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Can Dairy Value-Chain Projects Change Gender Norms in Rural Bangladesh?

Impacts on Assets, Gender Norms, and Time Use

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ABSTRACT

Value-chain projects are increasingly being used to link smallholders to markets. However, in contexts where women tend to own and control fewer assets than men, and are more likely to be involved in informal rather than formal market activities, there is potential for value-chain projects to have unintended consequences on gender dynamics. In particular, there is concern among project implementors regarding possible adverse effects for women in terms of shifting intrahousehold distribution of assets, gender norms, and household members' time allocation to various activities. Using both quantitative and qualitative research methods, the Gender, Agriculture, and Assets Project (GAAP) worked with CARE-Bangladesh to assess the impact of the Strengthening the Dairy Value Chain Project (SDVCP) on (1) women's ownership of assets, men's ownership of assets, and jointly held assets; (2) gender norms around asset ownership and control; (3) gender norms regarding decisionmaking in these areas surrounding the dairy value chain; and (4) trade-offs and time costs involved in project participation.

We find that participation in SDVCP had significant positive impacts on the *composition* of household assets. SDVCP participants increased the value of livestock assets, as well as the value of agricultural and nonagricultural productive assets, relative to nonparticipant households that were similar prior to the program. While participation in the program increased the value of men's assets, it also increased the value of assets held jointly by men and women. This finding suggests that women were able to build up assets, not by acquiring assets that they exclusively owned, but by acquiring jointly owned assets.

We also find that program participation tended not to affect who makes dairy-related decisions. Regardless of SDVCP participation, dairy-related decisions involving financial outlays or inflows were made by husbands, while those about allocation of milk not for sale were made by wives. However, SDVCP participation had a modest impact on men's and women's decisionmaking within the household, favoring greater participation of women in household decisions and greater control by women of money for household expenses. SDVCP also increased women's mobility and ability to access value-chain services (input dealers, livestock health workers, milk collection points) both inside and outside the community.

SDVCP participation also increased households' time allocation to the specific dairy activities encouraged by the program, particularly activities related to livestock health and hygiene. This increase in time allocation was borne mostly by adult women. SDVCP also increased women's time spent on dairy activities located *within the homestead*, while it increased adult men's time spent on dairy activities that required leaving the homestead. There was no significant impact on young girls' time devoted to dairy activities, but there was a small increase among young boys. We find that the increased allocation of adult women's time for dairy activities came at the expense of their time in household activities, with young girls (but not boys) consequently increasing their time in domestic work.

Keywords: gender, value chains, dairy, impact evaluation, Bangladesh

1. INTRODUCTION

Value-chain development projects have increasingly been promoted as a way to link smallholder farmers to markets. These projects aim to increase the productivity and efficiency of actions and organizational links that move a product or service from conception through a series of steps, including production, processing, marketing, and delivery to final consumers and finally through consumption and disposal (Rubin and Manfre 2012). These efforts attempt to link smallholders to markets by shifting traditional farming strategies toward increased production for the market; by providing market information; by organizing farmers into groups, associations, or cooperatives; and by coordinating contract farming and outgrower schemes (Njuki et al. 2011a). The promotion of value-chain development for smallholders is, however, accompanied by concerns that the benefits of market-oriented production are more likely to be captured by the rich, that increased access to new market opportunities can displace local farmers, and that value-chain projects will create a privileged group of farmers with exclusive access to a new technology or marketing channel (see Njuki et al. 2011a for a review).

While income distribution effects of value-chain development projects attracted initial interest, attention to their gender impacts is relatively recent (Rubin, Manfre, and Barrett 2009; Rubin and Manfre 2012). Njuki et al. (2011a, 15) argue that programs aimed at increasing commercialization or using a value-chain approach must take into account gender and intrahousehold dynamics, and specifically different commodity options, the relative opportunities for men and women, and the potential constraints and benefits with respect to intrahousehold relations and resource flows. Njuki et al. (2011b) recognize that in many marketing activities, women's roles and preferences may be unclear, especially because they tend to participate more in local and informal markets. This can be due to a variety of factors. On the one hand, women's participation in local markets can be constrained not only because of lack of access to means of transport (Hill and Vignieri 2013) but also because some cultures value female seclusion, such as parts of South Asia. In addition, gender norms often dictate the control of income from different income sources (Duflo and Udry 2004). It has been observed that as commodities typically controlled by women become increasingly commercialized and sold in markets, women's control over income is weakened. Moreover, it is often assumed that, even when value-chain development projects are targeted to households, men and women are equally able to participate in and benefit from these projects. However, drawing on the growing empirical evidence that individuals in households do not always pool resources or share the same preferences (Alderman et al. 1995; Quisumbing 2003), questions have been raised about how men's and women's control of resources within the household affect their ability to participate in value-chain development projects, as well as how these projects, in turn, affect men's and women's control of assets and the gender norms surrounding ownership and control of those assets (Quisumbing et al. 2012). Is it possible that value-chain development projects exacerbate gender gaps? Or, if designed with adequate attention to gender norms, can they instead help to catalyze social transformation in rural areas?

This paper uses a mixed-methods approach to analyze the impact of a dairy value-chain project, CARE-Bangladesh's Strengthening the Dairy Value Chain Project (SDVCP), on the gendered distribution of assets, on gender norms surrounding the ownership and control of assets (particularly dairy cows), on decisionmaking regarding dairy-related activities and milk disposal, and on women's mobility and time use. The SDVCP is one of nine partner projects participating in the Gender, Agriculture, and Assets Project (GAAP) co-led by the International Food Policy Research Institute (IFPRI) and the International Livestock Research Institute (ILRI) with funding from the Bill and Melinda Gates Foundation.[1] This paper attempts to answer the following questions: (1) Did the SDVCP increase women's ownership of assets, men's ownership of assets, or both? If so, what types of assets? (2) Did the program change gender norms around the ownership and control of those assets? (3) Did participation in specific nodes of the

[1] See http://gaap.ifpri.info/ for more detailed information about the GAAP project and its partners.

dairy value chain change gender norms regarding decisionmaking in these areas? (4) What were the trade-offs and time costs involved in participating in this value-chain project?

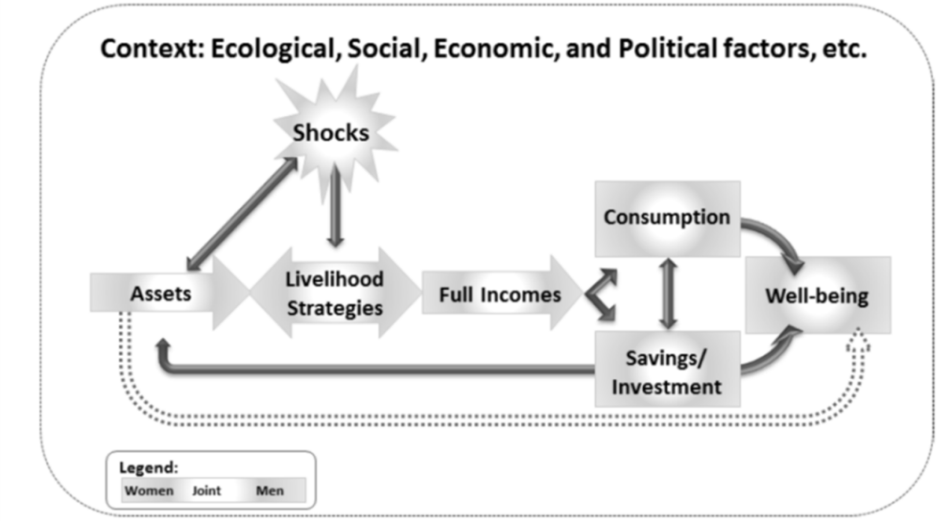
The quantitative analysis draws on longitudinal data from two rounds of household surveys conducted in August–September 2008, prior to the start of the project, and in November–December 2012, during the fourth year of the project.[2] Because site selection was purposive, the intervention could not be randomized. Thus, the quantitative analysis uses propensity-weighted regressions to compare program impact among program SDVCP participants (treatment households) with two counterfactual comparison groups: eligible non-beneficiary farmers in areas where the SDVCP operates (Control 1 households) and eligible farmers in areas without milk-chilling plants where the SDVCP does not operate (Control 2 households). The qualitative analysis comprised key informant interviews and focus group discussions (FGD) among program participants and was conducted in July–August 2011. It must be noted that the SDVCP participants included in this study were those who participated in the first year of the project, and not those recruited in later years, which involved slightly different programmatic emphases and recruitment criteria.

[2] Although it would have been ideal for the endline survey to be carried out at the same time of year as the baseline survey, funding delays led to a delay in the fieldwork. However, our use of a comparison group (as described below) helps minimize the possibility of bias in the results due to seasonal factors.

2. CONCEPTUAL FRAMEWORK: ANALYZING THE GENDER-ASSET IMPACTS OF VALUE-CHAIN DEVELOPMENT PROJECTS

The GAAP draws on a conceptual framework that highlights the gendered character of asset access, control, and ownership throughout a process of creation, accumulation, and savings or consumption (Meinzen-Dick et al. 2011).[3] It maps the gendered pathways through which asset accumulation occurs. It includes not only men's and women's exclusively owned assets but also assets with jointly shared control and ownership, as indicated by the shading in Figure 2.1. Unlike previous frameworks, this model depicts the gendered dimensions of each component of the pathway, recognizing that men and women not only control, own, or dispose of assets in different ways, but also access, control, and own different kinds of assets.

Figure 2.1 Schematic representation of the role of assets in a gendered livelihood conceptual framework



Source: Meinzen-Dick et al. 2011.

The framework generates hypotheses that can be tested empirically, including that (1) different types of assets enable different livelihoods, with a greater stock and diversity of assets being associated with more diverse livelihoods and better well-being outcomes; (2) men and women use different types of assets to cope with different types of shocks; (3) interventions that increase men's and women's stock of a particular asset improve the bargaining power of those who control that asset; and (4) interventions and policies that reduce the gender gap in assets are better able to achieve development outcomes related to food security, health, nutrition, and other aspects of well-being related to agency and empowerment (see Meinzen-Dick et al. 2011).

Agricultural development interventions tend to influence assets in three major ways. First, some interventions increase the stock of agricultural assets such as land, livestock, water, or machinery. This enables farmers to increase production or build up the stock of intangible assets (human capital, social capital, or political capital) that may be complements to traditional agricultural assets and that can also be crucial in enhancing empowerment and women's decisionmaking roles. Second, interventions can increase the returns to assets such as land or labor that are used in agriculture by increasing productivity, for example, through improved technologies or interventions to strengthen markets and increase income. Third, interventions can reduce risk, thereby protecting assets from being sold to smooth consumption if a

[3] This conceptual framework was developed by the GAAP research team and is a guiding model of its work.

household experiences income losses or other shocks. In reality, many projects affect assets through a combination of these three approaches. The SDVCP, for example, does not directly increase the stock of agricultural assets (it does not transfer livestock to farmers), but by strengthening the dairy value chain, it has the potential to increase returns to livestock assets held by households and individuals within households. This may, in turn, increase incentives to accumulate livestock assets. It may also increase incomes, which could lead to investment in livestock assets or other types of assets. By intervening in the value chain, the SDVCP could change patterns of male, female, and joint ownership and control of livestock and other assets, income flows, and use of resources, such as time, of different household members.

3. BACKGROUND AND PROGRAM DESCRIPTION[4]

Background

In Bangladesh, although the number of women in the agricultural labor force is increasing (Asaduzzaman 2010), they still tend to be "invisible" in the agricultural sector, owing to the commonly held view that women are not involved in agricultural production, especially outside the homestead, because of cultural norms that value female seclusion and undervalue female labor (Kabeer 1994; Rahman 2000). However, women in poor households, who are at greater risk of being food-insecure, are more likely to be involved in the agricultural sector, particularly as wage laborers, because women's earnings are important to their families' subsistence. Zaman (1995) provides evidence that the gender division of labor in agriculture is not as strictly demarcated as assumed, with women being involved in agricultural work both inside and outside the household.

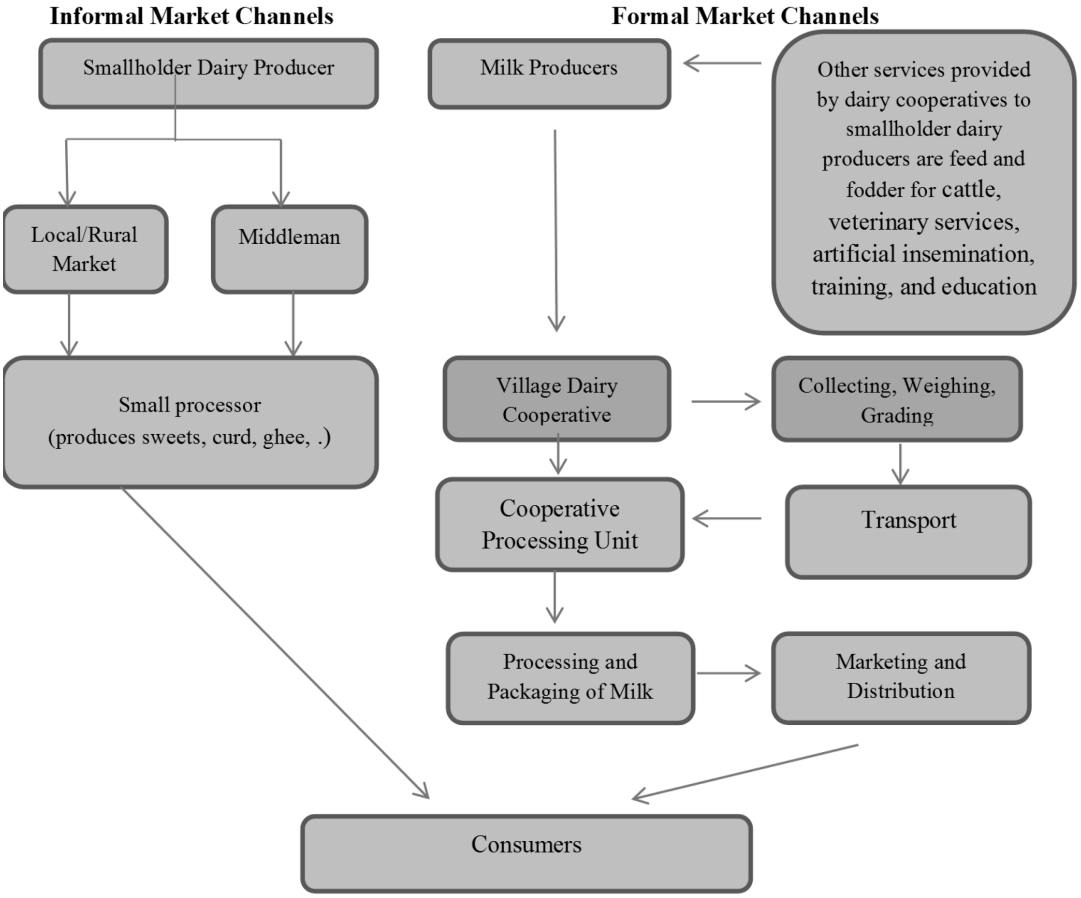
Men and women play different roles in the livestock sector. Women engaged in smallholder dairy farming feed the cattle, clean livestock sheds, milk cows, and sell milk within the homestead. Men are more involved in cattle breeding, herding, and marketing of milk outside the homestead. Although women are actively involved in cattle rearing, they have limited decisionmaking ability, especially when it comes to marketing and income control (Saadullah 2001). Women very rarely own land in Bangladesh, but they do own some livestock, particularly poultry, which they raise for food for the household and for income through sale of eggs. Todd (1998) describes a livestock investment trajectory for women in Bangladesh, starting with poultry, then moving on to goats and eventually to milk cows. Goats are also managed by women for cash income for the household. Women tend not to consider taking care of poultry and goats to be work. Because goats and chickens do not require purchased feed, they can be raised without competing for resources with cattle raising (Jahan and Rahman 2003).

