In this context, the potential income from public works is about 3 times higher than women's average weekly earnings from self-employment activities. On the other hand, women's potential earnings from public works participation are less significant when compared to their husbands' labor income: both the hourly wage and hours offered to such women are lower than what their working husbands receive. For husbands, the weekly wage offered by the public works program is just over half of their mean labor income. In this sense, prospective public works income has the potential to increase household income from any source by 50 percent.

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<sup>4</sup> The International Labour Office (2015) details a variety of ways in which public works programs can be adapted to address the constraints that women face.

<sup>5</sup> These computations are based on the EDAM 2017 and include reported earnings from self-employment and salary/wage jobs, with population weights applied.

### 3. Experimental Design

This study took place in Hayabley, a poor neighborhood of urban Djibouti City. Households were eligible to participate in the study if they had either a pregnant woman and/or a mother of children younger than 2 years old who was registered for and participating in nutrition sessions. Of the 1,055 eligible households, 1,011 (96 percent) were successfully interviewed and enrolled in the study at baseline.<sup>6</sup>

Our evaluation exploited the phased rollout of Djibouti's public works program. After participating in the baseline survey, each of the 1,011 eligible households were randomly assigned to one of 4 groups (A-D, as shown in Figure 1), and offered the opportunity to engage in public works every 6 months, starting in 2014 and ending in 2016. A total of 504 households constituted the first two randomly allocated groups, A and B, which were given priority in the opportunity to work. These two groups were designated as the treatment group. The remaining 507 households, groups C and D, constituted the control group and started the public works, on average, 15 months later than groups A and B (and nine months after the intervention for the treatment group ended). Stratification was conducted by the location of the public works (5 project sites);<sup>7</sup> by nutrition session type: one session for pregnant women, and another for women with child(ren) aged 0-2 years; by the session participant subsets: women in ongoing nutrition sessions and those whose sessions had ended, and by session groups. This stratification results in 65 strata.<sup>8</sup>

There are two potential threats to the validity of this study. First, the gradual rollout of the intervention might have generated anticipation effects insofar as women who were not offered to participate in the program in the first round knew that they would eventually receive the offer. By midline most women in the control households (93 percent) who had yet to be offered the opportunity to work already knew about the program. As a result, these women might have delayed involvement in self-employment activities while waiting for the public works offer. However, since the women's baseline level of economic engagement was very low, the margin for the aforementioned effect is likely small. Still, anticipation effects could have manifested in other ways; for example, some participants could have sought credit to engage in advanced spending with the expectation of receiving future public works income.

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<sup>6</sup> One-third of the 44 non-responses is due to the fact that no one from the household was present/available at time of the recruitment, while another one-third of the non-responses is due to refusal to be interviewed.

<sup>7</sup> For program implementation, Hayabley district was divided into five geographical areas, and women were required to participate in the nutrition sessions offered where they lived.

<sup>8</sup> Within our analysis we control for strata. Due to the high total sample and the large number of strata, 8 of the 65 strata cells have only one study participant after stratification. We dropped these observations from our analysis due to the lack of variation within the strata. We conduct robustness checks of main results using more aggregate strata variables (i.e., location, session type, and current status), which results in 20 strata categories instead of 65. Results are unchanged (Annex B Table 1).

The second potential threat to validity depends on the existence of general equilibrium effects on local labor markets.<sup>9</sup> Our data suggest that these effects are not likely at play. We do not observe any trend in the control group’s search for employment or employment activity across the different survey waves. The control group’s median income from self-employment is similar at midline and endline, thereby suggesting that no shifts occurred in economic behavior due to anticipation of the program. In addition, given that the casual labor markets in Djibouti are segmented by gender and virtually absent for women, general equilibrium effects on the local labor market are unlikely.

## 4. Empirical Approach

### 4.1. Data sources

A baseline household survey was administered to eligible households in the first quarter of 2014, immediately before the public works program rolled out for group A. Two more rounds of surveys were conducted at staggered times based on timing of the rollout of the public works (Figure A1). Midline surveys were administered over the course of three weeks while the public works were taking place. This survey included a weekly questionnaire on employment and intra-household transfers with a rotating set of modules on time use (week 1 and 3), expenditures (week 2), and food security (week 3). The endline surveys were conducted over three consecutive weeks nine months after the households completed the public works program. In terms of specific calendar dates, the timing of the midline and endline surveys varied by group. In addition, administrative data, including program data on payments and transactions obtained from the financial institution responsible for paying the program beneficiaries, was used to complement the survey data.

Each treatment group was interviewed with its corresponding randomized control group both at midline and at endline—that is, group A was interviewed with group C, and group B was interviewed with group D. The endline survey for a treatment group and its corresponding control group took place before the latter was offered the public works opportunity.

#### *Household Survey*

Extensive baseline and endline questionnaires were administered separately to current and prospective beneficiary women and their husbands. The survey for woman covered household socioeconomic characteristics, non-labor income, transfers, time use, durable assets, housing characteristics, household expenses, health and nutrition practices, food security, intra-household decision making, personality traits, and mental health and well-

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<sup>9</sup> For example, Imbert and Papp (2015) show that the rollout of NREGA in India results in increases in private sector wages. Franklin et al. (2023) find spatial spillover effects on private wages in urban areas in Ethiopia due to changes in the labor supply from commuters who live in the treated neighborhoods.

being. The questionnaire for the husbands covered the labor supply of household members, income from labor, time use, household expenses on items usually bought by male members (e.g., khat, cigarettes, transport, etc.), intra-household decision making, personality traits, and mental health and well-being.

Subsets of modules from the household survey were administered as part of the midline weekly surveys. These modules covered time use, expenditures, food diversity and security, school participation, program knowledge, and public works delegation. For women who delegated the public works opportunity to another household member, the interview collected self-reported information on the women and their delegees' mutually agreed upon income-sharing rule.

### *Weekly Surveys on Employment and Intra-household Transfers*

A key innovation in our data collection was to improve measurement of the working status of the target population in a setting with volatile and irregular rates of self-employment and casual labor. We based our survey instruments on the labor diaries developed by Dupas et al. (2020). The weekly surveys were administered to both the female beneficiary and her husband, if present (95 percent of beneficiaries were married), for three consecutive weeks both at midline and at endline. Enumerators visited each household once a week and asked whether the respondent had worked, the amount of time worked, and the type of work performed for each of the seven days prior to the interview. Work is defined as time on any income-generating activity. In one of the three weeks, the female beneficiary was also asked about the labor force participation and earnings of other adult household members (excluding husbands) in the seven days prior to the interview.<sup>10</sup>

In addition, the weekly survey included a special section on intra-household transfers. Specifically, the section documented whether any transfers had occurred between the woman and the rest of household members as well as the amounts of the transfers in either direction. The module was intended to measure potential intra-household reallocation of income in response to the intervention, i.e., whether the women engaging in public works handed over their income to their husbands.

## **4.2. Baseline balance and attrition**

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<sup>10</sup> It is important to keep this change in survey design in mind when looking at changes in the levels of employment and earnings from baseline to midline or endline, as this change would impact the four groups (A-D) equally. Indeed, we observe a much higher and similar rate of employment for women in control households at midline and endline, suggesting that the weekly surveys did capture volatile work better than the standard 7-day recall design.

The treatment and control groups are well balanced with respect to observable characteristics (Table 1). While there are small differences in demographics (the age of the household head, who is almost always the beneficiary's husband;<sup>11</sup> the beneficiary is female; and the number of children aged 6-15 years), work (the proportion of other adults, excluding the female beneficiary, who are inactive or are day laborers), and food expenditures, they are not jointly significant.<sup>12</sup> In our analysis we control for these unbalanced baseline characteristics. We also compare our main results to those without baseline controls and using a double lasso procedure to select a more parsimonious set of baseline controls (Annex B Table 2); neither alter the main findings.

Consistent with Djibouti's national statistics, a staggering 82 percent of women in our study have no formal education, matched by a share of 66 percent illiterate household heads who are mostly (90 percent) husbands. In contrast, 77 percent of children aged 6-15 years are formally enrolled in school. At baseline the proportion of women employed or looking for work is very low; only one in ten women worked for income in the 7 days prior to the interview. Half of these women are self-employed, meaning that they almost exclusively selling food, either as street vendors or at a fixed location (e.g., baked goods, khat, ice, produce). Almost no women are self-employed as hairdressers, tailors, construction workers, or transport drivers). Women who report working usually belong to poorer households, are older, and rely significantly more on money from family members to cover the cost of household needs compared to women who do not work. Despite having very little schooling and low socioeconomic status as well as residing under strict social norms, the vast majority of women reported at baseline that they have high aspirations for their daughters' education (completed secondary), marriage (after the age of 18), and employment (as teachers, in the public sector, or in a high-skill profession).

Among the other adults residing in the households (mostly husbands), 60 percent are working at any given point in time. Of those working, about 60 percent are casual day laborers and one-third are wage/salaried workers. Very few male adults are self-employed. Overall, participating households are poor, spend half of their income on food, and report high food insecurity.<sup>13</sup> Based on the asset index modeled on the national 2017 EDAM

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<sup>11</sup> Ninety percent of households identified the beneficiary's husband as the head. Among the remaining 10 percent, either the female beneficiary or her daughter is the head.

<sup>12</sup> The imbalance in food expenditure is due to a few observations at the right tail of the distribution (per capita food expenditure) for the control group. This imbalance disappears, however, when we work with natural logs. In our analysis, we introduced a dummy to indicate that the household belongs to the 25<sup>th</sup> percentile of the per capita food expenditure distribution in order to control for the nature of the imbalance at baseline.

<sup>13</sup> Forty percent of respondents reported some form of food insecurity across six domains, which are captured in baseline survey via the following six questions about food insecurity in the last 7 days: (1) Have you been worried about your household getting enough food? (2) Do you rely on consuming less popular and/or less expensive foods? (3) Do you need to limit portion sizes? (4) Do you reduce the number of meals your household consumes? (5) Do you limit adult consumption so that infants can eat? (6) Do you borrow food or rely on a

household data, 73 percent of these participating households in urban Djibouti fall within the bottom two quintiles of the asset index.

Based on our detailed time use data (not shown in Table 1), women devoted 50 percent of their time doing household chores and about 20 percent of their time caring for other household members in the 24-hour period prior to the baseline interview. Even with low levels of employment, they spend, on average, very little time in income-generating activities. Men, in contrast, spend half of their time in income-generating activities. Social activities within the neighborhood are important for both men and women, with men (women) spending 25 percent (16 percent) of their time (outside of personal care) socializing with neighbors and friends.

To capture the extent of women’s empowerment, we created two indices from questions related to decision making within the households. These questions touched on 10 areas related to spending: food; women/men/children’s clothes and personal items; and health consultations and medicines; education for sons; education for daughters; and taking out or repaying credit. The set of questions are drawn from the standard module administered in the Demographic Health Surveys. The first index measures whether the woman expressed her opinion the last time the household made this decision (“0” indicates “No” and “1” indicates “Yes” for each of the 10 areas). The second index captures whether the woman made the decision on her own the last time she made a decision in the given area (“0” indicates “No” and “1” indicates “Yes” for each of the 10 areas). For both indices, these 10 binary outcomes are summed and then normalized to 0. As to whether we might expect to see improvement in empowerment in this context, we were encouraged by Abdallah Ali et al.’s (2021) results showing that women’s access to microfinance results in a sense of increased empowerment among relatively more educated women in Djibouti. In other contexts, outside labor earnings have been shown to give women a sense of greater agency (Anderson & Eswaran, 2009, in Bangladesh, and Majlesi, 2016, in Mexico). Although it is important to also add that, in their review of experimental and quasi-experimental studies, Chang et al. (2020) conclude that little evidence exists that employment leads to greater empowerment or agency for women. This is also true in studies that look specifically at public works. Croke et al. (2024) find a short-run increase in women’s control over household resources from public works in the Arab Republic of Egypt, but a decline in control occurred both after the program ceased and two years later. The World Bank East Asia and Pacific Innovation Gender Lab (2020) find mixed results in the Lao People’s Democratic Republic. Leight and Mvukiyehe (2023) find an improvement in women’s empowerment in

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friend or relative to help provide food? The food insecurity index in Table 1 and Annex A Table 5 documents the number of affirmative responses to questions (2) through (6). The coping strategy index in Annex A Table 5 adjusts the food insecurity index by applying weights to the responses to questions (5) and (6) by a factor of 3 and 2, respectively. These measures are based on the U.S. Agency for International Development and CARE (2008).



the short-run, which attenuates to zero after five years, even though their index includes women’s work itself, which increased due to the public works offer.