Both informal and formal milk-marketing channels coexist in Bangladesh. Formal channels consist of public- and private-sector companies or dairy cooperatives such as the Bangladesh Milk Producers' Cooperative Union, Limited. Informal channels involve selling milk directly to consumers in rural areas or to traders in local or rural markets. Traders or middlemen then sell milk in bulk to dairy cooperatives (Zaedi et al. 2009). It is estimated that about 90 percent of milk produced by smallholders is sold through informal channels, and only 10 percent is sold to formal dairy-processing companies. However, the formal sector is increasing its role in the dairy sector by providing smallholder dairy farmers with improved dairy breeds, improved inputs, and marketing facilities for milk products (Curtis 2011). Dairy products available in urban areas include pasteurized liquid milk, butter, ghee, full-cream milk powder, skim milk powder, flavored milk, sweet curd, *rasa malai* (sweetmeats), and cream. Sweetmeats and ghee are the most important dairy products sold by the informal sector (Hemme, Garcia, and Khan 2004) (Figure 3.1).

Milk and milk product consumption is much lower in Bangladesh than in other developing nations. The National Health Strategy recommends a daily milk ration of 250 millimeters (ml)/person. The actual average daily consumption is 42 ml/person, less than one-fifth of the recommended intake. The low level of national production cannot meet the demand of Bangladesh's growing population (PRAN-RFL Group 2007; Edwards and Shamsuddoha 2000), and when available, fresh milk is very expensive and of poor quality. As a result, Bangladesh is a net importer of milk and milk products. The imported milk is preserved and thus has a longer shelf life than fresh milk. This makes it more attractive to customers than the locally produced fresh milk. Consumption of locally produced milk can be enhanced if production volumes increase, quality is improved, and prices are reduced (PRAN-RFL Group 2007).

[4] This section draws on Ahmed et al. (2009), Ahmed et al. (2013), and Sraboni et al. (2013).

Figure 3.1 Formal and informal marketing channels in Bangladesh



Source: Zaedi et al. 2009; Saadullah 2001.

Project Description

With the support of the Bill and Melinda Gates Foundation, CARE-Bangladesh implemented the SDVCP in nine districts in northwestern Bangladesh from October 2007 to December 2012. The project aimed to increase the income of 35,000 targeted smallholder and landless milk-producer households and to create employment opportunities for extremely poor households—and especially for women in those households—through various activities along the dairy value chain. This project was motivated by the fact that even though dairy is integral to poor households' livelihood in a crop–livestock system, the formal dairy sector in Bangladesh has not been able to effectively link small farmers and the landless to markets. Indeed, the region of focus—the north and northwest of Bangladesh—is characterized by extremely weak dairy value chains. An area feasibility study undertaken by Hossain and Mahamud (2007) describes how sites for the project were selected. At the *upazila* (subdistrict) level, sites were chosen based on a stakeholder consultation, and the worst-off regions were included to maximize the impact on poverty reduction. Priority for inclusion was given to regions with weak dairy value chains, remote geographic areas, and areas prone to natural disasters such as floods.

The SDVCP aimed to achieve its goals by linking producers with service providers and chilling plants; mobilizing capital for chilling plants; transporting the chilled milk to formal-sector processing plants, informal-sector sweet-makers, or both; and documenting and disseminating efficient techniques and best practices. Specifically, the objectives of the project were as follows:

1. Improve milk collection systems in rural and remote areas
2. Improve access to inputs, markets, and services by mobilizing groups of poor farmers, producers, and *char* dwellers[5]
3. Improve the artificial insemination network
4. Ensure access to quality service at the producer level
5. Improve the policy environment in the dairy sector

The project emphasized relieving supply-side bottlenecks in a smallholder dominated system. Care of dairy animals is usually a woman's responsibility in Bangladesh, but low yields, particularly of indigenous breeds, and constraints to women's mobility outside the village, owing to norms favoring women's seclusion as well as poor transport networks, often limit milk distribution to home consumption and marketing of the limited surplus to informal channels within the village. The problem of low yields was addressed by encouraging households to purchase crossbred animals, to use AI services, and to adopt better livestock care practices (including better feeding and livestock health practices). The project also supported the establishment of input supply points where dairy farmers could obtain feed and other inputs into dairy production.

One of the project's innovations addressed the issue of collecting and transporting an adequate volume of milk to chilling plants. Although most households sold milk within the village to either milkmen (who went door-to-door) or the informal market (Ahmed et al. 2009) at baseline, locating fixed milk-collection facilities (including testing for quality using a lactometer) more conveniently within the village was intended to benefit all dairy producers because it reduces transactions and transportation costs and also ensures quality of the milk. It also reduces barriers to women's participation in dairy marketing by eliminating the need to leave the village to sell milk. By the time of the mid-term evaluation in 2010, project participants had the perception that the overall quantity and quality of milk had improved as a result of the project (Alam et al. 2011). The milk collection facilities within the village, however, do not directly reduce the barriers to women's mobility *outside* the village—the milk still has to be transported to the chilling plants, which are typically located in larger market areas—but at least they offer a way to sell milk with lower transactions cost while ensuring appropriate compensation for milk quality.

The project also helped to create dairy farmer associations, most of which were formed among groups of poor women-smallholder dairy farmers. Reflecting the focus of CARE-Bangladesh's programming, the project aimed to increase women's employment throughout the value chain as producers, input suppliers including as livestock health workers, and other jobs where they are typically underrepresented (for example, AI specialists, milk collectors, loan officers, and transport positions). However, attempts to increase women's participation in the dairy value chain in Bangladesh have not been uniformly effective. While the SDVCP has done well with respect to women producers, with women accounting for close to 80 percent of the project's producers, only 25 percent of the livestock health workers and 17 percent of milk collectors are women (Alam et al. 2011). Further details on the operation of the SDVCP can be found in the baseline report (Ahmed et al. 2009) and the mid-term evaluation (Alam et al. 2011).

[5] *Char* dwellers live on remote areas of new land formed through a continual process of erosion and deposition associated with the major rivers that run through the country.

4. STUDY DESIGN

This research was undertaken using a mixed-methods approach, with the qualitative study nested within a quantitative longitudinal impact evaluation. The scope of the quantitative impact evaluation was quite broad, but this paper concentrates on four key questions related to gender and assets, which were investigated using both quantitative and qualitative methods (Table 4.1). We begin by describing the approach and estimation method for the quantitative impact evaluation, and then we discuss the qualitative methods used.

Table 4.1 Questions addressed using quantitative and qualitative methods

Research Question	Quantitative	Qualitative
Did the SDVCP increase ownership of assets by women, men, or both? What types of assets?	Yes	Yes
Did the program change gender norms around the ownership and control of those assets?	No	Yes
Did participation in specific nodes of the dairy value chain change gender norms regarding decisionmaking in these areas?	Yes	Yes
What were the trade-offs and time costs involved in participating in the dairy value-chain project?	Yes	Yes

Source: Authors.

Quantitative Impact Evaluation Methodology

The quantitative evaluation of the SDVCP includes an assessment of what impacts on key outcomes the project caused for beneficiary households, relative to the outcomes those households would have experienced in the absence of the project.

Sampling

The quantitative impact evaluation draws on longitudinal data from two rounds of household surveys. The first round of the survey was collected in August–September 2008, prior to the start of the project. The second survey was carried out in November–December 2012, the fourth year of the project.[6] Originally, the endline survey was intended to take place two years after the baseline, in 2010, after which the first group of participants would have graduated from the project; however, owing to changes in programming and logistical delays, the survey took place in 2012 instead. Because the impact evaluation relied on a baseline survey collected prior to the start of the program, participant households were those who participated in the first year. The results of the impact evaluation should not be interpreted as the impact of the overall SDVCP, because the program was modified in subsequent years, including shifts in recruitment criteria starting from the second year of SDVCP.

For the purposes of impact evaluation, the sample included both beneficiary households and two categories of non-beneficiary households deemed similar to the beneficiary households at baseline. These two non-beneficiary categories are referred to as Control 1 and Control 2:

- Control 1 households were nonparticipants selected from villages where the SDVCP would not operate but within unions where the SDVCP would operate. The geographic proximity of Control 1 households to participant households makes them good candidates to be similar at baseline, but it also creates substantial potential for them to experience spillover effects from the project. In particular, because the SDVCP strengthens the dairy value chain at large, villages neighboring SDVCP villages are likely to be affected by the program even though households in those villages are not directly targeted.

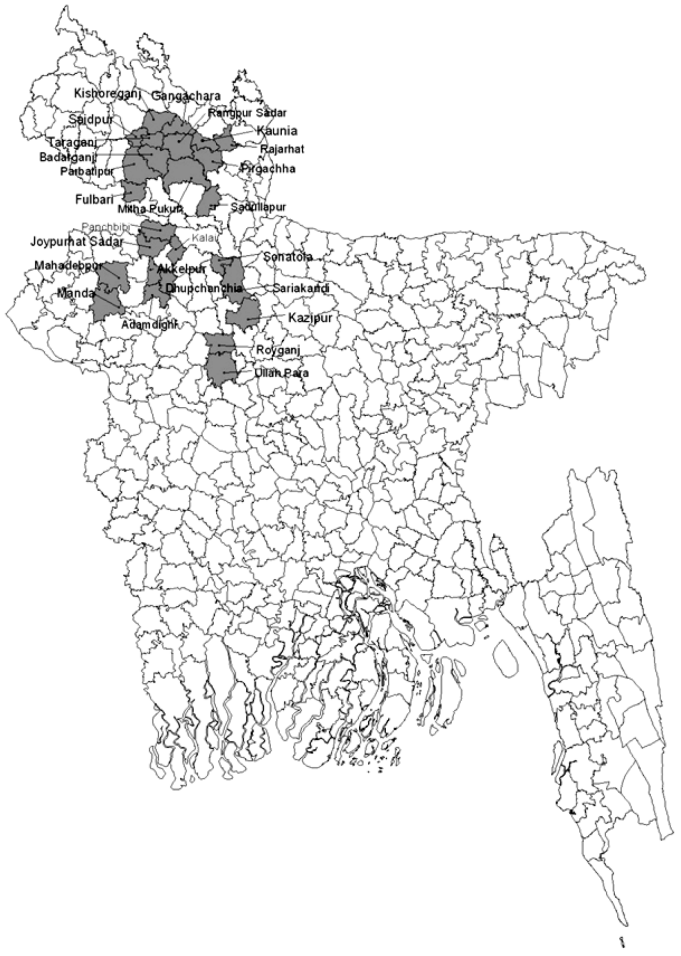
[6] While it would have been ideal for the second round of the survey to be carried out at the same time of year as the first round of the year, funding delays led to a delay in the fieldwork. However, our use of a comparison group helps minimize the possibility of bias in the results due to seasonal factors.

- Control 2 households were nonparticipants selected from the nine project districts but in *upazilas* where the SDVCP would not operate. The geographic distance between Control 2 households and SDVCP participants gives minimal potential for spillover effects. However, the distance may also lead Control 2 households to be slightly less comparable to participant households at baseline. In particular, Control 2 households were chosen from *upazilas* that did not have any milk-chilling plants at baseline, but all SDVCP *upazilas* did have milk-chilling plants, creating a potential source of noncomparability.

Sample size calculations were conducted prior to designing the baseline sample and are discussed in detail in Ahmed et al. (2009); the total baseline sample included 1,500 households in 60 clusters or villages, or 25 households in each survey village. Our sample contains 1,509 households interviewed at baseline and successfully reinterviewed at endline. We use all of these households for our analysis, with the exception of a small number of households (33) that were intended to be eventual participants but reported having no cows at baseline; however, cattle ownership was part of the eligibility criteria. Thus our potential estimation sample is 1,476 households: 635 participant households, 421 Control 1 households, and 420 Control 2 households. It must be noted that beneficiary, Control 1, and Control 2 households were sampled from the producer population, and may not be representative of other stages in the dairy value chain. Although interviews were also conducted among participants in other stages of the value chain (livestock health workers, input suppliers), these respondents are not included in the sample used for the impact estimates.

A map of the surveyed *upazilas* is presented in Figure 4.1.

Figure 4.1 Map of Bangladesh showing the survey *upazilas*



Source: Ahmed et al. (2009).

Questionnaire Design Focusing on Gender and Assets

Both baseline and endline questionnaires collected information on household demographic characteristics, employment, food and nonfood expenditures, and anthropometry of children and adult women. In addition, detailed land and assets modules obtained information on the area of landholdings and the value of different types of assets, including whether land and assets were owned by the husband, owned by the wife, jointly owned by both spouses, jointly owned with other household members, or jointly owned with nonhousehold members. Owing to the emphasis on the dairy value chain, questionnaire modules also collected data on the number and type of livestock, including cattle breeds, as well as information on livestock care and dairy practices. Furthermore, the questionnaire delved into different aspects of gendered decisionmaking and control over dairy-related assets, credit, uses of women's income, decisionmaking over household expenditures, and attitudes toward women's mobility. Questions on women's mobility were related not only to movement within and outside the village, but also to women's ability to go to specific places related to the dairy value chain (such as milk collection, input supply, and health facilities) without the need to ask permission from other household members. Most of these questions were asked at both baseline and endline, but additional questions on time allocation of different household members were added in the endline survey. Dairy-related outcomes are analyzed in Ahmed et al. (2013); the present paper focuses on gendered ownership and control of assets and changes in women's decisionmaking, particularly around the value chain, as well as on impacts on time allocation of men, women, girls, and boys.

Assessment of Project Impact

To measure the impact of the SDVCP, we must compare observed outcomes for project beneficiary households to the outcomes that *would have been for those same households in the same time period if the project had counterfactually not been implemented.*[7] The fundamental challenge in estimating impact is that we do not observe the counterfactual—that is, the outcomes of beneficiaries in the absence of the intervention. The key to impact evaluation is devising a strategy to construct these counterfactual outcomes of beneficiary households in the absence of intervention, using information on non-beneficiaries. It is not straightforward to take outcomes of non-beneficiary households as a proxy for outcomes of beneficiary households in the absence of intervention.

The counterfactual inference is particularly challenging when beneficiaries were purposively chosen, as is the case in the SDVCP. Given that worse-off regions with weaker dairy chains were prioritized for the SDVCP program receipt, we would expect that the average SDVCP non-beneficiary household would have better dairy-related outcomes than the average SDVCP beneficiary household in the absence of any program. A simple comparison of the average beneficiary household and the average non-beneficiary household would thus misrepresent the program impact, conflating differences caused by the program with differences that already existed prior to the program. Constructing a valid counterfactual requires controlling for the effects of confounding economic and contextual factors that make project beneficiaries systematically different from an average non-beneficiary. These confounding factors can include the relative poverty of beneficiaries in targeted programs, exposure to economic shocks, or differences in household characteristics (for example, demographics, skill levels, or social networks) that

[7] Note that this measure of impact is distinct from simply comparing beneficiary households' outcomes before and after the program; these before-and-after comparisons can be made using monitoring and evaluation data. To illustrate the difference, suppose that there was an outbreak of cattle disease during the course of the project, but for reasons unrelated to the project. In such a case, beneficiary households' dairy incomes might be lower after the program than before the program, but the reduction should not be attributed to the program. Instead, we should attribute to the program only the change between before-program and after-program income that would not have occurred if the same households had not received the program. If we were to find a proxy for this counterfactual situation, based on similar households that had not received the program, we would likely find that their incomes, too, were lowered between the two periods. Comparing differences over time between the beneficiaries and similar non-beneficiaries would therefore give us a more accurate measure of the program's impact, which is the approach we take in impact evaluation.

affect the impacts of the program. Impact estimates that adjust for these confounders reduce the likelihood of selection bias.

We note that the most powerful way to construct a valid counterfactual for SDVCP beneficiaries would have been through an experimental design, in which households were randomly selected out of a pool of eligible candidates to receive the program. However, for the evaluation of the SDVCP, an experimental approach was not feasible because the project sites had been purposively selected for this intervention. Moreover, the project beneficiaries had been selected from smallholder milk producers who were mostly concentrated around the formal-sector milk-chilling infrastructure. Since we cannot expect average non-beneficiaries to be valid proxies for average beneficiaries in this scenario, we must instead employ a nonexperimental approach for assessing the impact of the SDVCP.

Our preferred nonexperimental approach to evaluating the impact of the SDVCP is a method called propensity score–weighted regression (Hirano, Imbens, and Ridder 2003). Propensity score–weighted regression entails constructing weights that, when applied, yield a statistically balanced "comparison group" out of nonrandomly assigned non-beneficiaries. With the weights applied, the beneficiary households and the comparison group are balanced in terms of preprogram observable characteristics. The key identification assumption for this methodology is that after differences in these observable characteristics are accounted for, no characteristics correlated with both program receipt and key outcomes remain. Under this assumption, the comparison group can then be used to estimate impacts in a regression framework, in a manner very similar to an experimental design.[8] We use this strategy to estimate "intent to treat" impacts, that is, the impacts of the project on those households selected at baseline as eventual project recipients. Key steps in implementing propensity score–weighted regressions are outlined in the Appendix.

Our propensity score–weighted regression analysis makes use of the longitudinal data collected on treatment and comparison households. For our main estimates, we use an analysis of covariance (ANCOVA) specification. The ANCOVA specification allows a household's outcome at endline to depend on the same household's outcome at baseline as well as on the household's treatment status and an error term (accounting for any omitted observable or unobservable factors). Denoting Y_t as an outcome of interest at time t, T^1_t as the treatment indicator for Treatment Definition 1, T^2_t as the treatment indicator for Treatment Definition 2, and ε^1_t and ε^2_t as the respective error terms, the specifications estimated for Treatment Definition 1 and Treatment Definition 2 are as follows:

Treatment Definition 1: $Y_t = \beta_0^1 + \beta_1^1 * Y_{t-1} + \beta_2^1 * T_t^1 + \varepsilon_t^1$,

and

Treatment Definition 2: $Y_t = \beta_0^2 + \beta_1^2 * Y_{t-1} + \beta_2^2 * T_t^2 + \varepsilon_t^2$.

As described above, the identification assumption of the propensity score–weighted regression method is that once we account for the propensity score weights, any omitted observable or unobservable factors should be uncorrelated with treatment status. Thus the coefficients estimated on the respective indicators for treatment status should yield unbiased estimates of project impact: β^1_2 for Treatment Definition 1 and β^2_2 for Treatment Definition 2.

ANCOVA is our preferred specification for several reasons. First, ANCOVA captures the same key sources of variation in longitudinal data as the difference-in-difference specification: the before-and-after dimension (allowing us to distinguish post-program differences caused by the program from those generated by preprogram differences) and the with-or-without dimension (allowing us to distinguish changes between preprogram and post-program that were caused by the program from those that occurred due to unrelated changes over time). Furthermore, the ANCOVA specification provides a more efficient

[8] We note that this identification assumption is the same as for propensity score matching, a very closely related nonexperimental impact estimation methodology. Propensity score–weighted regression and propensity score matching are likely to yield very similar impact estimates. Hirano, Imbens, and Ridder (2003) note that propensity score–weighted regression is more efficient in general.

estimate of program impacts for outcomes with relatively low autocorrelation (McKenzie 2010), since the specification allows estimating autocorrelation rather than imposing it to be unity.[9]

Qualitative Study Design

The qualitative study was conducted in 10 subdistricts in Rangpur and Bogra Districts, in the SDVCP area in July and August 2012. Eleven SDVCP beneficiary groups were purposively selected for the qualitative study. Each focus group consisted of between 14 and 30 participants. Of the 11 groups interviewed, 7 consisted of only women and 4 of both sexes. Although the total number of men was small, only 7 out of 208 people (Table 4.2), the number reflects the actual composition of groups (mixed-sex groups have very few men, typically one or two, who are chosen because they are literate or have good contacts within the community).[10] Focus group interview protocols (available from the authors upon request) were prepared in English and translated to Bangla. These were pretested with two groups not included in the final sample of groups. The FGDs were conducted in Bangla and the responses were then translated to English. Interviews with key informants (community leaders, livestock health workers, traders, or project officials) were conducted, and observations were made to clarify points raised in discussions. Responses from the focus group were documented, arranged into categories, and analyzed.[11]

Table 4.2 Composition of focus groups, by sex

Group name	Number of men	Number of women
Hashi milk-producing group	0	20
Lipi milk-producing group	2	16
Surjomukhi milk-producing group	1	16
Bijli milk-producing group	2	12
Shapla milk-producing group	2	21
Sraboni milk-producing group	0	15
Bondhon milk-producing group	0	18
Uddyog milk-producing group	0	16
Kolpona milk-producing group	0	20
Nodi milk-producing group	0	30
Usha milk-producing group	0	17

Source: Kakuli Tanvin, field notes.

Note: Real names have been replaced with pseudonyms to conceal groups' real identity.

The FGD checklist study consisted of three major sections: (1) asset ownership, (2) access to resources (capacity, credit, savings group), and (3) dairy and management of dairy-related income. The first group of questions addressed the patterns of asset ownership and decisionmaking responsibility over them. The second set of discussion questions inquired about the access to, use of, and extent of productive resources, including credit and training, for men and women. The last set of questions addressed the management of dairy production and the use and control of dairy-related income.

[9] To assess sensitivity to specification, we ran our estimation both using difference-in-difference and using ANCOVA, finding little difference in results for most outcomes. However, for outcomes with large variability such as expenditures, the difference-in-difference estimates were less robust, as we would expect. Therefore, in our main presentation of results, we show estimates using the ANCOVA specification.

[10] A male member of mixed-sex groups is usually a husband of a group member.

[11] Initially, data were documented by group, whereby responses to all the questions in the checklist were documented by group. Responses for each question by each group were then transferred verbatim into a table, which we call the first database. The responses were then organized into categories; for example, differently worded responses stating the same message were identified and a representative statement of the group of key messages developed. The number of groups associated with a key message was then counted, and then listed as groups that made the statement and presented in a second database. The statements were then analyzed and their implications or what they represented documented with support from existing literature and in reference to the findings of the (quantitative) baseline survey (Ahmed et al. 2009), a (qualitative) mid-term evaluation (Alam et al. 2011), and an endline impact evaluation (Ahmed et al. 2013).

5. PATTERNS OF GENDERED ASSET OWNERSHIP AND CONTROL: FINDINGS FROM QUANTITATIVE AND QUALITATIVE STUDIES

Descriptive Statistics

Table 5.1 presents information on baseline asset and landholdings at the household level, by treatment status. All descriptive statistics are weighted using propensity scores to make the control groups more comparable to the treatment group.

At baseline (2008), the value of household nonland assets ranged from 50,563 to 57,480 taka across all three groups, with livestock accounting for close to 70 percent of the value of the households' nonland asset portfolio.[12] Among nonlivestock assets, consumer durables were the most important, followed by jewelry, agricultural productive assets, and nonagricultural productive assets. On average, households in this area cultivated close to 100 decimals of land (100 decimals = 1 acre), with owned land accounting for about 60 percent of cultivated land area, the balance being rented. Note that because ownership of a cow was one of the criteria for being included in the program, program participants (and their comparable treatment households) are not among the poorest in rural Bangladesh.

Gender asset inequality is evident when we examine a breakdown of asset and landownership by husband and wife (top of Table 5.2, with jointly owned assets distributed among each equally), as well as when we explicitly take into account the distribution of assets across husband, wife, and jointly owned assets (bottom of Table 5.2). If we assume that joint assets are equally owned by husband and wife, the value of nonland assets owned by wives was approximately half the value that their husbands own. The value of wives' nonlivestock assets was about 63 percent of their husbands, while the value of their livestock assets was only 48 percent of husbands' livestock assets. However, if we account for husband's exclusively owned, wife's exclusively owned, and jointly owned assets, gender asset gaps are stark, with husband-owned assets accounting for the bulk of each asset category, followed by jointly owned, and then wife's assets, with the exception of jewelry. Jewelry is clearly identified as women's assets, although households may also consider a large portion of jewelry as jointly owned.

Similarly, large gender gaps were found in landownership, even larger than what is found in asset ownership (Table 5.3). About 93–94 percent of land was owned by husbands, and about 5–6 percent of land was owned by wives. Very little land was jointly owned—less than 1 percent of the households' total holdings.

Livestock accounted for about two-thirds of the value of households' nonland asset portfolio. Households in the SDVCP owned three cows at baseline; on average, control households had slightly smaller herds (Table 5.4). On average, households owned one goat and 6.8 chickens, as well as other animals. Similar to nonlivestock assets and land, most livestock were owned by men (Table 5.4), although the degree of gender inequality varies across types of livestock. Men owned close to 50 percent of the households' cattle; jointly owned cattle accounts for about 40 percent, and women-owned cows account for only about 11 percent of the value of household cattle holdings. Both male-owned and jointly owned goats account for about 40 percent of household holdings of small ruminants (goats and sheep), and women owned close to 20 percent of these livestock, higher than their share of large ruminants. Poultry holdings were the most evenly distributed by type of ownership, with about 37 percent jointly owned, 35 percent owned by women, and 27 percent owned by men.

[12] In September 2008, US$1 = 67.4 Bangladeshi taka.

Table 5.1 Baseline land and asset holdings, by treatment status, incorporating propensity scores

Types of land and nonland assets	Treatment (n = 635)		Control 1 (n = 844)		Control 2 (n = 813)	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Household asset holdings (in 2008 taka)						
Value of household assets	56,448.35	53,545.75	57,480.36	56,480.71	50,562.92	47,234.44
Value of nonlivestock assets	17,568.21	27,095.19	18,095.18	27,822.39	15,543.3	23,988.96
Value of livestock assets	38,880.15	36,496.36	39,385.18	37,175.73	35,019.62	31,830.85
Value of nonlivestock assets, by type (in 2008 taka)						
Consumer durables	14,003.82	22,568.71	14,362.03	22,918.84	12,569.83	20,003.82
Jewelry	5,720.09	14,777.31	6,100.02	14,789.13	5,224.41	13,130.42
Agricultural productive assets	2,538.51	7,241.52	2,908.71	8,706.96	2,261.79	6,563.77
Nonagricultural productive assets	1,340.61	5,421.38	1,171.43	4,801.88	990.79	4,572.39
Landholdings (area in decimals)						
Owned land	77.13	126.44	74.29	117.78	68.78	126.44
Owned and cultivated land	61.60	110.64	59.38	102.98	54.80	110.64
Other owned land	7.70	48.32	7.24	42.89	5.83	48.32
Land rented in	33.99	62.30	32.55	58.14	32.69	62.30
Cultivated land	98.78	130.10	94.66	120.57	90.43	130.10

Source: Authors' computations from baseline dataset of Impact Evaluation of Strengthening the Dairy Value Chain in Bangladesh.

Table 5.2 Individual asset holdings, by treatment status, in 2008 taka, incorporating propensity scores

	Treatment (n = 635)		Control 1 (n = 844)		Control 2 (n = 813)	
Types of assets	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Value of nonland assets						
Husband	37,554.70	40,212.50	36,999.59	39,410.01	33,301.46	35,334.76
Wife	18,893.66	27,729.80	20,480.77	29,153.90	17,261.46	24,538.54
Value of nonlivestock assets						
Husband	10,895.80	17,296.70	11,165.91	17,892.15	9,322.37	15,332.06
Wife	6,672.41	13,795.49	6,929.27	14,050.28	6,220.94	12,391.32
Value of livestock assets						
Husband	26,658.90	31,007.23	25,833.68	28,906.14	23,979.09	26,906.37
Wife	12,221.25	19,552.78	13,551.50	20,308.64	11,040.53	17,294.69
Value of nonlivestock assets, by category and type of ownership						
Consumer durables						
Owned by husband	3,954.87	7,160.79	4,000.13	7,579.46	3,470.25	6,618.02
Owned by wife	611.68	2,170.30	530.85	1,987.87	542.24	2,026.34
Owned jointly	3,402.46	9,661.16	3,384.04	9,444.18	3,053.81	8,424.95
Jewelry						
Owned by husband	895.88	4,520.33	799.37	4,430.68	767.92	4,065.97
Owned by wife	2,262.66	7,782.20	2,298.82	8,319.02	2,331.08	7,464.59
Owned jointly	2,561.54	12,555.49	3,001.83	12,336.21	2,125.41	10,813.31
Agricultural productive assets						
Owned by husband	1,544.79	6,313.35	1,596.52	7,623.52	1,236.92	5,408.67
Owned by wife	49.43	587.34	43.83	502.69	45.07	543.81
Owned jointly	944.29	3,806.65	1,268.35	4,559.82	979.80	3,939.55
Nonagricultural productive assets						
Owned by husband	814.52	4,672.46	760.05	4,192.84	597.75	3,921.56
Owned by wife	62.90	557.32	45.93	470.47	53.02	479.46
Owned jointly	463.19	2,723.77	365.45	2,311.64	340.02	2,298.86

Source: Authors' computations from baseline dataset of Impact Evaluation of Strengthening the Dairy Value Chain in Bangladesh.

Table 5.3 Individual-level landholdings at baseline, by treatment status (area in decimals)

	Treatment (n = 635)		Control 1 (n = 844)		Control 2 (n = 813)	
Landholdings	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Men's owned land	63.55	108.31	62.34	102.67	58.14	108.31
Women's owned land	4.41	23.30	3.48	19.97	3.73	23.30
Jointly owned land	0.29	3.71	0.31	3.83	0.23	3.71

Source: Authors' computations from baseline data set of Impact Evaluation of Strengthening the Dairy Value Chain in Bangladesh.
Note: 100 decimals = 1 acre.