Another dimension of women’s agency is their physical mobility. As noted earlier, Djibouti’s restrictive gender norms limit women’s mobility. For this reason, our baseline survey asked respondents about several dimensions of movement, which we subsequently used to construct an index on mobility that was then taken into consideration in our heterogeneity analysis.<sup>14</sup>

### *Attrition*

Table 2 presents the attrition results for men and women and includes regression results (i.e., not being interviewed at midline or endline) as a function of treatment status, controlling for group and strata effects. On average, 7.5 percent of the women in the control group were not interviewed at midline. This fraction increases to 11.4 percent at endline. Given their daily work schedules and temporary absence from the household, it was difficult to interview husbands: about 28 and 22 percent of husbands were not re-interviewed at midline and endline, respectively.

Differential attrition by treatment status is a potential source of bias in program effectiveness, since the balance in observable and unobservable characteristics that ensues from the randomization of treatment status at baseline may be lost. In our study, there is some indication of differential response at midline, with participant women 3.6 percentage points more likely to complete the midline survey than control women, and 4 percentage points less likely to fully complete the weekly survey at endline. This attrition moves in two different directions, suggesting that differential attrition by treatment is not systematic. No differential attrition is observed among women at the endline household survey or in husband’s responding to any of the questionnaires. Lastly, the minor imbalances in baseline that we observe in Table 1 correspond to the imbalances in the post-attrition sample (not shown). As noted earlier, we control for baseline characteristics to partially address potential concerns about non-random attrition.

### **4.3. Empirical methods**

We use the following reduced-form expression to estimate the effect of being offered the public works program:

$$y_{it}^g = \alpha + \beta T_{it}^g + \delta X_{i0} + \lambda_g + \lambda_s + u_{it}^g \quad t \in \{M, E\}$$

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<sup>14</sup> The five domains of mobility are: (1) Going to the grocery store, (2) Going to the market, (3) Going to the health center for consultation for self or child, (4) Visiting friends or family in the neighborhood, and (5) Visiting friends and family outside the neighborhood. For each domain, we classify women by whether they did not go anywhere in the last 12 months (coded as 0); they went out but needed permission and could not go alone (coded as 1); or they went out alone (coded as 2). We conducted a factor analysis and then normalized to 0.

where  $y_{it}^g$  is an outcome for household  $i$  in group  $g$  at survey wave  $t$ , and  $T_{it}^g$  is a dummy equal to 1 if household  $i$  in group  $g$  is offered public works. All regressions control for group effects ( $\lambda_g$ ), strata fixed effects ( $\lambda_s$ ), with an ANCOVA specification, and controlling for a vector of baseline (pre-determined) covariates ( $X_{i0}$ ).<sup>15</sup> The impact of the public works offer is captured by  $\beta$ . We estimate this equation separately at two points in time: during the public works program (M, midline) and after the program ended (E, endline).

In order to improve precision of the estimates and to account for random imbalance on observable characteristics, our regressions include the following set of baseline regressors: age of female beneficiary and her husband (if present), number of household members, number of children aged 0-5 years, number of children aged 6-15 years, an indicator for whether the woman is working, share of household members who are inactive, and whether the household is among the poorest 25<sup>th</sup> percentile of the food per capita expenditure distribution. We use this equation to estimate the effects presented in Tables 4 to 9. We also included survey-time indicators.<sup>16</sup>

### *Heterogeneity Analysis*

Our standard attempts to find heterogeneous effects are limited by the parametric modeling assumptions and by one-at-a-time testing for heterogeneity using interaction terms with adjustments for multiple hypotheses testing. Given the large array of potential sample splits for detecting heterogeneity, choosing ad hoc subgroups ex-post creates the possibility of overfitting. To this end, we aimed to minimize the concerns of specification searching by applying a machine learning approach to guide the selection of the relevant dimension of heterogeneity. We follow Chernozhukov et al.'s (2018) general framework, which provides valid inference to test whether there is heterogeneity in impact based on a set of baseline covariates. If heterogeneity is detected, then Chernozhukov et al.'s method makes it possible to (i) compute the magnitude of such heterogeneity and characterize the difference in the treatment effect across the most and least impacted groups, and (ii) identify the key observable correlates of the most and least impacted groups. Annex C contains a more detailed discussion on this approach.

We applied these methods to test for heterogeneity on key primary outcomes of interest, such as the woman and husband's employment status, the woman's labor income, and

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<sup>15</sup> Since the unit level of randomization is the household and within-cluster dependence of the main outcomes is not meaningful, we do not cluster at the site level. Therefore, the baseline intra-cluster correlation for women's employment is 0.006 and for women's inactivity is 0.004.

<sup>16</sup> These indicators control for the possibility of arising or worsening economic conditions emerging after the baseline to midline and the endline surveys. Notably, we do not find any evidence for this after examining time patterns in total per capita expenditure for control households while leveraging 8 survey data points (month/years) from the baseline through to the last endline surveys.

household consumption per capita. We ran the heterogeneity analysis separately for midline (during the program) and endline (after the program).

## 5. Results

### 5.1. Program take-up

Program take-up was almost universal, with 96 percent of treatment households accepting the offer.<sup>17</sup> While equally high participation in public works opportunities has been documented in other studies in the region, such as Côte d'Ivoire (Bertrand et al., 2021), urban Democratic Republic of Congo (Brandily et al., 2020), Central African Republic (Alik-Lagrange et al., 2023), and urban Ethiopia (Franklin et al., 2023), take-up was lower in two studies in Malawi, ranging from over 70 percent (Goldberg, 2016) to 57 percent (Beegle et al., 2017). The variation, no doubt, reflects many design and contextual features such as program seasonality, the wage rate compared to local casual wage rates, initial employment rates, and the prospective workers' other socioeconomic characteristics. Nonetheless, high take-up rates clearly call into question the self-targeting vision of public works programs.

The high take-up in our study is arguably striking in light of the extremely low level of work for women in Djibouti and some of its neighboring countries. It is also notable that the target population was pregnant women and mothers of young children under the age of 2, and that 71 percent of this population chose to accept the work offer. This number is even higher—77 percent—if one considers household take-up. Two other features of the program might make it particularly attractive to women. The first feature is the explicit gender labeling of the program. Designating women as the main recipients of the work offer and as the entry points to their entire household via the nutrition sessions may have encouraged women to take up the jobs themselves. This feature could also explain why, when women choose to delegate the offer, it is more likely that they delegated it to other women and not to their husbands. The second enticing feature of the program are the favorable working conditions put in place to facilitate women's participation. The partial daily work commitment (4 hours), the proximate work location within the neighborhood, and the scheduled breaks may have persuaded women with very low levels of past or current work experience to take up the public works offer.

Interest in the program remained stable during its gradual rollout. No significant differences were detected in take-up rates across the four waves of implementation, which took place between May 2014 and May 2015.

Women's participation accounts for the high take-up: 77 percent of women who accepted the offer perform the public works activities themselves rather than delegating the offer to another adult either within or without the household. It is important to note that the

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<sup>17</sup> Table 3 also shows that 3.9 percent of women in the control group were in households that should not have been offered the program. This was an administrative error resulting in some women assigned to the control group receiving an offer.

presence of other household members also plays a role in the option to delegate the offer. Just over half of the women (56 percent) have no other household members aged 15 years or older apart from their husbands. Another 14 percent have a husband and at least one child aged 15-19 years. The remaining 30 percent of female beneficiaries have a husband and one other adult aged 20 years or older (e.g., an adult child, sibling, parent, niece/nephew, or other relative) in their household.

When the female beneficiaries delegate their offer, they do so primarily to other women: 63 percent of delegees were woman. Among the women who delegate the offer, just over 25 percent do so due to ineligibility—they are either in their last trimester of pregnancy or had newborn under 40 days old); 15 percent delegate due to illness at the time they received the offer.<sup>18</sup> The remaining reason why women delegate their offer is because they needed to care for another household member: 32 percent delegate due to childcare constraints and 11 percent due to caring for a sick household member. For the remaining 15 percent of delegations, the original female beneficiaries do not report a specific reason. Whenever a female beneficiary delegates her offer to someone outside the household, then the delegees has to agree to share the earnings with the original female beneficiary.

With near universal take-up, we cannot assess to what extent socio-economic status influenced program take-up. We do notice, however, that women in relatively wealthier households are more likely to delegate the public works opportunity. In fact, the share of women in the highest asset index quintile who delegate is double that in the lowest quintile.

## **5.2. Labor supply response**

Table 4 presents the impact that the public works offer has on employment outcomes for three demographic groups within the household: (a) the female beneficiary (self-reported); (b) all remaining adult household members, including the husband (reported by the female beneficiary); and (c) the husband (self-reported). Figure 2 shows graphically a subset of the employment measures. Employment status at midline and at endline was computed based on data collected via the weekly surveys described above.

We find that the contemporaneous labor supply effect on women's employment is substantial and corresponds with the high take-up discussed earlier. Female participation in public works results in a 54.5 percentage-point increase in female employment, which subsequently increases general employment from 21.3 to 75.8 percent.<sup>19</sup> There is evidence that public works has a crowding-out effect among a small share of the self-employed women who appear to cease self-employment activities and, thereby, reduce their self-employment from 16 to 6 percent. This same effect has been found in other studies on public works, which

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<sup>18</sup> We collected the beneficiaries' reasons for delegating the offer only in rounds 3 and 4. Consequently, the distribution of the reported reasons is based on only half of the treatment sample.

<sup>19</sup> The public works reported in Table 4 at midline and endline are almost entirely part of the government's emergency social assistance program as almost no other public works programs were being implemented in Djibouti during this period.

document even close to full crowding out of private wage employment in urban Ethiopia (Franklin et al., 2023) and a transition out of self-employment altogether in urban Côte d'Ivoire (Bertrand et al., 2021).

This increase in female employment is reflected in the time women spent working on the intensive margin and in the labor income that they generated. On average, women in the treatment group work 14.4 hours more per week compared to their peers who do not receive the public works offer. This increase is consistent with the fact that female beneficiaries work, on average, 5 days per week for 4.8 hours per day (working time plus breaks) over the course of 2.5 months, adjusted for the take-up rate of 71 percent and the shift out of self-employment and into public works.

Table 4 depicts the share of other household members (Panel 2) and the husbands (Panel 3) who participate in the program due to delegation. The delegation effects are evident in the increase in participation of husbands and other adults. These results are consistent with the participation reported in Table 3. For the rest of household members, there is a positive 3.8 percentage-point effect in public works employment. There is also evidence that, as with female beneficiaries, the public works program crowds out self-employment activities for other household members and husbands, leading to no significant change in their rate of labor market participation.

When we look specifically at the husband's labor supply, we observe a 6.4 percentage-point increase in public works employment, which is similar to the increase for other household members. It is important to note, however, that unemployed husbands who joined the program account for the majority of the responses. This proportion originates most likely from the fact that employed husbands receive, on average, higher wages than husbands participating in a temporary public works program. In sum, the program has very modest effects on the labor of other household members, due in part to the low level of delegation.

By significantly increasing women's participation in public works, the intervention itself could prompt both men and women to consider the possibility of women working outside the home and come to an agreement on this issue. In this way, the intervention could have served as a gateway to future female employment (Ho et al., 2024). Had this happened, we should observe an increase in female labor force participation after the program ended. Instead, we find that, once the public works opportunity ceased, most women do not become employed elsewhere (75 percent) and only a few report that they were searching for work (13 percent). Women in the treatment group, therefore, are not more likely than those in the control group to secure employment when the program ceased.