Table 5.4 Number and value of household livestock holdings at baseline, by treatment status, incorporating propensity scores

	Treatment (n = 635)		Control 1 (n = 844)		Control 2 (n = 813)	
Livestock holdings	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Ownership at the household level						
Number of livestock						
Cattle	3.01	1.65	2.98	1.64	2.77	1.54
Goats	0.96	1.54	1.03	1.58	0.99	1.47
Poultry	6.82	8.57	6.37	8.65	6.83	7.90
Other animals	0.15	0.74	0.22	1.96	0.13	0.68
Value of livestock (in 2008 taka)						
Cattle	36,429.92	35,487.68	37,120.39	36,249.01	32,634.81	30,932.21
Goats	1,137.24	2,147.10	1,117.55	2,053.55	1,143.33	2,059.83
Poultry	806.76	1,363.77	737.34	1,367.26	812.44	1,213.54
Other animals	506.23	4,517.40	409.91	4,211.24	429.04	4,153.45
Number of livestock, by type of ownership, top three categories by value						
Cattle						
Owned by husband	1.55	1.88	1.37	1.77	1.42	1.75
Owned by wife	0.43	1.16	0.41	1.11	0.35	1.04
Owned jointly	1.03	1.80	1.21	1.93	1.00	1.66

Table 5.4 Continued

Livestock holdings	Treatment (n = 635)		Control 1 (n = 844)		Control 2 (n = 813)	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Goats						
Owned by husband	0.40	1.07	0.43	1.07	0.42	1.06
Owned by wife	0.19	0.70	0.19	0.71	0.20	0.69
Owned jointly	0.37	1.16	0.41	1.23	0.37	1.10
Poultry						
Owned by husband	2.06	6.05	1.96	5.84	2.04	5.87
Owned by wife	2.65	5.82	2.48	5.73	2.50	5.40
Owned jointly	2.10	5.82	1.93	5.90	2.29	5.45
Value of livestock, by type of ownership (in 2008 taka), top three categories by value						
Cattle						
Owned by husband	18,919.69	30,749.94	16,455.07	27,724.48	16,515.39	26,949.48
Owned by wife	4,677.95	13,915.35	4367.71	12,876.76	3,746.79	12,254.21
Owned jointly	13,241.10	30,218.99	16,760.82	34,734.04	12,679.84	26,705.29
Goats						
Owned by husband	529.84	1,543.20	457.93	1,359.74	498.54	1,437.85
Owned by wife	229.45	981.95	206.67	890.73	233.51	900.43
Owned jointly	407.17	1,528.40	486.60	1,624.19	431.57	1,541.18
Poultry						
Owned by husband	235.35	701.09	212.95	626.97	222.49	670.68
Owned by wife	305.83	816.26	269.46	733.71	288.55	737.49
Owned jointly	299.17	1,721.71	281.27	1,611.80	324.73	1,478.12

Source: Authors' computations from baseline dataset of Impact Evaluation of Strengthening the Dairy Value Chain in Bangladesh.

Qualitative Insights on Women's Asset Ownership

These gendered patterns of land and asset ownership are confirmed by FGDs. FGD participants defined assets (largely land, livestock, and jewelry) as those items that could be used to earn an income and that could also yield other benefits.[13] When asked what *individual and joint asset ownership meant*, most groups, when defining *ownership* used words such as *use*, *purchase*, and *sale*. Poultry and cattle were mentioned by 10 groups and were the most frequently named important livestock asset, followed by goats (7 groups). Jewelry, especially nose rings and earrings, was also mentioned as an asset in 10 groups and was considered an especially valuable asset because women could access it and sell it easily. Members of the 11th group, Usha, considered jewelry to be an asset of much lower value than livestock and not worth including in the list.[14] Other assets mentioned included trees, a house, skills acquired from training, vegetables, land, fertilizer, and money from savings. Group members considered cattle to be the most important asset for women, because cattle produced milk that could be sold, the income could be managed by women, and women could keep the cattle if their marriage dissolved.

Women had different ways of accumulating assets. In 8 groups, the majority of women mentioned acquiring assets mainly by purchasing them with income from dairy or poultry sales. In 2 groups, women said they had also inherited assets such as jewelry from their parents. In 6 of the groups, some women indicated an asset to be hers if she had inherited it from her parents, while in another 3 groups, buying an asset with a woman's own money was one way to acquire assets.

Four groups said that women could not sell any asset, however small, without the husband's permission. Three groups said that women could sell assets without the husbands' permission if they were of less value than a goat, like eggs, milk, chicken, nose rings, or earrings. Only one group said that they could sell a cow with the husband's permission. In contrast, 8 groups said that men could decide to sell all assets owned by women. Two groups that men could sell all assets owned by women with the exception of land registered in a woman's name. On decisionmaking within the households, women from 8 groups stated that women should participate in decisionmaking to buy or sell assets, such as cows, goats, and land, as well as give an opinion and direction in managing households.

Paradoxically, women who had bought their own assets might still have no control over them. They could not decide what to do with them on their own at all, and the law did not protect women's asset ownership. Men could sell women's assets even without consulting them, and women's assets were the first to be disposed of in the event of an emergency such as illness (8 groups) and any other anticipated expenses in the household such as school fees (3 groups) and weddings (3 groups). Women in 10 out of 11 groups said that a woman could not make any decisions on her husband's assets. The exceptional case mentioned by women in 2 groups, that men could not sell land registered in women's names, was not directly relevant, because none of the women in the groups owned land.

In addition to facing constraints to selling assets, women also face constraints to owning assets. In 8 groups, a majority of the women reported that about 30 percent of married women may receive compensation from their brothers if they give up inherited land in favor of their brothers, although the amount is typically less than the value of the land. The received wisdom is that because women move into their husband's home after marriage, they can use the husband's land and do not need to inherit their own. In 2 groups, between 35 and 45 percent of the women said that they could not inherit land; 35 percent said that they could inherit land that might be of poor quality, and about 30–40 percent said that they could get money in lieu of land. A few women thought that it was not right for women to inherit assets from their

[13] Each asset named was listed and marked with a tally to indicate that a group had mentioned it as an important asset. In the subsequent discussion, we indicate the prevalence of particular findings by mentioning the number of groups in which a statement emerged in the discussion in parentheses or in the text.

[14] This group considered jewelry less important than livestock because unlike livestock it cannot be used to generate income. Livestock can also be sold easily in times of urgent need, unlike jewelry, which is only bought occasionally, as part of wedding preparations. Rural people also like to buy jewelry from a shop rather than from a neighbor. FGD participants also noted that jewelry shops do not offer fair prices for small pieces of jewelry when it is being sold back to the shop: typically, the price one obtains for resale is lower than the purchase price. The price of gold also tends to fluctuate. Participants also said that they can consume milk, eggs, and meat from livestock, aside from deriving a regular income from livestock assets through dairying.

parents because it could hurt the relationship between brothers and sisters. In some groups, women stated that low family income and the Sonatan Hindu law constrained women from owning assets.

Qualitative Insights on Men's Asset Ownership

Men in all 11 FGDs considered land to be the most important asset for men. Men benefited most from land because they had direct access to it and had full control of income from it. Land is the main source of income and livelihood for the community because men grow crops both for selling at the market and for provisioning the home. Land could be used for household food production and as security during medical emergencies and other less urgent events such as borrowing money to finance a son's or daughter's wedding. Agricultural equipment was also considered an important asset for men because it helped to generate income (5 groups). In addition, all types of employment and income earned from the employment were considered to be an important asset for men (3 groups).

Women in all 11 groups reported that they could not make decisions on men's assets under any circumstances but that men could make any decisions on the assets that women owned. Women said that men consulted them on decisions regarding women-owned assets, but very few women in the group reported that their husbands consulted them before making a decision on male-owned assets. Sometimes men consulted women on decisions to sell livestock. Most men bought assets with income from agricultural production, rental of agricultural equipment and land, sale of livestock (beef cows), services such as tailoring and employment, transport (such as vans, *nosiman*—small motorized pickup trucks—and rickshaws), shops, and dairy income.

Qualitative Insights on Joint Asset Ownership

Some participants considered all assets used by the family collectively to be jointly owned. Jointly owned assets, such as dishes and furniture, are cared for by the whole family and their benefits are also shared by the family. These assets could be purchased by the husband alone or by both the husband and wife contributing some money toward the purchase or raising money from joint projects for the purchase.

Most of the groups agreed that livestock are the most common jointly owned assets, especially cows, followed by goats. Sometimes husbands buy cows, but women care for them and benefit from the income accrued from milk. Other times, husbands and wives buy cows and goats jointly, but the woman's share ranges from very large to very small.

In most of the groups, participants indicated that the joint owners discuss and come to an agreement prior to making a decision on the asset. Men's opinions, however, receive higher priority in the discussions, and the husband has the final say. In one of the groups, participants stated that the husband decides and there is no joint decisionmaking. This group belongs to a relatively more conservative community in terms of adherence to and sustenance of prescribed gender roles and responsibilities.

Men's and women's situations with respect to gaining asset ownership and control were seen differently. The main constraint to asset ownership by men, mentioned in four groups, was low family income, with the constraints that women faced in accumulating assets seemingly not applying to men.

6. SDVC PROGRAM IMPACTS

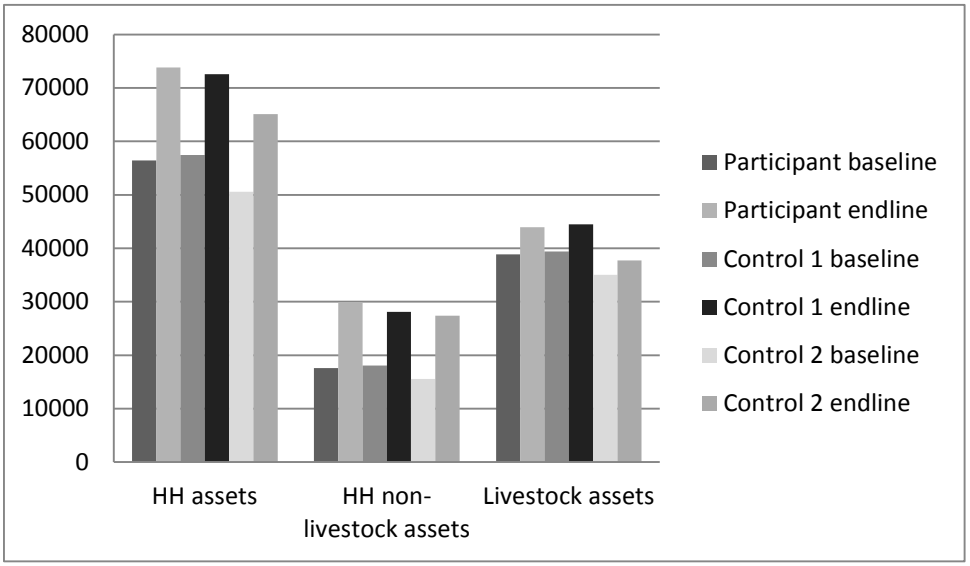
Impact on Men's, Women's, and Joint Asset Ownership

Quantitative Results

The impacts of value-chain interventions are not limited to direct impacts on the particular value chain (such as dairy) but can potentially be felt more broadly in impacts on household assets, in terms of both value and composition of the asset portfolio. It is possible, for example, that a dairy value-chain intervention would not only increase the returns to a particular type of asset (livestock) but also lead to accumulation of other types of assets. Asset accumulation could, in turn, have impacts on control of resources within the household, depending on whether the men's, women's, or jointly owned assets are affected.

Figure 6.1 and Table 6.1 present estimates of program impacts on household land and asset holdings, from propensity-weighted ANCOVA regressions. Participation in the SDVCP does not appear to change the overall value of the household's asset portfolio; however, impacts on the value of particular types of assets are significant. Taking Control 2 households as the counterfactual, participation in the SDVCP has increased the value of livestock assets. One would expect that the value of livestock assets would increase relative to those households that are not linked directly to the dairy value chain because they do not live in localities with milk-chilling plants. Apart from the (expected) increase in the value of livestock assets, participation in the program also seems to have induced significant reallocation within the households' asset portfolios. Relative to similar households within the areas where the SDVCP operates, participant households increased the value of both agricultural and nonagricultural productive assets (although the estimated impacts are only weakly significant at 10 percent). Estimated impacts on agricultural productive assets relative to households living in unions without a chilling plant (Control 2) are highly significant. Interestingly, the magnitude of impacts between Control 1 and Control 2 is similar, in the neighborhood of an increase of 1,300 taka (in 2008 prices) in the value of agricultural productive assets.

Figure 6.1 Household livestock and nonlivestock assets at baseline and endline, in 2008 taka (incorporating propensity score weights)



Source: Authors' computation.
Note: HH = household.

Table 6.1 Program impacts on household land and asset holdings

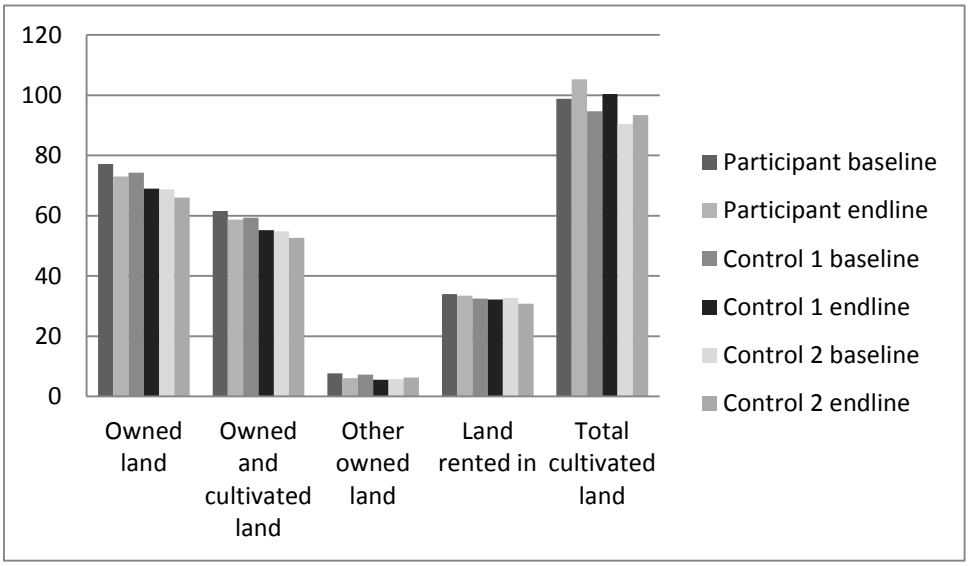
Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Household-level aggregates		
Value of household nonland assets (including livestock)	6,303.967 (5,398.812)	6,034.133 (4,077.481)
Value of household nonland assets (without livestock)	6,266.498 (4,388.978)	950.321 (2,967.882)
Value of livestock assets	–43.342 (3,122.191)	6,073.435** (2,790.660)
Value of nonlivestock assets, by type		
Value of agricultural productive assets	1,303.246* (690.244)	1,370.823*** (486.738)
Value of nonagricultural productive assets	452.581* (252.497)	–1.783 (352.115)
Value of consumption assets	4,874.666 (4,401.009)	794.279 (2,906.728)
Value of jewelry	3,401.685 (3,524.929)	2,161.300 (2,328.879)
Observations	820	786
Landholdings (area in decimals)		
Owned land	7.646 (11.295)	–0.755 (6.780)
Owned and cultivated land	6.545 (9.624)	–0.317 (5.907)
Other owned land	1.077 (3.446)	–5.544 (5.581)
Land rented in	2.088 (3.960)	6.853 (7.184)
Total cultivated land	6.470 (14.401)	14.595* (8.056)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression. All monetary estimates are based on values in 2008 prices (deflated using the rural consumer price index).