Both the public works program's wages and favorable working conditions, which were intended to facilitate women's participation and are not common in other forms of employment, may explain why the female participants do not continue working after the intervention was completed. Still, the program might have affected women's aspirations

toward work. At endline, women were asked whether they intended to look for a job in the subsequent 6 months, and about 30 percent of women, regardless of treatment status, expressed this intention. Similarly, in India—a setting with very low female labor force participation—McKelway (2023) finds a temporary uptake in employment among women in response to an information intervention for women’s family members fading after one year. In Croke et al.’s (2024) study on high-quality community social services jobs for women that offered full-time work for 1-1.5 years in rural Egypt, and another setting with low female labor force participation, they do not find lasting effects on women’s employment after the programs concluded. This finding is also consistent with Gehrke and Hartwig (2018) and Bagga et al.’s (2023) reviews which find that public works for both men and women does not result in long-run employment effects.

### **5.3. Impact on time use**

Table 5 presents the time use data results for both the female beneficiaries and their husbands. The results are the calculated average of data from two 24-hour measurements (the day before the midline survey for weeks 1 and 3, and the day preceding the three weekly endline surveys). The time use across the 7 categories in Table 5 refers to the time spent by the female beneficiaries and their husbands on the main activity reported for each hour. We compute caregiving as the number of minutes spent caring for the youngest child if caregiving was either the primary or secondary activity of that hour, since caregiving is often performed simultaneously with other activities, such as chores.

Figure 3 also shows a subset of the results for time use—namely, women in the control group allocate 67 percent of daily time to household tasks and to caring for other household members. Working time makes up, on average, only 8 percent of women’s daily time, which is consistent with their low level of employment.

According to the midline survey results, women significantly reduce the time they spent on chores when offered public works. They do not replace the time they spent on chores completely with the time they spent doing public works, which indicates that they perform their chores during a modest “second shift.” Women who participate in public works increase the time they spend on paid work, which was approximately 3 hours (the previous day). This is consistent with the daily hours of the program (4-5 hours, with breaks) and when factoring in both the reduction in self-employment activities and the program take-up by 77 percent of women among the 92 percent households reported in Table 4. The increase in time employed is also marginally offset by a reduction in personal care, which includes sleep, and substantially offset by a reduction in time spent on chores.

The public works program has no effects on the time husbands spent on household chores (see Table 5, Panel 2), but it does produce a modest increase in the time men dedicated to work. This finding is consistent with the 6 percent take-up of public works among husbands,

as reported in Table 3. This additional time that husbands worked is made possible by a modest reduction in personal and other time.

The total time that female beneficiaries and participating husbands dedicate to chores declines with the public works offer. In the wake of this occurrence, other household members may increase the time they spend on chores, or daily chores might simply be neglected, reduced, or postponed. Looking at caregiving for the youngest child (see Table 5, Panel 3) can provide some indication of what happened. Female beneficiaries in the treatment arm reduce the time they spent as the main caregivers for their youngest child, which implies that a temporary caregiving shift to other women or girls within or outside the household may occur. The results indicate only a modest increase in the time that fathers spent caregiving. Therefore, it is possible that other females also take on some of the chores previously done by the female beneficiary while simultaneously caring for the beneficiary's youngest child.

The shift in caregiving that took place is consistent with the fact that mothers make limited use of institutional childcare or preschool in Djibouti (Crumpton & Elnahass, 2023) and that public works sites lack childcare. The shift also points to an important issue concerning efforts to increase women's work when childcare services are lacking. As noted earlier, several studies have shown that expanding childcare increased employment rates for women (Halim et al., 2022). Here, in the case of a temporary public works program, grandmothers, older children in the household, and other female neighbors assume responsibility for childcare, which seemingly allowed the female beneficiaries to take on public works. However, it remains unclear whether this approach to childcare is sustainable over the long term, even for a program that makes accommodations such as shorter hours and close proximity to women's homes.

At endline, which was 9 months after the program ended, there is no difference in the time allocated to the 7 time-use categories from the baseline levels. After the program, however, something of a shift in care giving for the youngest child takes place insofar as beneficiary women spend more (though not statistically significant) time in care giving while grandmothers spend 20 fewer minutes per day in childcare. This could indicate intertemporal compensation for the additional time grandmothers spend in childcare while the mothers are participating in the public works activities.

#### **5.4. Income, expenditures, savings, and loans**

In Table 6 we present the program's impacts on household income. We also show a subset of the results for employment in Figure 4. The boost of female employment due to the public works program leads to a substantial, short-term, 38 percent increase in household total

income. This increase can be attributed exclusively to the women's public works income of FDJ 3,000<sup>20</sup> per week, which was more than triple women's income on average in 2017.

The public works program paid 1,000 FDJ per day, for 50 days over a 2.5-month period (about 5 days of work per week). The 5,000 FDJ weekly income adjusted by the take-up of 71 percent end up at 3,550 FDJ, which is greater than the 2,986 FDJ impact shown in Table 6, because the former does not account for foregone earnings. As discussed previously, some women move from self-employment into public works (as reported in Table 4), and the foregone self-employment income is, on average, 16 percent of the income earned from public works.

This increase in earnings translates into a 23 percent increase in the women's share of household labor income, reflecting limited crowding out of other income sources in response to the public works participation. These findings are consistent with both the foregone earning of self-employed women who pivot to public works as well as earlier findings regarding the lack of effects on other household members' labor supply.

The net income gains derived from the Djibouti public works program are higher compared to those reported for other public works interventions. Bertrand et al. (2021) report a foregone income of about 60 percent of the transfer for a public works program implemented in Côte d'Ivoire. Estimates of foregone income from large-scale programs such as the *Jefas y Jefas* in Argentina (Galasso & Ravallion, 2004) and the National Rural Employment in Bihar (Murgai et al., 2015) are around one-third of the total wages earned through the program. In our case, the program targeted a population that, otherwise, would not have engaged in any type of work, resulting in sizeable net income gains (limited foregone income) for the beneficiary population.

Table 7 shows the program's effects on expenditures, savings, insurance, and loans. Households spend only part of the beneficiaries' income gain from public works, which is evident in the 9 percent increase in total expenditures and 12 percent increase in food expenditures when measured in log per capita. However, the program has no significant effects on durable purchases. The increase in expenditures represents around one-third of the incremental income earned from the program. These impacts are statistically significant for subsamples of households with expenditures at or below the 10 percent, 25 percent, 50 percent, 75 percent, and 90 percent points in the distribution. They are largest for households in the 10<sup>th</sup> and 25<sup>th</sup> percentiles (not shown here). This contrasts with the review of studies by Bagga et al. (2023) who find little evidence of a change in food expenditure. On the other hand, Ralston et al.'s (2017) meta-analysis finds that, on average, 74 cents per dollar transferred from cash transfer programs was spent on consumption. Ravallion and Chen (2007) also find that most households in China saved gains from a short-term, anti-poverty intervention. This is not surprising in light of the temporary nature of the

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<sup>20</sup> This is equivalent to 16.8 USD per week in 2014.



intervention and the beneficiaries' uncertainty about future public works opportunities. Accompanying these modest gains in food expenditure, there are—at best—modest gains in food diversity for young children at midline (Annex A Table 5).

It is possible that some of the income gains from the public works program are used to smooth consumption over time in the months following program completion. Households offered public works are more likely to have savings or insurance. And by endline, after a program has ended, they are more likely to make mortgage payments and owe less to grocers as well as less likely to buy groceries on credit, though these effects are not statistically significant.<sup>21</sup>

### **5.5. Intra-household transfers and women's empowerment**

In a setting with restrictive gender norms and limited income opportunities for women, the following question arises: Do women keep the income they earn from public works? To answer this question, we administered an innovative module which collected weekly data on intra-household money transfers. We find that the women offered the opportunity to engage in public works are 6.2 percentage points more likely to report giving money to their husbands (see Table 6). This rate, however, is far lower than the rate of program take-up. The aforementioned result is consistent with Islamic social norms whereby women control their own assets and income (Tucker, 2008). On the other hand, based on the program effect (when the income is given), the implied amount of income that women give to their husbands seems much larger than their income gains: 305 DFJ is the transfer effect, which, when applied to the 6.2 percent of women, suggests a transfer of nearly 5,000 FDJ, when the income gains are only about 3,000 FDJ.

The program has no effect on husbands' income transfers to their wives. Three-quarters of husbands participating in the program report giving money to their wives in at least one of the three weekly surveys at midline (not shown). The weighted rate of intra-household transfer from husbands to wives is, therefore, 57 percent. Moreover, women report receiving nearly 90 percent of their husbands' mean labor income. This is a surprising finding but, we think, reflects the fact that women do most of the purchasing and preparation of food and other consumables, and these are poor households. When taking this large portion into consideration and in light of the fact that women rarely transfer their income to their husbands, these findings show that female beneficiaries obtained a significant net increase in income through their participation in the public works program. Not surprisingly, given

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<sup>21</sup> A caveat for these findings is that the magnitudes of the different effects do not add up to the observed total increase in labor income. Obtaining accurate estimates of expenditures is methodologically less challenging than estimating savings. Respondents often have no incentive to provide precise reports about their savings, which is a sensitive topic and less apparent to the rest of the community. These methodological aspects, together with our endline results, suggest that a reduction in household indebtedness occurred, leading us to conjecture that the participants mostly saved their increased income.

the lack of labor supply effect at endline, no income gains or extra intra-household transfers are observed several months after the program ended.

Did having their own bank accounts enable women to manage their own earnings? The administrative data that we obtained from the paying agency show that women do not use their accounts to save their income. Instead, female beneficiaries withdraw almost all of their earnings shortly after deposit. This finding is not necessarily surprising, since the participating households were cash-poor. In addition, participating women are not likely to be familiar with financial institutions, so merely having a bank account might not be a sufficient reason for them to use other financial services or strategies like saving money. This explanation is more compelling because, even though the participating households were poor, their expenditures do not increase by nearly the full amount of their public works income. This result echoes Field et al.'s (2021) findings that providing individuals with access to a bank account alone, without training them on how to use it, does not result in greater use of a bank account. This is especially salient in our setting where women have very low literacy levels.

Next, we documented the program's effects on women's perceived decision-making power, which we proxied by five alternative indicators (see Table 8). We do not find that public works employment changes women's decision-making power. While we detect some marginal program effects contemporaneously with public works employment, such as increases in expenditures on women's personal goods like clothing, these increases are dwarfed in comparison to the share of income spent on items like khat and tobacco for men. Therefore, the program's insignificant impacts on women's decision-making power are consistent with the temporary nature of the employment offer.

## **5.6. Well-being**

We use two indicators to assess the program's impacts on the well-being of the female beneficiaries and their husbands. The five-item Mental Health Inventory (MHI-5) developed by Veit and Ware (1983) is a measure of overall emotional functioning. Data on the MHI-5 were collected for part of the sample at midline for part and for the whole sample at endline (only the latter is reported here). Second, we compute Rosenberg's (1965) self-esteem scale.

Our contemporaneous results show that both women and men do not experience any changes in their mental well-being or self-esteem due to the public works program (Table 9). As expected, given the absence of effects contemporaneous to the public works activities, there are no statistical differences several months after the program ended between women and men in households that are offered the program and those that do not receive the offer.

## **6. Treatment Effect Heterogeneity**

Our study sought to document whether there is any relevant heterogeneity in treatment effect by baseline socio-economic characteristics and explore whether any subgroups

benefitted from the program both during and after it ended. Despite the program's high take-up, it is important to understand whether the results could be strengthened by targeting households that are more likely to benefit from the program as well as the mechanisms or mediators behind the main outcomes of interest. To this end, using the statistical framework developed by Chernozhukov et al. (2018), we implement machine learning methods to analyze treatment effect heterogeneity.

We focus on the heterogeneity of treatment effects on six main primary outcomes: female beneficiary's employment, husband's employment, woman's average labor income, log household total income, log household per capita food expenditures, and log households per capita total expenditures. The set of observable covariates along which we explore heterogeneity at both midline and endline are the baseline socio-economic correlates of female labor force participation such as household demographics,<sup>22</sup> head of household education, household assets, share of household members by occupation status, per capita food expenditure and food security, woman's occupation status, and indices of the woman's decision-making power, mobility, and self-esteem.

Table 10 reports estimates of the coefficients of the average treatment effects and the heterogeneity parameter carried out at midline (Panel A) and at endline (Panel C). We detect significant heterogeneous effects only for female employment at midline. All other outcomes do not exhibit significant heterogeneity at midline or at endline. The coefficient on the average treatment effects estimated in the first line of the panel using machine learning methods are in line with the regression estimates of labor supply effects (Table 4) and income effects (Table 6).

Panel B (for midline) and Panel D (for endline) provide information about the magnitude of the heterogeneity, with estimates of the Group Average Treatment Effects (GATES) by quintile of predicted impact. The employment effects for women are positive and significant along the entire distribution, which we also represent graphically in Figure 5. The table and figure reveal that there is significant heterogeneity behind the women's average labor supply response at midline. The average employment effect in the lower quintile of the distribution (the 20 percent least affected) is about half of the employment effect in the highest quintile of the distribution (the 20 percent most affected), with average employment effects of 34 percentage points versus 67 percentage points. This difference is significant at the 5-percent level. There is no heterogeneity detected for any other key outcome of interest, even though there is still a large (though not statistically significant) difference in the log of total household income between the least affected and the most affected groups. It is also notable that there are no differences in husband's employment status along the distribution of

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<sup>22</sup> Specifically, we determined the household size and composition, which included the number of children aged 0-2 years, the number of children aged 3-5 years, the number of children aged 6-15 years, and the number of adults, whether household head was female, household head's age, household head's education, household has a child aged  $\leq 2$  years.

predicted impact, suggesting low substitutability in household labor supply along gender lines.

We also examine the characteristics that are mostly correlated with the heterogeneity score. Table 11 presents the differences in baseline characteristics between the bottom 20 percent and top 20 percent of the distribution of predicted employment gains at midline. The results suggest that younger women in households with a higher share of employed adult men were more likely to benefit to the public works offer. There are two key correlates that stand out. First, as expected, women who were not employed at baseline—that is, women with the lowest opportunity cost of their time and the highest potential foregone income—made up the group with the largest employment effects. Second, women with higher relative mobility at baseline were more likely to experience larger employment effects. Women’s mobility, therefore, plays an important role in their decision to take up the public works program’s employment offer.

## **7. Conclusion**

The low labor force participation rates of women in developing countries could be explained by a lack of attractive job opportunities and by social norms that deter women from working outside the home. In an experiment in a poor neighborhood of urban Djibouti, where most women do not participate in the labor force, we randomly varied women’s access to job opportunities through a public works program. This allowed us to directly examine the influence of job opportunities and indirectly assess the influence of social norms. We find that women were unambiguously willing to enter the labor market when offered sufficiently attractive and suitable job opportunities: 92 percent of households accept the employment offer and over 70 percent of all women who were offered the program take on the work, even when they could delegate it to any other male or female adult member of their household.

There were some key design features that may contribute to the sizeable labor supply response. Given the salient mobility constraints that affect women in the context we studied, the local proximity of the work might facilitate the intra-household decision to work. In addition, the public works program’s relatively high wage rate relative to precarious self-employment income likely influences women’s decisions to take up the job. Other enabling factors are the part-time nature of the work as well as the built-in work breaks, which accommodated the female beneficiaries’ regular household responsibilities. These work arrangements can ease the pressure that participants would have otherwise felt in meeting their competing responsibilities. In this way, women do not have to choose between work inside the home and wage-earning work outside of the home.

We find evidence that women have control over and save a substantial portion of their own public works’ earnings. However, once the program ends and the employment opportunity it presented was no longer available, women revert to remaining unemployed or engaging in low levels of self-employment. Since women do take up the offer and show up to work

outside the home, and since they revert back to the low labor supply after the program ended, we infer that the main barrier to these women's labor force participation is not the prevailing social norms about women and work, but rather the lack of suitable employment opportunities. Suitability itself is defined by norms related to provision of childcare and doing household chores. Alaref et al. (2024) have similar conclusions in their study of women's employment in Nepal which measures numerous dimensions of norms. They find that specific norms related to domestic work and care giving, and not those related to women working per se, drive low rates of female employment.

Although a lack of opportunity plays a greater role than social norms in deterring women from entering the labor force for this particular job offer, we do not claim that the former is the limiting factor in developing countries at large. Policies that focus exclusively on the role of social norms or, more generally, on the social and cultural determinants of women's labor supply, could, however, leave unexploited an important policy margin. Still, our results suggest that policies that increase work opportunities, especially to women at bottom of the skill distribution are important in promoting women's labor force participation. Future research is needed to identify the extent of the influence that the wage rates, job features, and benefits have in increasing women's labor supply in different contexts. Tailoring programs to women's needs, as opposed to more complex attempts at understanding and attempting to externally shift social norms, might play a substantial and effective role in increasing women's labor force participation.

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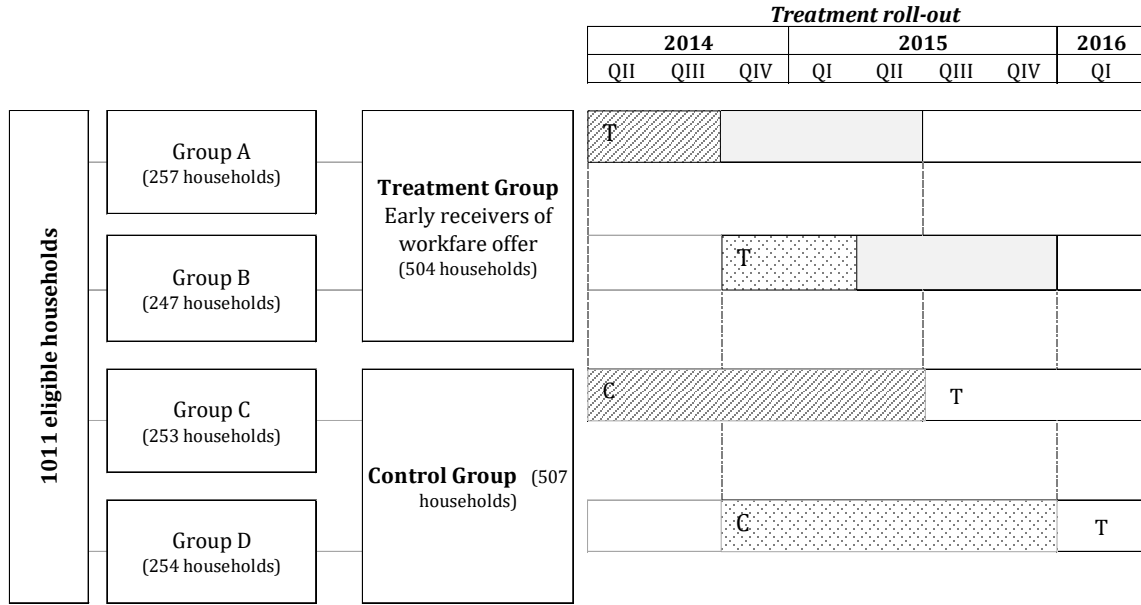


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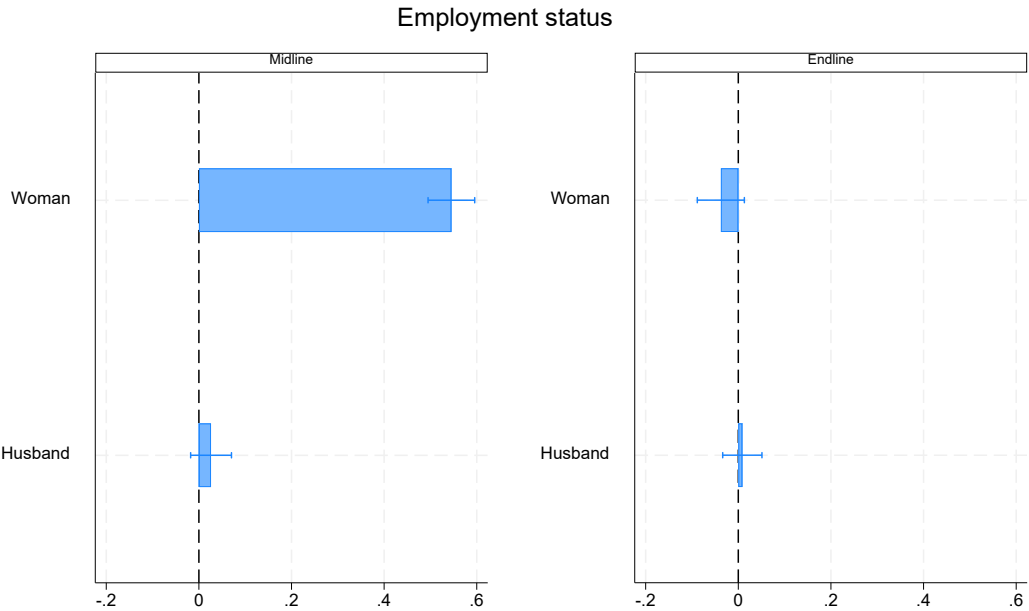
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**Figure 1: Evaluation Design**



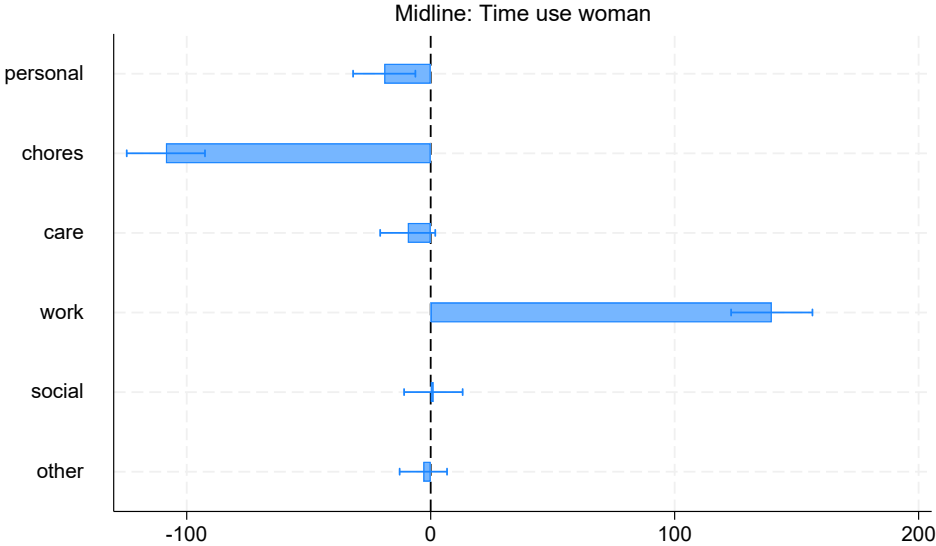
Note: The shaded areas refer to the time period when the group served as treatment or control. For treatment groups, different types of shades indicate the implementation period (midline) versus the period following the cessation of the public works program, with the endline therein (approximately nine months after completion).

**Figure 2: Employment Results at Midline and Endline**



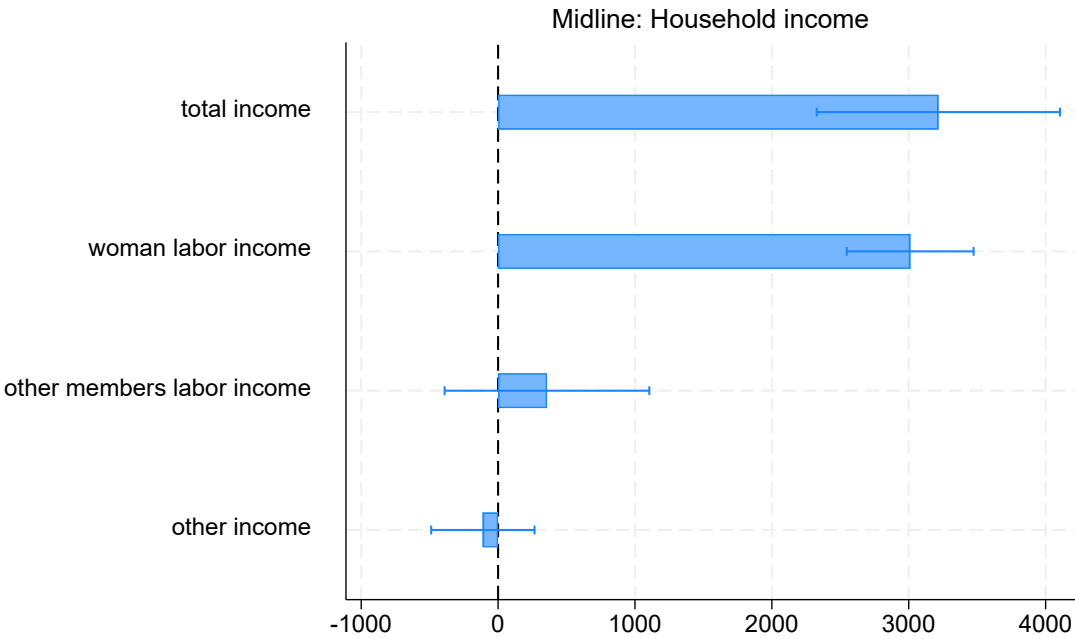
Note: Figure 2 depicts the coefficient plots with point estimates and the 95% confidence interval from Table 4.