Point estimates of program impacts on owned and operated land are not significant, with the exception of a weakly significant increase in the area of operated land of participant households relative to Control 2 households. However, the absence of impact is partly because similar changes in landholding sizes can be observed across participating and control communities (Figure 6.2). The size of owned land has been declining through time in both treatment and control communities, owing both to households gradually leaving agriculture to participate in the nonfarm sector, as well as to the division of owned land among (male) heirs. However, households are still able to expand cultivated land through renting and mortgaging; as a result, operated land increases over time in all treatment and control groups.

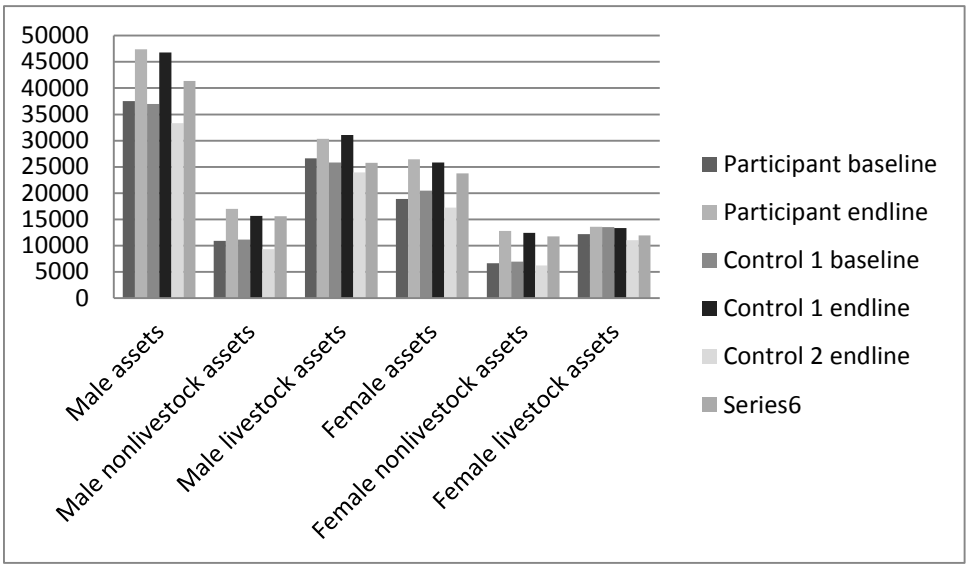
Figure 6.2 Size of owned and cultivated land at baseline and endline, incorporating propensity weights



Source: Authors' computation.

Did the SDVCP differentially affect the asset holdings of men and women? As shown by the descriptive statistics, seen in Figure 6.3, and results from the qualitative study, men own the bulk of assets within Bangladeshi households, although women do report owning some assets, whether individually or jointly.

Figure 6.3 Men's and women's livestock and nonlivestock assets at baseline and endline, incorporating propensity scores



Source: Authors' computation.

Table 6.2 indicates that when a simple division of asset ownership into men's and women's assets is used (with jointly owned assets evenly split across men's and women's assets) relative to households in unions without chilling plants, participation in the SDVCP increased the value of men's nonland assets

(including livestock). This increase was accounted for mainly in the value of *livestock* assets. In contrast, in comparison with households in nearby localities with chilling plants but that did not participate in the SDVCP, participation in the program increased the value of men's *nonlivestock* assets. Thus, in comparison with households that are less connected to the dairy value chain because chilling facilities are not present in their localities, participants in the project showed increased value of livestock assets. In comparison with households in areas where chilling plants were present but the SDVCP did not operate, male project participants increased their holdings of agricultural productive assets.

Table 6.2 Program impacts on individual land and asset holdings

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Value of nonland assets (including livestock)		
Male	190.441	7,490.985**
	(5,484.887)	(3,529.912)
Female	4,456.074	3,331.287
	(5,689.496)	(4,545.977)
Value of nonland assets (without livestock)		
Male	4,390.840**	694.862
	(1,900.116)	(2,286.051)
Female	1,662.281	1,556.283
	(3,279.192)	(2,715.841)
Value of livestock assets		
Male	–4,393.599	7,603.749***
	(6,254.649)	(2,798.464)
Female	2,802.475	1,556.283
	(3,394.808)	(2,715.841)
Value of nonlivestock assets, by type and category of ownership		
Value of agricultural productive assets		
Male	940.329	1,163.885*
	(616.813)	(605.287)
Female	183.395	126.207
	(167.887)	(178.365)
Joint	–95.315	318.853**
	(441.567)	(145.086)
Value of nonagricultural productive assets		
Male	253.683	–74.454
	(231.676)	(338.152)
Female	60.187	8.123
	(51.371)	(84.196)
Joint	127.737**	60.810
	(58.435)	(82.108)
Value of consumption assets		
Male	347.580	–261.794
	(1,213.800)	(1,377.469)
Female	70.948	–36.788
	(328.389)	(423.775)
Joint	485.543	1,263.976*
	(852.042)	(754.426)

Table 6.2Continued

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Value of jewelry		
Male	1,625.968 (1,018.729)	232.258 (1,710.480)
Female	–19.080 (2,085.018)	625.958 (2,473.352)
Joint	1,365.358 (1,340.177)	2,265.946*** (663.882)
Observations	820	786
Owned land		
Male	6.916 (7.947)	15.389*** (5.955)
Female	0.479 (0.917)	–6.475 (6.925)
Joint	–0.183 (0.426)	–0.042 (0.289)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression. All monetary estimates are based on values in 2008 prices (deflated using the rural consumer price index).

Dividing the household's assets into "male" and "female" assets, however, is overly simplistic because it does not consider the possible "jointness" of asset ownership within households (Meinzen-Dick et al. 2011). Acknowledging this, the lower portion of Table 6.2 examines impacts on male, female, and joint assets. Using this three-way division, we find that participation in the SDVCP not only increases the value of men's agricultural assets but also increases the value of jointly held agricultural assets. In terms of magnitude, however, the point estimate of the increase in the value of men's agricultural assets is about 3.6 times the size of the increase in the value of jointly owned assets. We see significant increases in joint ownership of other types of assets, however. Relative to Control 1 households, participants in the SDVCP increased the value of jointly held nonagricultural productive assets; and relative to Control 2 households, participants increased the value of jointly held consumption assets (consumer durables) and jewelry. There was no significant impact on women's exclusively owned assets in any asset category: any increase in women's asset ownership occurred through increases in jointly owned assets.

Given the skewed gender distribution of assets that favors men, increases in jointly held assets are a move toward gender equality, even if this does not take into account gender disparities in the control of those assets. In contrast, program participation seems to have reinforced gender inequalities in landownership, with the size of land owned by men increasing in participant households relative to those in Control 2 households. The previous discussion indicates that the value of livestock assets on aggregate increased for participant households in comparison with Control 2 households. Table 6.3 presents program impacts on the number and value of livestock holdings. Interestingly, while the stock of cattle has not increased, owing to participation in the program, the value of the cattle stock of participant households has increased significantly compared with that in Control 2 households. This is partly because of a shift in the composition of the herd toward crossbred cows. Relative to Control 1 households, however, participant households appear to be diversifying their livestock portfolio by acquiring more goats.

Table 6.3 Program impacts on number and value of household livestock holdings

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Livestock holdings (number)		
Cattle	–0.169	0.165
	(0.188)	(0.164)
Goats	0.213*	–0.075
	(0.128)	(0.245)
Poultry	–0.332	–0.765
	(0.674)	(0.743)
Livestock holdings (value)		
Cattle	–431.163	6,105.097**
	(3,107.943)	(2,715.995)
Goats	320.328*	164.655
	(191.859)	(282.011)
Poultry	23.078	–75.890
	(120.458)	(108.445)
Observations	820	786

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression. Data also include other animals not reported here. All monetary estimates are based on values in 2008 prices (deflated using the rural consumer price index).

We present a similar disaggregation of asset ownership across types of livestock and ownership category in Table 6.4. We find that most of the significant impacts of the program on gendered asset ownership occur in the comparison between participant households and Control 2 households. The value of men's cattle holdings in participant households increases relative to men's cattle holdings in Control 2 households, but interestingly, the *value of jointly owned cattle, goats, and poultry* also increases in participant households compared with their value in Control 2 households. The increase in the value of jointly owned holdings can be interpreted as an increase in women's asset ownership through the accumulation of jointly held cattle (albeit only weakly significant) and small livestock. While ownership of large animals is commonly viewed to lie within the domain of men, women are often viewed as owners of small animals (poultry and small ruminants), something that was also mentioned in the qualitative study. The program has therefore appeared to encourage asset accumulation by women through the acquisition of jointly owned large animals (cattle) as well as smaller livestock.

Impact of Participation in Value Chain on Decisionmaking

Intrahousehold Decisionmaking Regarding Dairy

Because the project focuses on the dairy value chain, it is reasonable to expect that the SDVCP would affect intrahousehold decisionmaking with respect to dairy. Women are intensively involved in dairy activities: in the qualitative study, all 11 groups said that mainly women carry out dairy activities (feeding, watering, milking, selling milk, healthcare, and so forth), and 7 groups said this is because they stay at home all day and can manage these activities while at home. But do SDVCP interventions lead to changes in patterns of decisionmaking surrounding dairy?

Table 6.4 Program impacts on number and value of individual livestock holdings

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Livestock holdings (number)		
Cattle		
Male	0.072	0.197
	(0.381)	(0.255)
Female	–0.039	0.074
	(0.139)	(0.086)
Joint	–0.252	0.135
	(0.334)	(0.167)
Goats		
Male	0.086	0.024
	(0.109)	(0.106)
Female	–0.002	–0.250
	(0.143)	(0.227)
Joint	0.029	0.068**
	(0.050)	(0.033)
Poultry		
Male	0.110	–0.681
	(0.616)	(0.914)
Female	–0.237	–0.199
	(0.950)	(0.871)
Joint	–0.206	0.234**
	(0.247)	(0.100)
Livestock holdings (value)		
Cattle		
Male	–3,796.393	7,933.308***
	(9,757.096)	(2,727.423)
Female	603.722	–747.792
	(1,518.051)	(2,252.426)
Joint	1,911.730	4,920.459*
	(5,701.453)	(2,973.757)
Goats		
Male	199.594	94.139
	(134.017)	(156.637)
Female	–62.991	–157.896
	(223.203)	(233.196)
Joint	51.148	99.499*
	(67.639)	(51.320)
Poultry		
Male	23.622	–115.245
	(78.922)	(151.861)
Female	0.522	–13.288
	(89.614)	(127.847)
Joint	–14.648	37.552**
	(34.566)	(16.918)
Observations	820	786

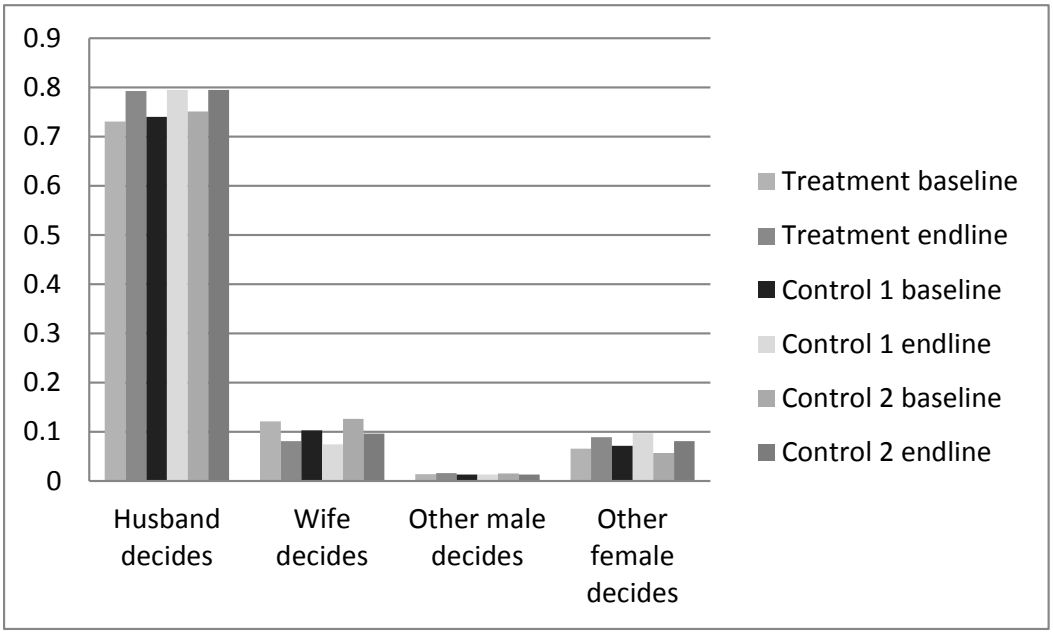
Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression. Data also include other animals not reported here. All monetary estimates are based on values in 2008 prices (deflated using the rural consumer price index).

For each of the following dairy-related decisions, we have information at both baseline and endline on who is reported to be the primary decisionmaker for the following decisions: buying, selling, or leasing a dairy cow or buffalo; dairy maintenance expenses; where to sell milk; how much milk to give to children; and how much milk to give to other members of the household. We estimate ANCOVA regressions to estimate impacts on these outcomes. For several other decision spheres, mostly related to dairy management practices, information on the primary decisionmaker was collected only at endline. For this latter category, we can estimate only single-difference impacts. For the purposes of impact assessment, for each decision sphere, we focus on whether the primary decisionmaker was the husband (the male head), the wife (the female spouse of head), some other male in the household (for example, son of head), or some other female in the household (for example, daughter of head or mother of head).

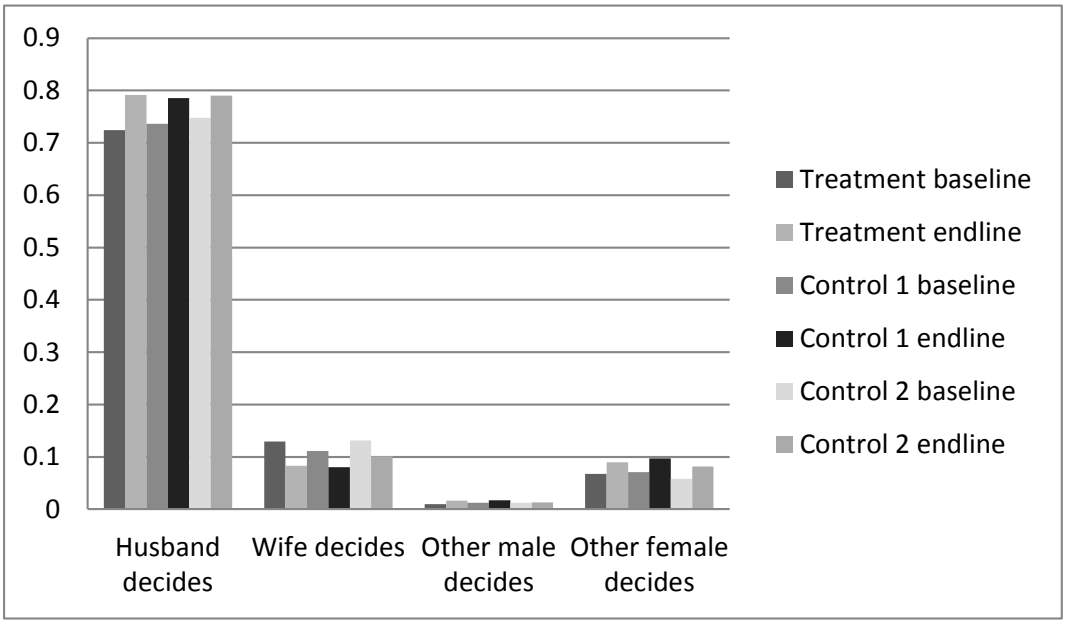
The quantitative results suggest that the program had negligible impacts on decisionmaking related to buying, selling, and leasing of cows and to dairy-related expenses. Figures 6.3–6.7 present descriptive information on decisionmaking for those decisions on which information was available at both baseline and endline. All these decisions have direct financial implications, and not surprisingly, all these decisions were male dominated at baseline, with the next most important decisionmakers being the wife, followed by other females (typically the mother-in-law), and then other males (sons). The endline patterns are very similar. This is confirmed by ANCOVA regressions (Table 6.5), in which very few of the impacts are significant. Some coefficients are significant, suggesting that relative to Control 2 households, the program did increase the proportion of households in which another male decides on dairy-related expenses and whether to lease a cow. The program also increased the proportion of treatment households where the wife decides on livestock expenses (such as feed and medicines) relative to Control 1 households. However, the magnitude of these changes is very small in absolute terms. Overall, the proportion of households where husbands make dairy-related expenditure decisions has increased, although this occurs across the board, regardless of program participation status.