**Figure 3: Woman's Time Use Results in Minutes at Midline**



Note: Figure 3 depicts the coefficient plots with point estimates and the 95% confidence interval from Table 5.

**Figure 4: Income Results in FDJ at Midline**



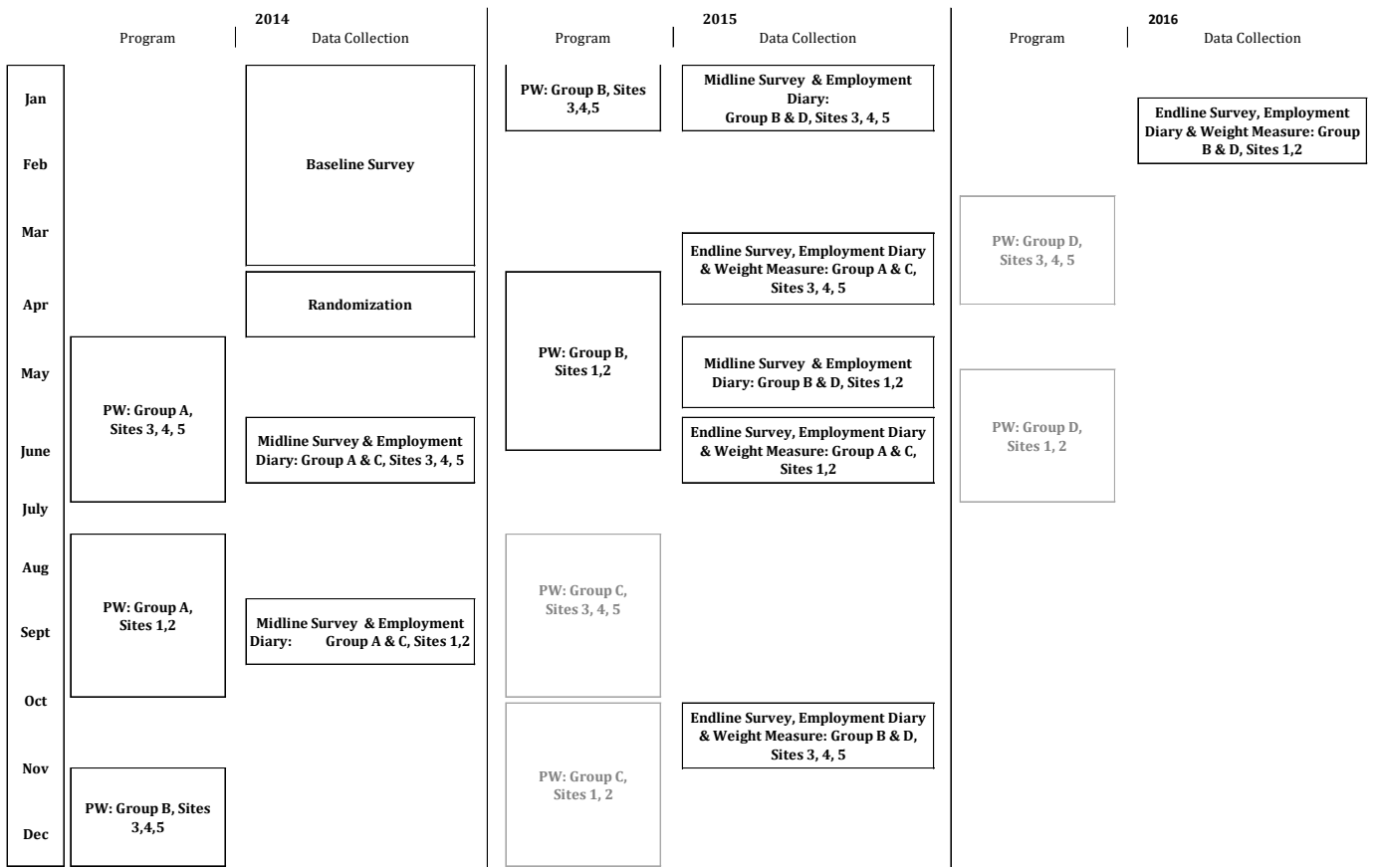
Note: Figure 4 depicts the coefficient plots with point estimates and the 95% confidence interval from Table 6.

**Figure 5: Group Average Treatment Effects on Women’s Employment at Midline, Sorted by Quintile of Predicted Impact**



Note: Figure 5 displays the point estimates and the 95% adjusted confidence intervals for the different machine learning methods and based on 50 random splits.

**Figure A1: Detailed Study Timeline**







**Table 1. Baseline Summary Statistics**

	Obs	Control Group Mean	Control Group St. Dev.	Treatment - Control Coeff.	<i>p-value</i>
<b>Household demographics</b>					
Pregnant woman or child 0-3	1011	0.970	0.170	0.004	0.727
Number of HH members	1011	6.9	2.7	-0.3	0.118
Number of children 0-5	1011	1.8	0.8	0.0	0.434
Number of children 6-15	1011	2.2	1.8	-0.2 *	0.055
Number of adults >15	1011	3.0	1.6	-0.1	0.396
Share of children 6-15 in school (cond on a child 6-15)	747	0.773	0.324	-0.004	0.866
HH head: male	997	0.966	0.181	-0.022 *	0.083
HH head: age	995	40.4	8.5	-1.3 **	0.017
HH Head: no education	970	0.656	0.475	-0.003	0.927
Beneficiary woman: age	1005	33.4	6.7	-1.0 **	0.021
Beneficiary women: no education	1000	0.824	0.381	0.009	0.712
<b>Beneficiary woman</b>					
Not employed & not searching	955	0.874	0.332	-0.001	0.946
Not employed & searching	955	0.021	0.143	0.010	0.331
Employed	955	0.105	0.307	-0.009	0.656
Day worker	955	0.036	0.186	-0.008	0.499
Self-employed	955	0.057	0.231	-0.005	0.731
Salaried	955	0.008	0.091	0.007	0.348
<b>Share of adult members (excludes beneficiary)</b>					
Not employed & not searching	950	0.363	0.377	-0.042 *	0.091
Not employed & searching	950	0.034	0.134	0.011	0.286
Employed	950	0.603	0.390	0.031	0.231
Day worker	950	0.347	0.415	0.060 **	0.031
Self-employed	950	0.035	0.170	-0.013	0.172
Salaried	950	0.218	0.374	-0.023	0.342
<b>Income &amp; transfers</b>					
Income from labor in last 7 days (in FDJ)	953	8,427	9,459	-753	0.186
Log of income from labor in last 7 days	724	8.98	1.04	-0.09	0.245
HH had non-labor income in last 12 months	1001	0.250	0.433	-0.005	0.848
HH made a transfer in last 12 months	1001	0.104	0.306	-0.003	0.861
<b>Expenditures &amp; PMT</b>					
Per capita total expenditures in last 30 days	958	14,294	11,264	-929	0.142
Per capita food expenditures in last 30 days	958	6,992	7,054	-855 **	0.020
Per capita health and educ expenditures in last 30 days	958	1,515	1,803	68	0.669
Per capita other expenditures in last 30 days	958	5,787	6,629	-142	0.704
Log of per capita total expenditures in last 30 days	958	9.41	0.51	-0.04	0.192
Log of per capita food expenditures in last 30 days	958	8.66	0.53	-0.06 *	0.067
Share of households with PMT score above the median	997	0.520	0.500	-0.043	0.178
<b>Nutrition and food security</b>					
Youngest child aged 6-59 months has a diversified diet	397	0.351	0.479	0.024	0.622
Youngest child aged 6-59 months ate food rich in proteins	397	0.550	0.499	0.034	0.514
Youngest child aged 6-59 months ate food rich in vitamins	397	0.777	0.417	-0.038	0.384
Pregnant or lactating woman has a diversified diet	672	0.410	0.493	-0.021	0.571
Pregnant or lactating woman ate food rich in proteins	672	0.664	0.473	0.012	0.749
Pregnant or lactating woman ate food rich in vitamins	672	0.805	0.397	-0.020	0.518
Concerned about not having enough food in last 7 days	1001	0.31	0.46	0.04	0.190
Index of food insecurity in last 7 days	1001	1.10	1.68	0.13	0.235
<b>Bargaining Power</b>					
Index 1: Woman participated in HH decisions	1001	0.00	1.00	-0.18 ***	0.006
Index 2: Woman took decisions alone	1001	0.00	1.00	0.02	0.755
Index 3: Mobility Index	1000	-0.05	0.85	0.10 *	0.060

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies. \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

**Table 2. Attrition**

		Control Group	Treatment - Control	
	Obs	Mean	Coeff.	<i>p-value</i>
<b>Panel A. Midline Survey</b>				
Woman did not complete midline survey	1011	0.075	-0.036 **	0.014
Husband did not complete midline survey	1011	0.276	-0.022	0.424
<b>Panel B. Endline Survey</b>				
Woman did not complete endline household survey	1011	0.114	0.020	0.341
Woman did not complete endline weekly survey	1011	0.112	0.039 *	0.072
Husband did not complete endline household survey	1011	0.215	-0.003	0.897
Husband did not complete endline weekly survey	1011	0.288	-0.012	0.663

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies. \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

**Table 3. Take-up & delegation**

	Control Group		Treatment - Control	
	Obs	Mean	Coeff.	p-value
<b>Panel A. Midline Survey: Take-up</b>				
HH took-up	948	0.039	0.920 ***	0.000
Woman worked in PW	952	0.021	0.712 ***	0.000
Woman delegated PWs	948	0.011	0.213 ***	0.000
Husband worked in PW	744	0.005	0.060 ***	0.000
<b>Panel B. Midline Survey: Delegation</b>				
A female HH member	476	0.042		
A male HH member	476	0.053		
A female non HH member	476	0.086		
A man non HH member	476	0.021		

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (age of the head and the beneficiary, number of household members, number of children aged 0-5, number of children aged 6- 15, a dummy equal to 1 if woman is active, share of members who are inactive and a dummy equal to 1 if the household belongs to the top 25 percentile of food per capita distribution). Panel B: Sample: treatment households surveyed at midline. \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

**Table 4. Employment**

	Midline Survey				Endline Survey			
	Obs	Control Group Mean	Treatment - Control Coeff.	<i>p-value</i>	Obs	Control Group Mean	Treatment - Control Coeff.	<i>p-value</i>
<b>Beneficiary woman</b>								
Not employed & not searching	951	0.551	-0.352 ***	0.000	875	0.629	0.050 *	0.073
Not employed & searching	951	0.234	-0.193 ***	0.000	875	0.127	-0.012	0.498
Employed	952	0.215	0.545 ***	0.000	875	0.244	-0.038	0.145
Day worker	952	0.014	0.007	0.277	875	0.016	0.001	0.861
Salaried	952	0.021	-0.010	0.185	875	0.016	0.000	0.966
Self-employed	952	0.166	-0.111 ***	0.000	875	0.213	-0.038	0.130
Public works	952	0.017	0.689 ***	0.000	875	0.000	0.000	0.000
Hours worked	952	7.9	14.4 ***	0.000	875	10.3	-2.3 *	0.056
Will look for a job or start a self-employment activity in next 6 months	n.a	n.a	n.a	n.a	875	0.289	0.008	0.770
<b>Share of adult members (excludes woman beneficiary)</b>								
Not employed & not searching	913	0.436	-0.003	0.869	893	0.516	-0.021	0.358
Not employed & searching	913	0.037	-0.013 *	0.054	893	0.014	0.007	0.216
Employed	913	0.540	0.006	0.761	893	0.516	0.025	0.234
Day worker	913	0.252	0.012	0.580	893	0.266	0.002	0.925
Salaried	913	0.249	-0.023	0.270	893	0.226	0.021	0.311
Self-employed	913	0.049	-0.020 **	0.037	893	0.031	0.001	0.895
Public works	913	0.003	0.038 ***	0.000	893	0.001	-0.001	0.637
Hours worked	913	26.8	0.6	0.728	893	28.9	0.3	0.854
<b>Husband</b>								
Not employed & not searching	744	0.071	0.002	0.916	724	0.079	0.012	0.497
Not employed & searching	744	0.089	-0.028 *	0.080	724	0.050	-0.020 *	0.088
Employed	744	0.839	0.026	0.242	724	0.870	0.009	0.688
Day worker	744	0.459	-0.024	0.443	724	0.482	-0.035	0.271
Salaried	744	0.339	0.001	0.968	724	0.355	0.036	0.267
Self-employed	744	0.045	0	0.997	724	0.048	0.002	0.919
Public works	744	0.003	0.064 ***	0.000	724	0.002	0.001	0.700
Hours worked	743	39.9	1.5	0.385	724	44.5	2.0	0.290

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

**Table 5. Time use (minutes in 24 hours period) and caregiving**

	Midline Survey				Endline Survey			
	Obs	Control Group Mean	Treatment - Control Coeff.	<i>p-value</i>	Obs	Control Group Mean	Treatment - Control Coeff.	<i>p-value</i>
<b>Minutes spent by beneficiary woman</b>								
Personal care	944	738	-19 ***	0.004	880	734	9	0.257
Study	944	0	0	0.277	880	1	-1	0.391
Chores	944	364	-109 ***	0.000	880	349	9	0.384
Caring others	944	107	-9	0.102	880	100	3	0.725
Work	944	55	140 ***	0.000	880	67	-20 **	0.028
Social	944	95	1	0.857	880	117	-3	0.700
Other	944	78	-3	0.543	880	72	3	0.691
<b>Minutes spent by husband</b>								
Personal care	731	698	-21 **	0.042	684	685	-9	0.473
Study	731	0	1	0.327	684	0	2	0.159
Chores	731	6	-4	0.137	684	2	0	0.730
Caring others	731	22	9 **	0.029	684	16	-2	0.653
Work	731	377	36 **	0.027	684	415	4	0.822
Social	731	181	-8	0.476	684	205	-12	0.338
Other	731	154	-19 **	0.033	684	117	16 *	0.071
<b>Minutes caring for the youngest child in the household</b>								
Beneficiary woman	944	1280	-128 ***	0.000	880	1277	18	0.445
Grandmother or female HH member adult	944	28	44 ***	0.000	880	39	-22 **	0.023
HH member girl (<15)	944	37	33 ***	0.000	880	21	-8	0.244
Female neighbor	944	5	33 ***	0.000	880	5	-2	0.485
Male adult	944	11	8 **	0.020	880	11	-3	0.515
Other	944	14	10	0.109	880	12	3	0.666

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey- time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent. Time use data were collected twice at midline and at endline, in weeks 1 and 3 of the weekly survey. The data refer to the previous day (unless it was Friday, in which case Thursday is the reference day). Activities for the main respondent and for the caregiver of the youngest child are collected for each hour of the day (with exception of the hours between midnight-5am which were grouped together).

**Table 6. Income & Transfers**

	Midline Survey			Endline Survey		
	Control Group	Treatment - Control		Control Group	Treatment - Control	
	Mean	Coeff.	<i>p-value</i>	Mean	Coeff.	<i>p-value</i>
<b>Labor &amp; Non-labor income in last 7 days</b>						
Total income (in FDJ)	8,312	3,216 ***	0.000	9,110	-96	0.843
Amount (in FDJ) of beneficiary woman's labor income	1,441	3,010 ***	0.000	1,112	-237	0.210
Amount (in FDJ) of other HH members' labor income	6,394	357	0.349	7,772	44	0.920
Amount (in FDJ) of husband's labor income	7,855	-1,211	0.150	10,271	270	0.673
HH had non-labor income	0.109	-0.047 ***	0.001	0.043	-0.005	0.616
Amount (in FDJ) of non-labor income	748	-111	0.563	287	88.57	0.409
<b>Intra-HH transfers in last 7 days</b> (as declared by woman)						
Beneficiary woman gave money to husband	0.067	0.062 ***	0.000	0.032	0.001	0.879
Amount (in FDJ) beneficiary woman gave to husband	88	305 ***	0.000	184	28.75	0.752
Husband gave money to beneficiary woman	0.574	-0.035	0.155	0.549	-0.014	0.605
Amount (in FDJ) husband gave to beneficiary woman	7015	159	0.770	7445	537.9	0.433

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent. Husbands' labor income is reported both separately as well as being included in other household members' labor income.

**Table 7. Expenditures, Savings, Insurance and Loans**

	Midline Survey				Endline Survey			
	Obs	Control Group Mean	Treatment - Control Coeff.	<i>p-value</i>	Obs	Control Group Mean	Treatment - Control Coeff.	<i>p-value</i>
<b>Per capita HH expenditures last 30 days (FDJ)</b>								
Total	914	13,462	-649	0.428	879	10,106	675	0.274
Durables	914	274	-153	0.231	879	93	139	0.118
Non-durables	914	13,188	-496	0.534	879	10,013	536	0.377
Food	914	7,502	-339	0.618	879	4,666	46	0.778
<b>Ln of per capita HH expenditures</b>								
Total	914	9.22	0.09 **	0.021	879	9.04	0.04	0.293
Durables	189	5.91	0.26	0.161	120	5.67	0.18	0.562
Non-durables	914	9.21	0.10 **	0.013	879	9.03	0.04	0.358
Food	909	8.60	0.12 ***	0.005	879	8.31	0.04	0.257
<b>Home Durables</b>								
Index of home durables	n.a	n.a	n.a	n.a	1011	0.05	0.02	0.897
<b>Savings &amp; Insurance</b>								
The HH has any type of savings or insurance	963	0.221	0.062 **	0.021	903	0.160	-0.007	0.740
<b>Loans</b>								
The household buys at the grocery store at credit	684	0.412	0.014	0.701	895	0.285	-0.028	0.256
Amount owed to the grocer (in FDJ)	682	5,574	-32	0.977	894	4,688	-1,291	0.136
A HH member has an outstanding loan	684	0.057	-0.011	0.528	895	0.032	-0.001	0.931
HH reimbursed a mortgage or house- related loan in last 30 days	n.a	n.a	n.a	n.a	767	0.023	0.028 **	0.038

Notes: Coefficients from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.



**Table 8. Bargaining Power**

	<b>Midline Survey</b>				<b>Endline Survey</b>			
	Control Group		Treatment - Control		Control Group		Treatment - Control	
	Obs	Mean	Coeff.	<i>p-value</i>	Obs	Mean	Coeff.	<i>p-value</i>
<b>Expenditures last 30 days (FDJ)</b>								
Husband clothes and shoes	914	277	6	<i>0.931</i>	882	345	15	<i>0.881</i>
Beneficiary Woman clothes and shoes	914	468	162 **	<i>0.044</i>	882	499	111	<i>0.322</i>
Khat and Tobacco for male adults	844	5,250	-87	<i>0.888</i>	792	5,908	585	<i>0.600</i>
<b>Woman's participation in HH decisions</b>								
Index 1: Woman participated in HH decisions	n.a.	n.a.	n.a.	n.a.	882	0.000	0.116 *	<i>0.059</i>
Index 2: Woman took decisions alone	n.a.	n.a.	n.a.	n.a.	882	0.000	0.078	<i>0.255</i>

Notes: Coefficients from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

**Table 9. Well-Being**

	Midline Survey				Endline Survey				
		Control Group	Treatment - Control		Control Group	Treatment - Control			
	Obs	Mean	Coeff.	<i>p-value</i>	Obs	Mean	Coeff.	<i>p-value</i>	
<b>Beneficiary woman</b>									
Self-esteem indicator (Rosenberg Scale)	n.a	n.a	n.a	n.a	812	21.29	0.01	<i>0.971</i>	
Mental Health indicator	428	14.21	0.15	<i>0.644</i>	793	14.65	-0.26	<i>0.230</i>	
<b>Husband</b>									
Self-esteem indicator (Rosenberg Scale)	n.a	n.a	n.a	n.a	602	21.55	-0.03	<i>0.901</i>	
Mental Health indicator	306	13.64	0.70	<i>0.137</i>	612	14.77	-0.18	<i>0.476</i>	

Notes: Sample of mental health outcomes at midline: households surveyed in rounds 3 and 4. Coefficients from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

**Table 10. Heterogeneity in impacts on key outcomes**

Outcome	Husband employed	Woman employed	Women's labor income	Total household income (ln)	Per capita food hh expenditures (ln)	Per capita total hh expenditures (ln)
<b>Panel A: Predicted average treatment effect and the heterogeneity parameter, midline</b>						
Average intent to treat (beta1)	0.039	0.542***	3,270***	0.357***	0.115	0.086
Heterogeneity (beta 2)	0.147	1.148**	0.447	0.181	-0.218	-0.39
Best ML Method	Boosted tree	Elastic net	Random forest	Elastic net, exponential	Boosted tree	Elastic net
<b>Panel B: Mean predicted impacts by quintiles of predicted impact (using midline) (GATES)</b>						
Mean least affected (Q1)	-0.036	0.385***	2,710***	0.159	-0.046	-0.05
Mean most affected (Q5)	0.109	0.681***	3,839***	0.524***	0.273*	0.204
Most-least affected (Q5-Q1)	0.158	0.296**	1,129	0.37	0.332	0.27
<b>Panel C: Predicted average treatment effect and the heterogeneity parameter, endline</b>						
Average intent to treat (beta1)	0.01	-0.038	-18	-0.021	0.038	0.033
Heterogeneity (beta 2)	-0.389	0.399	0.065	0.147	-0.106	0.299
Best ML Method	Random forest	Elastic net	Elastic net	Random forest	Elastic net, exponential	Elastic net, exponential
<b>Panel D: Mean predicted impacts by quintiles of predicted (using endline) (GATES)</b>						
Mean least affected (Q1)	-0.056	-0.126	-274	-0.212	-0.079	-0.111
Mean most affected (Q5)	0.078	0.064	282	0.181	0.152	0.165
Most-least affected (Q5-Q1)	0.136	0.179	596	0.423	0.258	0.299

Notes: Heterogeneity analysis based on the approach in Chernozhukov et al. (2020) (see discussion in Section 6 and Appendix C). Panel A (respectively C) show estimates on the main average treatment effects (beta 1) and the heterogeneity loading parameter (beta 2) at midline (endline). Panel B (and panel D) shows impacts per quartile of the predicted treatment effects at midline (respectively endline).

Predictions are estimated for each sample split, values are the medians across 50 sample splits. Significance is based on adjusted p-values to account for partition uncertainty (\* p < .1, \*\* p < .05, \*\*\* p < .01). Weekly Income variable is in FDJ.