Figure 6.4 Decision to buy a cow: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



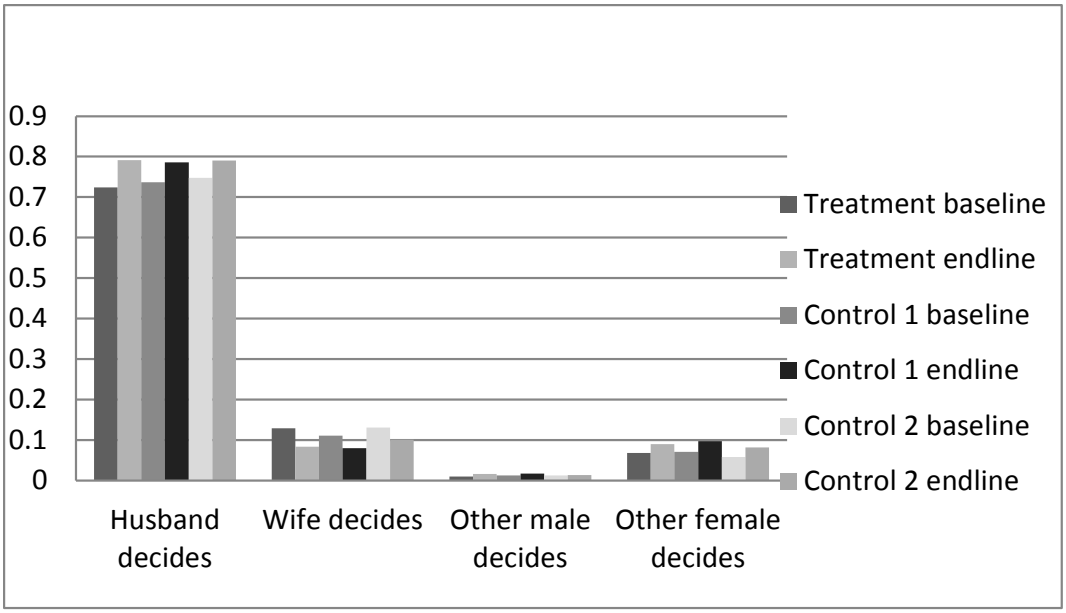
Source: Authors' computation.

Figure 6.5 Decision to sell a cow: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



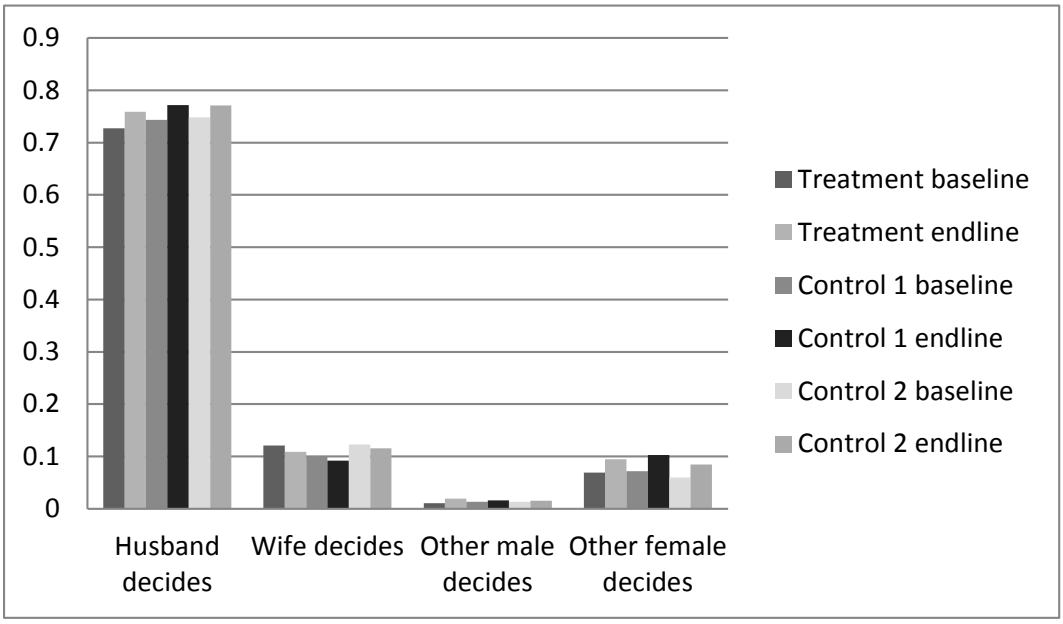
Source: Authors' computation.

Figure 6.6 Decision to lease a cow: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



Source: Authors' computation.

Figure 6.7 Decisions on dairy-related expenses: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



Source: Authors' computation.

Table 6.5 Livestock and dairy-related decisionmaking: Program impacts on the proportion of households with each category of primary decisionmaker

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Decision to buy a cow		
Husband decides	–0.001 (0.062)	0.013 (0.062)
Wife decides	0.020 (0.023)	–0.044 (0.058)
Other male decides	0.009 (0.009)	0.011 (0.007)
Other female decides	–0.008 (0.032)	0.008 (0.020)
Decision to sell a cow		
Husband decides	0.015 (0.062)	0.022 (0.060)
Wife decides	0.005 (0.022)	–0.049 (0.057)
Other male decides	0.008 (0.009)	0.010 (0.007)
Other female decides	–0.015 (0.031)	0.006 (0.020)
Decision to lease a cow		
Husband decides	0.027 (0.068)	0.027 (0.063)
Wife decides	0.008 (0.031)	–0.057 (0.060)

Table 6.5 Continued

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Other male decides	–0.004 (0.017)	0.011* (0.007)
Other female decides	–0.015 (0.032)	0.007 (0.020)
Decisions on dairy-related expenses (feed, livestock)		
Husband decides	–0.033 (0.061)	–0.021 (0.064)
Wife decides	0.055** (0.024)	–0.019 (0.061)
Other male decides	0.013 (0.009)	0.015** (0.007)
Other female decides	–0.018 (0.032)	0.012 (0.020)
Observations	820	788

Source: Authors' computation.

Note: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level. *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression.

While the program seems to have had little to no impact on decisionmaking, it appears to have had significant impact on specific dairy *practices.* Table 6.6 shows the impacts of the program on the proportion of beneficiary households where the primary decisionmaker is the husband, the wife, another male, or another female. We see that relative to Control 1 households, the program causes significant increases in the proportion of households in which the wife is a primary decisionmaker regarding the type of feed provided to cows or buffalo (about 10.3 percentage point increase) and on where to purchase inputs and services for cows or buffalo (about 3.7 percentage point increase). We also see that relative to both Control 1 and Control 2, the program appears to cause a slight but significant increase in the proportion of households in which another male (who is not the male head) is a primary decisionmaker.[15] Spheres where decisionmaking by another male appears to increase include whether to provide vaccinations and artificial insemination to cows or buffalo, what other health services to provide to cows or buffalo, and where to purchase inputs and services for cows or buffalo. These decisions—where the proportion of male decisionmakers has increased—are also those that have financial implications. It is possible that men's decisionmaking increases precisely because participation in the dairy value chain also entails incurring costs associated with these dairy-related practices.

[15] Husbands are the primary male decisionmakers; where another male is a decisionmaker, this is most likely an adult son.

Table 6.6 Program impacts on the proportion of households with each category of primary decisionmaker

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
What type of feed to provide to cows or buffalo		
Husband	–0.081	–0.008
	(0.074)	(0.126)
Wife	0.103**	–0.073
	(0.041)	(0.140)
Other male	0.005	0.006
	(0.008)	(0.007)
Other female	–0.022	0.034
	(0.055)	(0.028)
Whether to provide vaccinations to cows or buffalo		
Husband	0.003	–0.053
	(0.066)	(0.085)
Wife	0.016	–0.026
	(0.033)	(0.080)
Other male	0.015*	0.015*
	(0.009)	(0.008)
Other female	–0.031	0.022
	(0.055)	(0.028)
Whether to provide artificial insemination to cows or buffalo		
Husband	0.008	–0.030
	(0.064)	(0.085)
Wife	0.022	–0.047
	(0.026)	(0.080)
Other male	0.003	0.015*
	(0.016)	(0.008)
Other female	–0.030	0.019
	(0.055)	(0.028)
What other health services to provide to cows or buffalo		
Husband	0.016	–0.036
	(0.066)	(0.085)
Wife	0.014	–0.040
	(0.031)	(0.080)
Other male	0.003	0.015*
	(0.016)	(0.008)
Other female	–0.030	0.019
	(0.055)	(0.028)
Where to purchase inputs and services for cows or buffalo		
Husband	–0.017	–0.025
	(0.065)	(0.084)
Wife	0.037*	–0.048
	(0.020)	(0.079)

Table 6.6 Continued

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Other male	0.013	0.014*
	(0.009)	(0.008)
Other female	–0.030	0.019
	(0.055)	(0.028)
How to use income from dairy sales		
Husband	–0.047	–0.130
	(0.068)	(0.091)
Wife	0.067	0.052
	(0.045)	(0.083)
Other male	0.004	0.005
	(0.009)	(0.008)
Other female	–0.020	0.037
	(0.055)	(0.028)
Observations	844	813

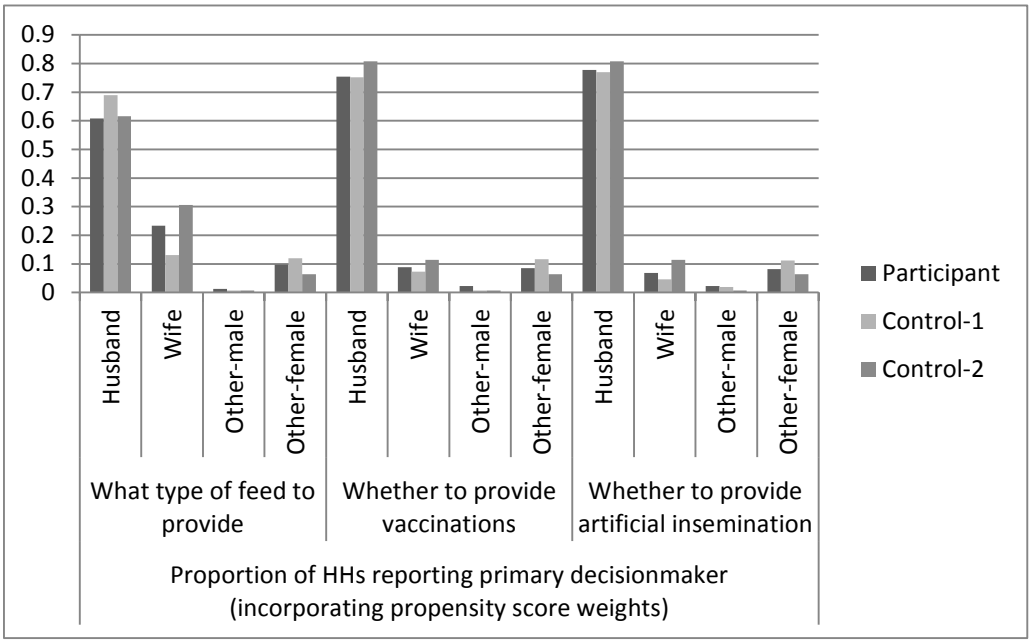
Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with a single-difference specification using propensity score–weighted regression.

Since the wives in beneficiary households were typically the program participants and were trained on what type of cattle feed to provide and where to purchase inputs and services for cattle, it is reasonable that the program might cause their decisionmaking in these realms to increase. However, wives' decisionmaking in other realms in which they were also trained (vaccinations, artificial insemination, and so forth) appears not to be affected. Instead, increasingly, decisions appear to be made by another male in the household who is not the male head (husband).

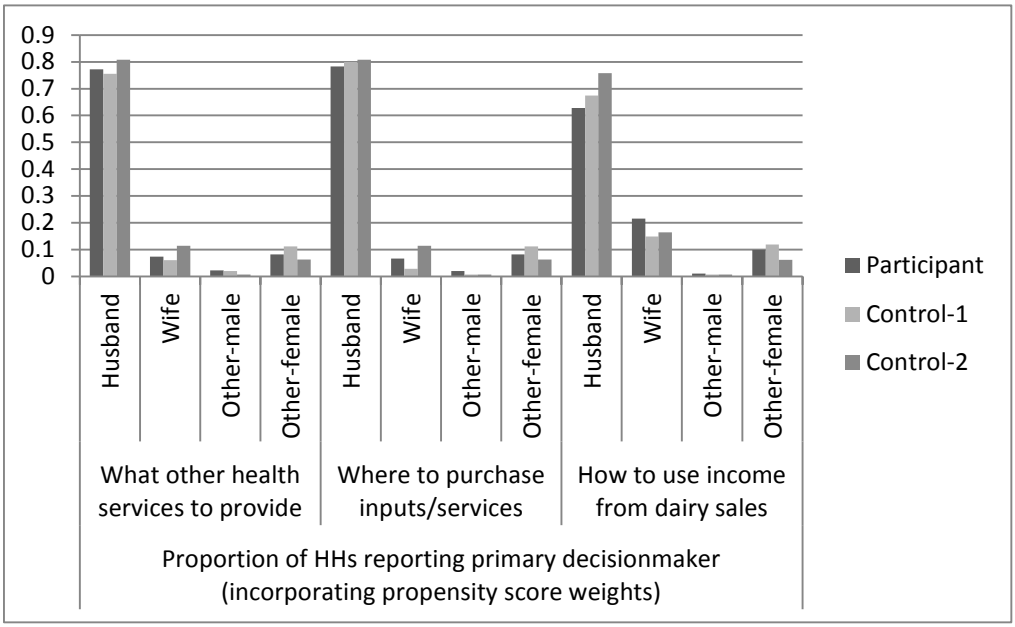
To give context to these estimates of program impact, we then present descriptive statistics for the propensity score–weighted proportions of primary decisionmakers for each of these spheres at endline, by group. Figures 6.8 and 6.9 show that despite small program impacts favoring wives as primary decisionmakers regarding type of feed and where to purchase inputs and services, and favoring other males as primary decisionmakers on things such as artificial insemination and vaccinations, the husbands are—across all groups and in all decision spheres—the large majority of primary decisionmakers. Thus, although the program appears to cause some shifts in dairy-related decisionmaking toward household members other than the husband, the dynamics nonetheless appear to remain strongly in favor of the husband.

Figure 6.8 Decisions on feed, vaccinations, and artificial insemination: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



Source: Authors' computation.

Figure 6.9 Decisions on health services, source of inputs and services, and use of income from dairy sales: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)

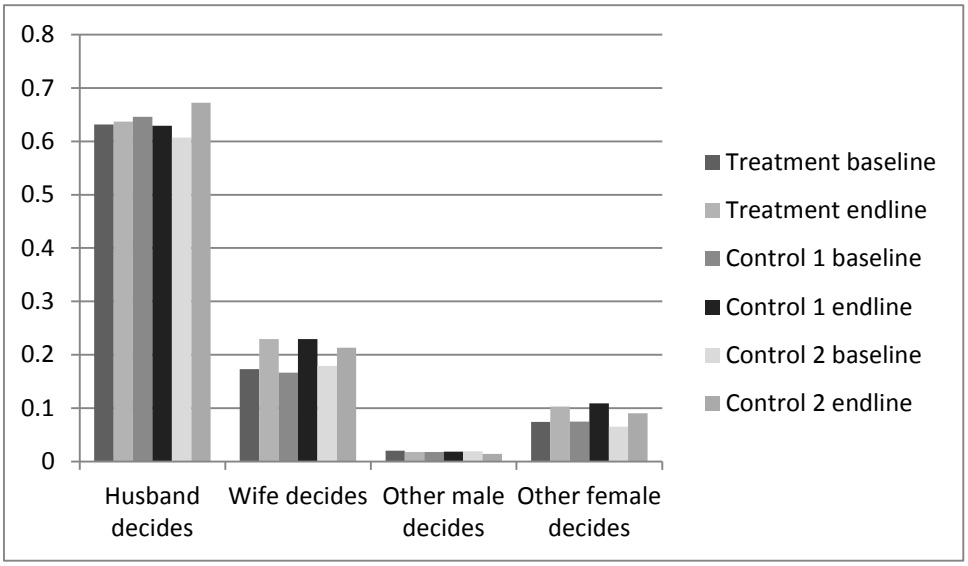


Source: Authors' computation.

What about decisions regarding the disposal of milk? The qualitative study found that morning (10 groups) and evening (7 groups) milk is marketed mainly by women. Women sell both morning and evening milk from home and to collectors. However, although women may *sell* milk, the quantitative

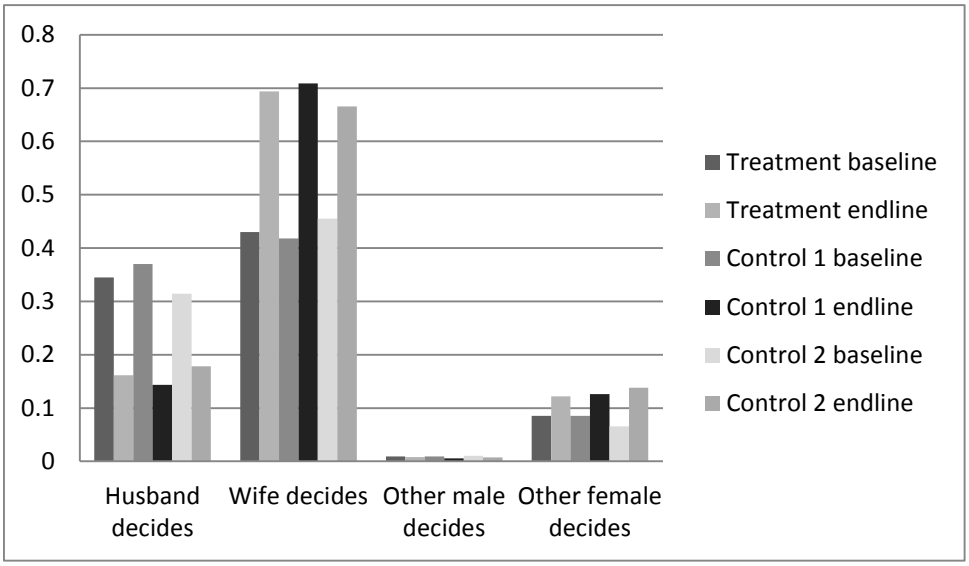
study suggests that the *decision* to sell milk is predominantly the husband's (Figure 6.10), similar to decisions involving large outlays or inflows of cash (buying or selling cows). However, the decision to allocate milk to set aside for home consumption by others, including children, is clearly within the wife's domain (Figures 6.11 and 6.12).

Figure 6.10 Decision to sell milk: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



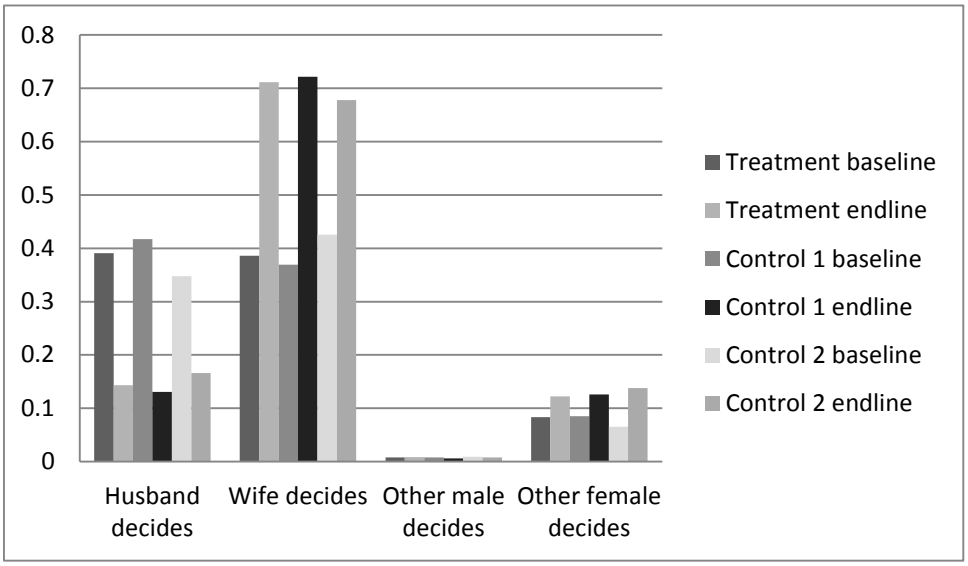
Source: Authors' computation.

Figure 6.11 Decision to give milk to child: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



Source: Authors' computation.

Figure 6.12 Decision to give milk to others: Proportion of households reporting each category of primary decisionmaker (incorporating propensity score weights)



Source: Authors' computation.

Table 6.7 suggests that the program has had negligible impact on who within the household decides to sell milk, to give it to children, or to give it to others. Decisions regarding milk sales are made mostly by husbands, and decisions regarding the disposal of milk kept for own consumption are made by wives. If there is any significant impact, it suggests that in participant households, other males have increased decisionmaking power to give milk to children and to others, relative to Control 1 households. However, similar to decisionmaking on dairy expenses, the magnitude of these effects is small. By and large, decisions that involve financial outlays or inflows are made by husbands, regardless of program participation status, while those about the allocation of milk that is not for sale are made by wives.

The qualitative work suggests that women play a larger role in the management of milk income than is apparent from the quantitative results. In 7 of the groups, participants stated that both morning and evening milk income was managed by women; in another 5 groups, that it was managed by men; and in another 3, that it was managed jointly. In 6 groups, participants indicated the main determinant of who manages the income is who receives the money. Because women most often receive the milk money, they manage it. In 2 groups, participants said that the amount of money being paid also determines who manages it: When it is a small amount, women will manage it; but when it is a larger amount, men manage it. In another 2 groups, participants were of the opinion that the expenditure requirement also determines who manages it, with men receiving money to use for large expenditures like construction, school fees, and asset purchase (for example, plots of land). In addition, findings from the qualitative work suggest that milk income was saved in group savings accounts (as mentioned in 10 groups) or used to purchase livestock, livestock feeds, and other farm inputs (mentioned in 7 groups).

It must also be noted that SDVCP made a deliberate effort to engage women in various stages of the dairy value chain, but this would not be reflected in our findings because the sampling strategy focused on producers. Thus, the above results would not reflect the total impact of the program on women's decisionmaking in all stages of the value chain.

Table 6.7 Decisions regarding disposal of milk: Program impacts on the proportion of households with each category of primary decisionmaker

Outcomes	Impacts relative to Control 1	Impacts relative to Control 2
Decision to sell milk		
Husband decides	0.030	–0.127
	(0.089)	(0.092)
Wife decides	0.000	0.055
	(0.068)	(0.073)
Other male decides	–0.002	0.011
	(0.017)	(0.009)
Other female decides	–0.014	0.022
	(0.033)	(0.018)
Decision to give milk to children		
Husband decides	0.059	–0.046
	(0.044)	(0.141)
Wife decides	–0.055	0.098
	(0.064)	(0.142)
Other male decides	0.008**	0.002
	(0.004)	(0.007)
Other female decides	–0.009	–0.088
	(0.036)	(0.112)
Decision to give milk to others		
Husband decides	0.041	–0.059
	(0.041)	(0.138)
Wife decides	–0.036	0.118
	(0.063)	(0.144)
Other male decides	0.008**	0.002
	(0.004)	(0.007)
Other female decides	–0.005	–0.085
	(0.036)	(0.112)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression.

Decisions Regarding Work and Income from Work

Table 6.8 presents program impacts on women's decisions to work, the reasons a woman may not be working, and decisions on how to spend income from work. Because difference-in-difference regressions provide additional insight into possible patterns of impact that are slightly different from ANCOVA regressions, both sets of estimates are presented here.

Participation in the SDVCP appears to have reduced the proportion of households where a woman works for pay (whether in a home-based enterprise or outside the home). Although program participation increases women's time spent on livestock activities (see next section), women do not seem to consider performing these activities as work for pay. The program has also had impacts on the *reasons* women do not work for pay. ANCOVA results suggest that domestic responsibilities among participating households have increased relative to Control 1 households—possibly because the woman has to stay on the homestead to attend to both livestock and children, but also because the woman says that she neither wants nor needs to work. The difference-in-difference results suggest that, although women themselves may not

choose to work for pay, the program has reduced the proportion of women reporting that their husbands disapprove of women working—this is indicative of changes in attitudes of husbands toward women's work. The difference-in-difference results also indicate that, relative to women in Control 2 households, those who participate in the SDVCP have more domestic responsibilities (which is again consistent with needing to stay close to the homestead to care for the dairy cattle). It is difficult to interpret the negative impact of the program on location of work for participant households compared to Control 2 households, as the program appears to reduce the proportion of women working inside the home as well as those working outside the home; it is possible that this question was not interpreted correctly. However, the program does not seem to have had an impact on decisionmaking regarding income from work.

Table 6.8 Decisions regarding work and income from work: Program impacts on the proportion of households with each category of primary decisionmaker

	ANCOVA		Difference-in-Difference	
Outcome	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**
Whether woman works for pay	–0.033*	–0.034*	0.034	–0.288**
	(0.018)	(0.018)	(0.121)	(0.126)
If not, reason why:				
Husband disapproves	0.000	–0.002	–0.028**	–0.035**
	(0.002)	(0.003)	(0.014)	(0.014)
Domestic responsibilities	0.020*	0.012	0.015	0.315**
	(0.011)	(0.011)	(0.117)	(0.127)
Does not want nor need to work	–0.003	0.006**	–0.014	0.024
	(0.006)	(0.003)	(0.011)	(0.024)
If working, location of work				
Outside the home	0.011	–0.116	–0.008	–0.286*
	(0.108)	(0.119)	(0.175)	(0.153)
Inside the home	–0.019	0.002	–0.017	–0.026***
	(0.026)	(0.006)	(0.038)	(0.009)
Both inside and outside the home	–0.026	0.065	0.048	0.018
	(0.106)	(0.119)	(0.126)	(0.130)
Decision to spend income from work				
Give all to husband	0.007	0.005	0.021	–0.135
	(0.102)	(0.116)	(0.143)	(0.122)
Give some money to husband	–0.008	–0.093	0.018	–0.134
	(0.092)	(0.125)	(0.069)	(0.196)
Keep it all	–0.020	0.030	–0.005	0.002
	(0.039)	(0.029)	(0.037)	(0.029)
Who decides how to spend				
Woman herself decides	0.041	–0.077	0.057	–0.118
	(0.046)	(0.089)	(0.040)	(0.087)
Husband decides	–0.058	–0.075	–0.025	–0.059
	(0.082)	(0.076)	(0.041)	(0.079)
Both decide	–0.012	0.185	–0.008	0.013
	(0.077)	(0.138)	(0.094)	(0.196)
Observations	820	788	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact, estimated using ANCOVA (first two columns) and difference-in-difference (last two columns) using propensity score–weighted regressions.

Decisions Regarding Loans from Nongovernmental Organizations, Household Expenditures, and Control of Money

Nongovernmental organizations (NGOs) are a common source of working capital for women in Bangladesh, and NGOs purposively target poor women for NGO membership. Participation in the SDVCP appears to have reduced the proportion of participant women taking loans from NGOs relative to women in Control 2, which may appear surprising, given that women in the SDVCP are members of dairy producer groups, which may facilitate obtaining access to credit (Table 6.9).

Table 6.9 Decisions regarding loans from nongovernmental organizations: Program impacts on the proportion of households with each category of primary decisionmaker

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Whether woman ever took a loan from an NGO	0.069	–0.231***
	(0.083)	(0.072)
If yes, who decided on loan:		
She herself	–0.021	0.008
	(0.034)	(0.023)
Husband	–0.068	–0.237
	(0.066)	(0.147)
Both she and her husband	0.151***	0.100
	(0.049)	(0.127)
Whether wife participated in loan decision (whether solely or jointly)	0.129**	0.110
	(0.064)	(0.123)
Who decides how to spend loan proceeds	–0.023	0.007
	(0.032)	(0.022)
Husband	0.007	–0.071
	(0.017)	(0.076)
Both she and her husband	0.075	–0.050
	(0.082)	(0.116)
Whether wife participated in loan decision (whether solely or jointly)	0.050	–0.042
	(0.089)	(0.104)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score weighted regression.

Some insights from the qualitative work help to explain this result. Discussants in all 11 groups admitted that women can access credit, and in 9 of the groups they emphasized that women can access credit more easily than men. Women receive credit so easily that in 3 out of these 9 groups, participants believed that women received credit unconditionally. One group's members indicated that in spite of this easy access to credit, the credit was always managed by men. More than 75 percent of members from 3 groups receiving credit had access to credit, and those that did not owe money had chosen not to borrow. Women who did not borrow money had decided not to because they did not feel the need for credit and because the interest rates for loan repayment were acting as a deterrent to borrowing. Moreover, women in 5 of the groups stated that men take credit from women after women have borrowed it because women always get credit from formal financial institutions more easily than men and the institutions always trust that women will repay. According to participants in 1 group, men take over money borrowed by women when women are not likely to be able to pay. In response to the question "Have men in this community taken credit borrowed by women?," participants in all 3 groups that answered this question responded affirmatively.

Instead of borrowing money from formal credit sources, as described above, some women preferred to raise it by saving. Discussions with key informants indicated that loans were perceived as debt traps by many women. Although saving money took time, at least women did not have to incur interest. All participants in the 11 FGDs had access to a savings group. These were savings groups that SDVCP supported in an explicit effort to get more money into the hands of women dairy producers that they themselves could control. Women from dairy savings groups were able to exercise autonomy from their husbands because they could receive money from the groups and spend it without asking for permission from their husbands.