**Table 11. CLAN Analysis: Baseline characteristics of the bottom and top quartiles of predicted impacts on women's employment at midline**

	Mean most affected (Q5)	Mean least affected (Q1)	Difference
Age of Woman Beneficiary	29.0***	34.3***	-4.4***
Index of Woman's mobility - factor analysis	0.241**	-0.225***	0.546***
Index of Woman's decision making - factor analysis	-0.089	0.12	-0.197
Share of adult men who have worked in last 7 days	0.887***	0.602***	0.291***
Indicator for self-esteem, beneficiary woman	21.4***	21.2***	0.1
Beneficiary women has worked in last 7 days	0	0.453***	-0.458***

Notes: Column 1 (respectively 2) display the average characteristics of the top (bottom) quintile of the predicted impact on women's employment at midline

# Annex A

**Table A1. Midline survey sample: Women**

<b>Panel A. Attrition rate</b>					
	Obs	Control Group		Treatment - Control	
		Mean	St. Dev.	Coeff.	<i>p-value</i>
Woman not surveyed at midline	1011	0.075	0.264	-0.036**	0.014
<b>Panel B. Baseline traits</b>					
	Obs	Control Group, surveyed at midline		Surveyed at midline X Treatment	
		Mean	St. Dev.	Coeff.	<i>p-value</i>
Household demographics					
Pregnant woman or child 0-3	952	0.972	0.164	0.005	0.645
Number of HH members	952	7.0	2.7	-0.3 *	0.090
Number of children 0-5	952	1.8	0.7	0.0	0.394
Number of children 6-15	952	2.2	1.8	-0.2 *	0.052
Number of adults >15	952	3.0	1.7	-0.1	0.299
Share of children 6-15 in school (cond on a child 6-15)	709	0.775	0.319	-0.005	0.836
HH head: male	939	0.968	0.177	-0.027 **	0.046
HH head: age	937	40.6	8.5	-1.3 **	0.020
HH Head: no education	914	0.66	0.47	-0.01	0.808
Beneficiary woman: age	947	33.5	6.8	-1.0 **	0.026
Beneficiary women: no education	942	0.821	0.384	0.021	0.403
Beneficiary woman					
Not employed & not searching	898	0.873	0.334	-0.003	0.890
Not employed & searching	898	0.023	0.149	0.008	0.456
Employed	898	0.105	0.306	-0.005	0.804
Day worker	898	0.039	0.193	-0.009	0.451
Self-employed	898	0.052	0.223	-0.001	0.954
Salaried	898	0.009	0.095	0.008	0.299
Share of adult members (excludes beneficiary woman)					
Not employed & not searching	892	0.355	0.373	-0.030	0.229
Not employed & searching	892	0.034	0.136	0.010	0.346
Employed	892	0.611	0.387	0.020	0.442
Day worker	892	0.339	0.410	0.065 **	0.024
Self-employed	892	0.037	0.176	-0.014	0.161
Salaried	892	0.231	0.383	-0.035	0.170
Income & transfers					
Income from labor in last 7 days (in FDJ)	895	8,517	9,191	-814	0.160
Log of income from labor in last 7 days	683	8.98	1.05	-0.07	0.322
HH had non-labor income in last 12 months	944	0.243	0.430	-0.000	0.996
HH made a transfer in last 12 months	944	0.106	0.308	-0.008	0.668
Expenditures & PMT					
Per capita total expenditures in last 30 days	902	14,307	11,515	-1,021	0.120
Per capita food expenditures in last 30 days	902	7,005	7,247	-890 **	0.021
Per capita health and educ expenditures in last 30 days	902	1,487	1,705	122	0.452
Per capita other expenditures in last 30 days	902	5,815	6,804	-253	0.517
Log of per capita total expenditures in last 30 days	902	9.41	0.52	-0.04	0.188
Log of food expenditures in last 30 days	902	8.66	0.54	-0.06 *	0.090
Share of households with PMT score above the median	939	0.514	0.500	-0.040	0.223
Bargaining Power					
Index 1: Woman participated in HH decisions	944	0.00	1.01	-0.19 ***	0.006
Index 2: Woman took decisions alone	944	0.01	1.01	-0.01	0.882
Index 3: Mobility Index	943	-0.04	0.85	0.09 *	0.096

Note: See Table 1 notes.

**Table A2. Midline survey sample: Men**

<b>Panel A. Attrition rate</b>					
	Obs	Control Group		Treatment - Control	
		Mean	St. Dev.	Coeff.	<i>p-value</i>
Husband not surveyed at midline	1011	0.276	0.448	-0.022	0.424
<b>Panel B. Baseline traits</b>					
	Obs	Control Group, surveyed at midline		Surveyed at midline X Treatment	
		Mean	St. Dev.	Coeff.	<i>p-value</i>
<b>Household demographics</b>					
Pregnant woman or child 0-3	744	0.967	0.178	0.005	0.667
Number of HH members	744	7.1	2.6	-0.4 **	0.047
Number of children 0-5	744	1.8	0.8	0.0	0.743
Number of children 6-15	744	2.3	1.8	-0.3 **	0.027
Number of adults >15	744	3.0	1.7	-0.1	0.345
Share of children 6-15 in school (cond on a child 6-15)	556	0.772	0.323	-0.011	0.707
HH head: male	732	0.989	0.105	-0.024 **	0.018
HH head: age	730	40.7	8.1	-1.7 ***	0.008
HH Head: no education	718	0.673	0.470	-0.012	0.741
Beneficiary woman: age	739	33.7	6.6	-1.2 **	0.016
Beneficiary women: no education	734	0.834	0.372	-0.001	0.966
<b>Beneficiary woman</b>					
Not employed & not searching	720	0.871	0.336	-0.010	0.700
Not employed & searching	720	0.022	0.148	0.017	0.198
Employed	720	0.106	0.309	-0.007	0.750
Day worker	720	0.039	0.194	-0.015	0.256
Self-employed	720	0.050	0.219	0.008	0.632
Salaried	720	0.011	0.105	0.003	0.727
<b>Share of adult members (excludes beneficiary woman)</b>					
Not employed & not searching	721	0.345	0.369	-0.036	0.196
Not employed & searching	721	0.037	0.142	0.010	0.413
Employed	721	0.618	0.382	0.026	0.377
Day worker	721	0.370	0.416	0.054	0.101
Self-employed	721	0.036	0.177	-0.015	0.183
Salaried	721	0.211	0.369	-0.020	0.469
<b>Income &amp; transfers</b>					
Income from labor in last 7 days (in FDJ)	717	8,522	8,657	-1126 *	0.071
Log of income from labor in last 7 days	558	8.98	1.01	-0.11	0.198
HH had non-labor income in last 12 months	737	0.224	0.417	0.030	0.357
HH made a transfer in last 12 months	737	0.105	0.307	0.009	0.705
<b>Expenditures &amp; PMT</b>					
Per capita total expenditures in last 30 days	722	14,002	10,634	-704	0.325
Per capita food expenditures in last 30 days	722	6,663	5,515	-410	0.258
Per capita health and educ expenditures in last 30 days	722	1,451	1,667	76	0.599
Per capita other expenditures in last 30 days	722	5,888	7,313	-370	0.433
Log of per capita total expenditures in last 30 days	722	9.40	0.49	-0.04	0.258
Log of food expenditures in last 30 days	722	8.65	0.50	-0.04	0.290
Share of households with PMT score above the median	732	0.499	0.501	-0.009	0.805
<b>Bargaining Power</b>					
Index 1: Woman participated in HH decisions	737	-0.04	1.05	-0.12	0.143
Index 2: Woman took decisions alone	737	-0.08	0.97	0.09	0.221
Index 3: Mobility Index	737	-0.05	0.86	0.10	0.105

Note: See Table 1 notes.

**Table A3. Endline survey sample: Women**

Panel A. Attrition rate	Control Group			<u>Treatment- Control</u>	
	Obs	Mean	St.Dev.	<u>Coeff</u>	<u>p-value</u>
Woman not surveyed at endline hh survey	1011	0.114	0.319	0.020	0.341
Woman not surveyed at endline employment survey	1011	0.112	0.316	0.039*	0.072
<b>Panel B. Baseline traits</b>					
	Obs	Control Group, surveyed at endline Mean	St. Dev.	Surveyed at endline X Treatment Coeff.	p-value
Household demographics					
Pregnant woman or child 0-3	882	0.971	0.168	0.004	0.684
Number of HH members	882	7.1	2.7	-0.3 *	0.071
Number of children 0-5	882	1.8	0.7	0.0	0.540
Number of children 6-15	882	2.3	1.8	-0.2 **	0.036
Number of adults >15	882	3.0	1.7	-0.1	0.341
Share of children 6-15 in school (cond on a child 6-15)	676	0.777	0.319	-0.007	0.774
HH head: male	871	0.966	0.181	-0.014	0.286
HH head: age	869	40.9	8.4	-1.5 ***	0.009
HH Head: no education	849	0.662	0.474	-0.018	0.579
Beneficiary woman: age	877	33.6	6.7	-0.9 *	0.057
Beneficiary women: no education	872	0.827	0.379	0.0127	0.618
Beneficiary woman					
Not employed & not searching	827	0.865	0.342	0.005	0.848
Not employed & searching	827	0.024	0.152	0.004	0.716
Employed	827	0.111	0.315	-0.009	0.688
Day worker	827	0.040	0.197	-0.017	0.180
Self-employed	827	0.057	0.232	0.002	0.902
Salaried	827	0.009	0.097	0.008	0.328
Share of adult members (excludes beneficiary woman)					
Not employed & not searching	821	0.356	0.371	-0.027	0.300
Not employed & searching	821	0.037	0.140	0.006	0.596
Employed	821	0.607	0.386	0.022	0.437
Day worker	821	0.350	0.410	0.049	0.102
Self-employed	821	0.033	0.165	-0.010	0.318
Salaried	821	0.223	0.380	-0.024	0.360
Income & transfers					
Income from labor in last 7 days (in FDJ)	826	8,825	9,741	-1070 *	0.087
Log of income from labor in last 7 days	640	9.00	1.02	-0.12	0.119
HH had non-labor income in last 12 months	867	0.247	0.432	-0.01	0.745
HH made a transfer in last 12 months	867	0.110	0.313	-0.011	0.582
Expenditures & PMT					
Per capita total expenditures in last 30 days	835	14,116	11,408	-941	0.170
Per capita food expenditures in last 30 days	835	6,849	6,926	-732 *	0.061
Per capita health and educ expenditures in last 30 days	835	1,484	1,665	83	0.621
Per capita other expenditures in last 30 days	835	5,784	6,956	-292	0.480
Log of per capita total expenditures in last 30 days	835	9.39	0.52	-0.04	0.321
Log of food expenditures in last 30 days	835	8.64	0.53	-0.04	0.236
Share of households with PMT score above the median	871	0.495	0.501	-0.028	0.422
Bargaining Power					
Index 1: Woman participated in HH decisions	874	0.00	1.00	-0.17 **	0.022
Index 2: Woman took decisions alone	874	0.02	1.00	-0.05	0.485
Index 3: Mobility Index	873	-0.03	0.85	0.07	0.205

Note: See Table 1 notes.



**Table A4. Endline survey sample: Men**

<b>Panel A. Attrition rate</b>		Control Group		Treatment - Control	
Husband not surveyed at endline hh survey	1011	0.215	0.411	-0.003	0.897
Husband not surveyed at endline employment survey	1011	0.288	0.453	-0.012	0.663
<b>Panel B. Baseline traits</b>		Control Group, surveyed at endline		Surveyed at endline X Treatment	
	Obs	Mean	St. Dev.	Coeff.	<i>p-value</i>
<b>Household demographics</b>					
Pregnant woman or child 0-3	793	0.972	0.164	0.000	0.985
Number of HH members	793	7.0	2.6	-0.3	0.174
Number of children 0-5	793	1.8	0.7	0.0	0.654
Number of children 6-15	793	2.3	1.8	-0.2	0.141
Number of adults >15	793	2.9	1.6	0.0	0.680
Share of children 6-15 in school (cond on a child 6-15)	606	0.772	0.329	-0.001	0.976
HH head: male	783	0.962	0.192	-0.002	0.867
HH head: age	782	40.5	8.3	-1.2	* 0.056
HH Head: no education	767	0.660	0.474	-0.013	0.709
Beneficiary woman: age	790	33.4	6.6	-0.6	0.239
Beneficiary women: no education	785	0.827	0.378	0.017	0.525
<b>Beneficiary woman</b>					
Not employed & not searching	690	0.863	0.344	0.012	0.643
Not employed & searching	690	0.020	0.142	0.015	0.228
Employed	690	0.117	0.321	-0.027	0.241
Day worker	690	0.041	0.198	-0.027	** 0.036
Self-employed	690	0.058	0.235	0.004	0.813
Salaried	690	0.012	0.108	0.000	0.973
<b>Share of adult members (excludes beneficiary woman)</b>					
Not employed & not searching	691	0.339	0.369	-0.036	0.212
Not employed & searching	691	0.035	0.138	0.007	0.581
Employed	691	0.626	0.383	0.029	0.335
Day worker	691	0.361	0.413	0.072	** 0.032
Self-employed	691	0.037	0.180	-0.013	0.269
Salaried	691	0.227	0.385	-0.036	0.212
<b>Income &amp; transfers</b>					
Income from labor in last 7 days (in FDJ)	689	8,660	8,759	-1010	0.115
Log of income from labor in last 7 days	540	8.97	1.09	-0.11	0.218
HH had non-labor income in last 12 months	717	0.236	0.425	-0.007	0.830
HH made a transfer in last 12 months	717	0.107	0.309	-0.007	0.756
<b>Expenditures</b>					
Per capita total expenditures in last 30 days	752	13,728	9,473	-602	0.347
Per capita food expenditures in last 30 days	752	6,733	6,562	-649	* 0.100
Per capita health and educ expenditures in last 30 days	752	1,422	1,566	202	0.266
Per capita other expenditures in last 30 days	752	5,574	4,496	-154	0.642
Log of per capita total expenditures in last 30 days	752	9.39	0.50	-0.03	0.462
Log of food expenditures in last 30 days	752	8.64	0.52	-0.04	0.320
Share of households with PMT score above the median	783	0.499	0.501	-0.022	0.543
<b>Bargaining Power</b>					
Index 1: Woman participated in HH decisions	785	0.02	0.95	-0.17	** 0.021
Index 2: Woman took decisions alone	785	0.03	0.99	-0.04	0.525
Index 3: Mobility Index	784	-0.02	0.85	0.05	0.389

Note: See Table 1 notes.

**Table A5. Nutrition**

	Midline Survey				Endline Survey			
	Obs	Control Group	Treatment - Control		Obs	Control Group	Treatment - Control	
		Mean	Coeff.	<i>p-value</i>		Mean	Coeff.	<i>p-value</i>
<b><i>Prenatal health and infant nutrition</i></b>								
At least 3 prenatal consultations during last pregnancy	n.a	n.a	n.a	n.a	734	0.718	0.05	0.139
At least 4 prenatal consultations during last pregnancy	n.a	n.a	n.a	n.a	733	0.103	0.023	0.328
Share of children 6-59 months who were fed exclusively with breast milk during the first 6 months	n.a	n.a	n.a	n.a	836	0.613	-0.038	0.268
Share of children 0-6 months old exclusively breastfed in the past 24 hours	n.a	n.a	n.a	n.a	74	0.342	-0.127	0.570
Share of children 12-23 months who still receive breast milk	n.a	n.a	n.a	n.a	272	0.391	-0.013	0.843
<b><i>Food diversity</i></b>								
<b><i>Youngest child aged 6-59 months old ... in last 24 hours</i></b>								
Had a diversified diet	675	0.526	0.036	0.365	770	0.393	-0.01	0.778
Ate food rich in proteins	675	0.744	-0.001	0.987	770	0.653	-0.033	0.345
Ate food rich in vitamins	675	0.859	0.061 **	0.016	770	0.786	0.055 *	0.054
<b><i>Youngest child aged 6-23 months old ... in last 24 hours</i></b>								
Had a diversified diet	294	0.516	0.012	0.851	227	0.304	0.12	0.114
Ate food rich in proteins	294	0.703	-0.031	0.596	227	0.554	0.018	0.811
Ate food rich in vitamins	294	0.852	0.075 *	0.050	227	0.83	0.066	0.181
<b><i>Youngest child aged 24-59 months old ... in last 24 hours</i></b>								
Had a diversified diet	381	0.535	0.025	0.646	543	0.429	-0.054	0.227
Ate food rich in proteins	381	0.778	-0.003	0.954	543	0.693	-0.068	0.117
Ate food rich in vitamins	381	0.865	0.039	0.277	543	0.768	0.065 *	0.078
<b><i>Pregnant or lactating woman.... In last 24 hours</i></b>								
Had a diversified diet	427	0.500	-0.001	0.980	197	0.376	0.066	0.476
Ate food rich in proteins	427	0.752	0.010	0.827	197	0.710	0.059	0.498
Ate food rich in vitamins	427	0.832	0.002	0.955	197	0.753	-0.034	0.644
<b><i>Food diversity 4/10 Indicator (baseline youngest child)</i></b>								
Had a diversified diet (child aged 6-59 months old)	675	0.694	0.081 **	0.022	751	0.625	-0.041	0.265
Had a diversified diet (child aged 6-23 months old)	294	0.658	0.099 *	0.077	144	0.662	-0.059	0.595
Pregnant or lactating woman has a diversified diet	427	0.703	0.009	0.847	197	0.602	0.015	0.859
<b><i>Food security</i></b>								
Concerned about not having enough food in last 7 days	920	0.196	-0.022	0.391	882	0.107	-0.026	0.189
Index of food insecurity in last 7 days	920	0.522	-0.073	0.316	882	0.287	-0.034	0.572
Coping strategy index for food security as per WFP	920	2.444	-0.712 *	0.091	882	1.122	-0.194	0.459

Notes: Coefficients from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

# Annex B

**Table B1. Comparison of results from the main analysis and from using a different set of strata variables, Midline results**

	Panel A					Panel B		
	Results from main analysis					Results controlling for different strata variables		
	Obs	Mean	Coef		<i>p-val</i>	Obs	Coef	<i>p-val</i>
Beneficiary women								
Not employed & not searching	951	0.551	-0.352	***	0.000	951	-0.351 ***	0.000
Not employed & searching	951	0.234	-0.193	***	0.000	951	-0.196 ***	0.000
Employed	952	0.215	0.545	***	0.000	952	0.547 ***	0.000
Husband								
Not employed & not searching	744	0.071	0.002		0.916	744	-0.002	0.916
Not employed & searching	744	0.089	-0.028	*	0.080	744	-0.030 *	0.052
Employed	744	0.839	0.026		0.242	744	0.032	0.145
	Share of adult members (excluding the beneficiary)							
Not employed & not searching	913	0.436	-0.003		0.869	913	-0.004	0.839
Not employed & searching	913	0.037	-0.013	*	0.054	913	-0.013 *	0.062
Employed	913	0.540	0.006		0.761	913	0.005	0.804
Total Income (in FDJ)	944	8312	3216	***	0.000	944	3197 ***	0.000
Log of total income	867	8.86	0.37	***	0.000	867	0.37 ***	0.000
Log of per capita total expenditures	914	9.22	0.09	**	0.021	914	0.08 **	0.027
Log of per capita non durables expenditures	914	9.21	0.10	**	0.013	914	0.09 **	0.018
Log of per capita food expenditures	909	8.60	0.12	***	0.005	909	0.11 ***	0.007

Notes: Coefficients are from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies, and baseline traits (see Table 3 note). \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent

**Table B2. Comparison of results from the main analysis and from selecting baseline covariate using a double lasso procedure, Midline results**

	Panel A Main analysis				Panel B Without baseline covariates			Panel C Double lasso procedure to select baseline covariates		
	Obs	Control Mean	Coef	<i>p-val</i>	Obs	Coef	<i>p-val</i>	Obs	Coef	<i>p-val</i>
Beneficiary women										
Not employed & not searching	951	0.551	-0.352 ***	0.000	951	-0.352 ***	0.000	951	-0.347 ***	0.000
Not employed & searching	951	0.234	-0.193 ***	0.000	951	-0.189 ***	0.000	951	-0.189 ***	0.000
Employed	952	0.215	0.545 ***	0.000	952	0.541 ***	0.000	952	0.543 ***	0.000
Husband										
Not employed & not searching	744	0.071	0.002	0.916	744	-0.001	0.938	744	-0.001	0.926
Not employed & searching	744	0.089	-0.028 *	0.080	744	-0.021	0.182	744	-0.022	0.156
Employed	744	0.839	0.026	0.242	744	0.023	0.315	744	0.023	0.283
Share of adult members (excluding the beneficiary)										
Not employed & not searching	913	0.436	-0.003	0.869	913	-0.026	0.307	913	0.004	0.843
Not employed & searching	913	0.037	-0.013 *	0.054	913	-0.012 *	0.086	913	-0.012 *	0.078
Employed	913	0.540	0.006	0.761	913	0.015	0.551	913	0.000	0.988
Total Income (in FDJ)	944	8,312	3,216 ***	0.000	944	2,870 ***	0.000	944	3,021 ***	0.000
Log of total income	867	8.86	0.373 ***	0.000	867	0.333 ***	0.000	867	0.348 ***	0.000
Log of per capita total expenditures	914	9.22	0.09 **	0.021	914	0.08 *	0.069	914	0.07 *	0.073
Log of per capita non durable expenditures	914	9.21	0.10 **	0.013	914	0.08 **	0.048	914	0.07 *	0.051
Log of per capita food expenditures	909	8.60	0.12 ***	0.005	909	0.11 **	0.011	909	0.10 **	0.014

Notes: Panel A: coefficients from an OLS regression of the left-hand side variable on a treatment dummy, controlling for strata dummies, survey-time dummies and baseline traits (see Table 3 note). Panel B: results of the estimates of the treatment effects, controlling only for strata dummies and survey-time dummies. Panel C: results of the estimates of the treatment effects when selecting a vector of household-level controls following the double post lasso procedure of Belloni et al. 2014. \*\*\*, \*\*, \* indicate significance at 1, 5 and 10 percent.

## Annex C: Heterogeneous Treatment Effects

In this section, we follow closely Chernozhukov et al.'s (2018) generic machine learning method to estimate heterogeneous treatment effects. The objective is to estimate treatment effects for subgroups of the target population, as defined by baseline observable characteristics  $z$ .

The objective is to estimate the conditional average treatment effect (CATE) for subgroup  $s_0(Z) = E[Y_i(1) - Y_i(0) | Z_i^d = z]$ . In the first step, we estimated a best linear predictor (BLP), or proxy predictor, of the conditional average treatment effect (CATE) of the public works offer, across a set of pre-specified covariates specified above.

We first split our data into an auxiliary sample on which to train and construct predictors of treatment effects as a nonlinear function of the control variables, and a main sample, to which the model is applied to estimate conditional average treatment effects (conditional on the relevant baseline covariate). We repeat the procedure 50 times on random splits. We adjust the algorithm to account for the randomization strata variables.

We use the estimated proxy predictors to test for heterogeneity with the following equation:

$$y = \alpha_1 + \alpha_2 B(Z) + \beta_1 (T - P(Z)) + \beta_2 (T - P(Z))(S(Z) - \hat{E}(S(Z))) + \varepsilon$$

We consider an ensemble of machine learning algorithms (Random Forest, Elastic Net, Boosting) to build the proxy predictor of  $s_0(Z)$  as well as the  $B(Z)$  using the auxiliary sample, separately by treatment group.

Estimated coefficients  $\beta_1$  corresponds to the average treatment effect (ATE), while  $\beta_2$  is heterogeneity loading parameter (HET), which is used to test whether heterogeneity exists. The method is chosen which maximizes the aggregate heterogeneity of treatment effects ( $\beta_2$ ) in the auxiliary sample. Testing the null hypothesis that  $\beta_2=0$  is a test for heterogeneity in treatment effects. ATE and HET coefficients are presented in Table 10.1. in panel A (or C) for the midline (or endline) analysis.

We next estimate the GATES (group average treatment effects), by dividing the households into 5 groups based on the quintile of the proxy predictor  $S(Z)$  and estimating the average effect of this group. Table 10 presents the average gains for the bottom quintile (the least affected group) and the top quintile (the most affected group) and the test whether the difference across the two groups is significant at conventional levels.

Finally, Table 11 focuses on the outcomes for which BLP and GATES provide evidence of significant heterogeneity. The table reports the average baseline characteristics of the subpopulations that are most or least affected, or what is referred to as classification analysis (or CLAN).