Patterns of household decisionmaking have also changed: Relative to other women in neighboring unions, women SDVCP participants were more likely to make decisions on NGO loans jointly with their husbands or to participate in the decision to take a loan (whether solely or jointly). However, the program has had no impact on the decision how to spend the proceeds of the loan. The qualitative work adds nuance to this finding. FGD participants explained that women are always committed to paying back loans. According to members from four groups, some men found it a burden to repay loans. Women sometimes forced men to pay the loans that women have borrowed the money for because the women were aware of the payment schedule and requirements. Women also often invested for the benefit of the entire family, but men did not always do so. It seemed as though most groups interviewed believed that women were more honest than men by virtue of being women.

Seven groups' participants mentioned that households spent borrowed money on agriculture and the entire family benefitted from the credit. A few families bought land and livestock (cattle, goats, and poultry) using the borrowed money. Some women contributed toward buying cattle with money borrowed, while men rented and purchased land and livestock with loan money. Thus, family assets increased owing to the accessibility of credit. In two groups, participants reported two main negative impacts on households where women borrowed credit: first, no change in assets owned was observed among families of women who had borrowed money, and second, men in some of these households used the money borrowed through the credit scheme for self-gratification in the form of gambling or consumption of betel leaf.

Table 6.10 presents estimates of program impacts on decisions regarding household expenditures and control of spending money. Program impacts on some expenditure decisions are minimal: compared with Control 2 households, a greater proportion of women who participate in the SDVCP report having sole decisionmaking power on food expenditures, house repairs, and health expenditures. However, these impacts are only weakly significant. In contrast, relative to Control 2 households, women in participant households report having significantly more control of money to buy food, clothes for themselves, medicines, and cosmetics. If participating in the dairy value chain provides women with opportunities to handle small amounts of cash, it is possible that this increases their decisionmaking power and control over monetary resources.

Table 6.10 Household expenditure decisions and control of money: Program impacts on the proportion of households with each category of primary decisionmaker

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Who decides on:		
Food expenditures		
She herself	–0.033 (0.038)	0.082* (0.042)
Husband	–0.015 (0.092)	–0.014 (0.101)
Both she and her husband	0.026 (0.082)	0.036 (0.132)
Whether wife participated in decision (whether solely or jointly)	–0.004 (0.090)	0.101 (0.115)
House repair expenditures		
She herself	–0.035 (0.034)	0.068* (0.040)
Husband	0.002 (0.091)	–0.001 (0.104)
Both she and her husband	0.015 (0.082)	0.038 (0.131)
Whether wife participated in decision (whether solely or jointly)	–0.020 (0.089)	0.088 (0.117)
Health expenditures		
She herself	–0.035 (0.034)	0.072* (0.042)
Husband	–0.018 (0.091)	–0.013 (0.091)
Both she and her husband	0.031 (0.083)	0.045 (0.131)
Whether wife participated in decision (whether solely or jointly)	0.000 (0.089)	0.100 (0.110)
Whether woman controls money		
To buy food in the market	–0.013 (0.063)	0.148*** (0.057)
To buy clothes for herself	0.059 (0.065)	0.211*** (0.060)
To buy medicines for herself	–0.015 (0.083)	0.214*** (0.054)
To buy cosmetics for herself	–0.015 (0.082)	0.228*** (0.070)
Observations	806	775

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression.

Women's Mobility

The final indicator of gender relations that we examine is women's mobility. Female seclusion is highly valued in Bangladesh, and such restrictions on women's mobility not only limit women's participation in paid work but may also limit the ability to maintain social networks (visiting friends and relatives) or partaking in leisure activities (watching a show at a cinema).

Table 6.11 presents estimates of program impacts on women's mobility, specifically who within the household typically makes decisions on whether a woman is allowed to go to a list of places both inside and outside the community. In comparison to Control 1 households, a greater proportion of SDVCP participants report that both husband and wife decide whether the wife can go by herself to visit friends outside her community, to the bazaar, and to the cinema. That is, in Control 1 households, husbands alone make these decisions to a greater degree. Also in comparison to households in the same union where the SDVCP operates, program participants report greater proportions of households where another person decides whether the wife can go to the bazaar or market, to health facilities, and to the cinema, although the point estimates of these impacts are small relative to impacts on the wife being a partner in these decisions (about one-tenth of the size of the estimated impact for both husband and wife participating in these decisions).

Table 6.11 Women's mobility: Program impacts on the proportion of households with each category of primary decisionmaker

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Who decides whether woman can go by herself to:		
Visit friends outside the community		
She herself	–0.028 (0.066)	–0.036 (0.081)
Husband decides	–0.138 (0.099)	–0.069 (0.133)
Both decide	0.159* (0.089)	0.062 (0.120)
Another person decides	0.003 (0.016)	0.020*** (0.007)
Woman participates in decision (whether solely or jointly)	0.138 (0.097)	0.045 (0.133)
The bazaar or market		
She herself	–0.052 (0.053)	–0.050 (0.076)
Husband decides	0.036 (0.040)	0.078** (0.031)
Both decide	0.108** (0.052)	0.062 (0.085)
Another person decides	0.013** (0.006)	0.013* (0.007)
Woman participates in decision (whether solely or jointly)	0.063 (0.060)	0.019 (0.116)
The hospital/clinic/doctor		
She herself	0.010 (0.060)	0.002 (0.089)
Husband decides	–0.100 (0.082)	–0.100 (0.138)

Table 6.11 Continued

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Both decide	0.052	0.020
	(0.084)	(0.118)
Another person decides	0.007*	0.009*
	(0.004)	(0.005)
Woman participates in decision (whether solely or jointly)	0.071	0.051
	(0.078)	(0.133)
Cinema/fair/theater		
She herself	–0.023	–0.070
	(0.035)	(0.081)
Husband decides	0.032	0.021
	(0.021)	(0.023)
Both decide	0.051**	0.005
	(0.022)	(0.039)
Another person decides	0.005*	0.005*
	(0.003)	(0.003)
Woman participates in decision (whether solely or jointly)	0.029	–0.063
	(0.044)	(0.082)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score weighted regression.

Respondents were also asked about the conditions under which it was acceptable for women to go to the places listed above. The answers are not mutually exclusive and do not imply that all of them have to be met but are indicative of the underlying gender norms that govern women's mobility. In response to the question, "Under which conditions a woman would be 'allowed' to go to a range of places without any objection from her husband or other household members," conditions include (1) if she would be accompanied by her children or other family members, (2) if she covers her own expenses, (3) if she observes purdah and is properly (modestly) dressed, and finally, (4) if this question were not applicable or no one would object to her going to this place. Table 6.12 shows that relative to both Control 1 and Control 2 households, SDVCP participants would face no objections to visiting friends outside the community or to visiting the hospital or doctor if she could cover her own expenses. This may indicate that women in the SDVCP are able to mobilize financial resources to go to these places. Also in comparison to both control groups, SDVCP participants are likely to face no objections to going to the cinema or theater if they were accompanied by children or other family members. Nevertheless, objections to women's mobility remain; relative to Control 2 households, there is a *reduction* in the proportion reporting no objection to the woman's going to the bazaar or market or to the theater or cinema by herself.

Table 6.12 Attitudes toward women's mobility: Program impacts on the proportion of households, by requirement

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Conditions under which woman can:		
Visit friends outside the community		
If accompanied by children/family	–0.093 (0.066)	0.100 (0.122)
If she covers her own expenses	0.010** (0.005)	0.011*** (0.004)
If she observes purdah/is dressed properly	–0.057 (0.082)	0.041 (0.043)
Not applicable/no one else would object	0.113 (0.073)	–0.187 (0.137)
Go to the bazaar/market		
If accompanied by children/family	0.133*** (0.050)	0.180*** (0.057)
If she covers her own expenses	0.005 (0.004)	0.005 (0.004)
If she observes purdah/is dressed properly	–0.010 (0.031)	0.034 (0.023)
Not applicable/no one else would object	–0.032 (0.095)	–0.311*** (0.065)
Go to the hospital/clinic/doctor		
If accompanied by children/family	0.021 (0.068)	0.085 (0.132)
If she covers her own expenses	0.007** (0.003)	0.007** (0.003)
If she observes purdah/is dressed properly	–0.079 (0.082)	0.038 (0.044)
Not applicable/no one else would object	0.043 (0.099)	–0.144 (0.135)
Go to the cinema/fair/theater		
If accompanied by children/family	0.004 (0.039)	0.058*** (0.018)
If she covers her own expenses	(dropped)	(dropped)
If she observes purdah/is dressed properly	0.001 (0.011)	–0.011 (0.019)
Not applicable/no one else would object	0.044 (0.112)	–0.184*** (0.046)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with an ANCOVA specification using propensity score–weighted regression.

Table 6.13 examines whether women's ability to attend training provided by NGOs, both within and outside the community, and avail herself of value-chain services has improved as a result of the program. These data were collected only at endline and thus only single-difference estimates are feasible. These estimates also incorporate propensity weights.

Table 6.13 Women's ability to access value-chain services: Program impacts on the proportion of households with each category of primary decisionmaker, single-difference estimates

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Who decides whether woman can go by herself to:		
Attend NGO training outside the community		
She herself	0.021 (0.045)	0.003 (0.081)
Husband decides	0.006 (0.055)	–0.069 (0.146)
Both decide	0.105** (0.054)	0.039 (0.106)
Another person decides	0.008** (0.004)	–0.094 (0.092)
Woman participates in decision (whether solely or jointly)	0.126* (0.072)	0.043 (0.109)
Attend NGO training inside the community		
She herself	0.041 (0.063)	0.079 (0.090)
Husband decides	0.025 (0.042)	0.092*** (0.023)
Both decide	0.074 (0.064)	0.045 (0.097)
Another person decides	0.006* (0.004)	–0.096 (0.092)
Woman participates in decision (whether solely or jointly)	0.114 (0.097)	0.124 (0.105)
Go to an agricultural input dealer		
She herself	–0.009 (0.042)	0.052*** (0.010)
Husband decides	0.017 (0.034)	0.073*** (0.024)
Both decide	0.070 (0.057)	0.159*** (0.024)
Another person decides	0.010** (0.005)	0.011*** (0.004)
Woman participates in decision (whether solely or jointly)	0.061 (0.076)	0.211*** (0.026)
Go to a milk collection point outside the community		
She herself	–0.023 (0.046)	0.052*** (0.018)
Husband decides	0.047 (0.054)	0.126*** (0.026)
Both decide	0.057 (0.057)	0.151*** (0.027)
Another person decides	0.014** (0.006)	0.016*** (0.006)
Woman participates in decision (whether solely or jointly)	0.033 (0.076)	0.202*** (0.033)

Table 6.13 Continued

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Go to a milk collection point inside the community		
She herself	0.024	0.095*
	(0.062)	(0.049)
Husband decides	0.048	0.131***
	(0.042)	(0.025)
Both decide	0.041	0.216***
	(0.087)	(0.035)
Another person decides	0.009*	0.011***
	(0.005)	(0.004)
Woman participates in decision (whether solely or jointly)	0.065	0.311***
	(0.109)	(0.059)
Visit a livestock health worker		
She herself	–0.051	0.024
	(0.055)	(0.034)
Husband decides	0.049	0.117***
	(0.040)	(0.025)
Both decide	0.084	0.186***
	(0.071)	(0.034)
Another person decides	0.011**	0.013***
	(0.005)	(0.005)
Woman participates in decision (whether solely or jointly)	0.033	0.210***
	(0.090)	(0.056)
Go to an input dealer outside the community		
She herself	–0.019	0.032
	(0.056)	(0.020)
Husband decides	0.026	0.116***
	(0.050)	(0.027)
Both decide	0.057	0.159***
	(0.059)	(0.027)
Another person decides	0.014**	0.016***
	(0.006)	(0.005)
Woman participates in decision (whether solely or jointly)	0.038	0.191***
	(0.087)	(0.040)
Go to an input dealer inside the community		
She herself	0.017	0.065
	(0.060)	(0.057)
Husband decides	0.035	0.122***
	(0.041)	(0.024)
Both decide	0.025	0.220***
	(0.090)	(0.034)
Another person decides	0.009*	0.011***
	(0.005)	(0.004)
Woman participates in decision (whether solely or jointly)	0.042	0.285***
	(0.109)	(0.066)
Observations	820	788

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with a single-difference specification using propensity score–weighted regression. NGO = nongovernmental organization.

Relative to Control 1 households, a greater proportion of women who are in the program participate in the decision to attend NGO training *outside* the community, whether jointly or solely (the proportion of households reporting that both husband and wife make this decision has also increased among participants relative to Control 1 households). Impacts relative to Control 2 households are insignificant. With respect to attending NGO training *within* the community, participation seems to have increased the proportion of households where another person makes that decision, relative to Control 1 households. However, the point estimate is small, and it is only weakly significant. Similarly, the proportion of households reporting that another person decides whether the woman can go to an agricultural input dealer by herself has also increased relative to Control 1 households. Interestingly, relative to Control 2 households, the proportion of households reporting that husbands decide whether wives can attend NGO training within the community has increased.

One of SDVCP's objectives has been to link smallholder dairy producers more closely to markets. Are women better able to access these services? Relative to Control 2 households, who do not live close to a chilling plant, the program has increased the proportion of households in which women participate in the decision to go to an agricultural input dealer, a milk collection point within the community, or a milk collection point outside the community (whether on her own or jointly with her husband). When Control 1 households are used as a counterfactual, the only detectable impact is an increase that this decision is made by another person within the household, although the point estimates are very small.

All in all, these results suggest that participation in the SDVCP has increased women's mobility through two pathways. The first acts through proximity to the value chain: Effective participation in the program requires being able to access services provided throughout the value chain. The second pathway results through changes in social norms: The presence of the program, which is being implemented by an organization that places a high value on women's empowerment, may have changed social norms surrounding women's mobility. Evidence for the value-chain proximity pathway is evident from the impacts on program households relative to Control 2 households, for which these value-chain linkages are weaker, owing to greater distance to a chilling plant. Evidence for the second pathway is more indirect: a greater impact is found on social norms related to women's mobility relative to Control 2 households, but relatively little impact compared with Control 1 households, possibly because of spillover effects.

Impacts on Women's Human Capital

One should not underestimate the possible spillover effects of women's increased mobility on the accumulation of another form of capital—human capital. Participants in all 11 focus groups said that women were able to access training provided by the program. The most commonly mentioned topics were cattle health management (4 groups) and farm management (3 groups). Training of milk collectors was cited by participants in only 2 groups. The main impacts of the trainings on women were enhanced skills in cattle production and farm management and an increase in their cows' milk production. In addition, trained women were considered by their families and their communities to be more capable in dairy activities and marketing of milk. As a result of their enhanced skills and knowledge, women were consulted on dairy production matters. The only time women were constrained in accessing training was when the training was conducted outside the home village, because it affected their household activities (mentioned in 3 groups). For the same reason, women could participate in only short (one- to two-day) trainings.

According to participants in 9 groups, decisions on who should be trained were made jointly by men and women, with members of only 1 group saying that the man decides who should be trained. In all 11 groups, participants said that women should be trained in dairy production—because they take care of cattle (mentioned in 9 groups), because they could be trained within or close to the homestead home (mentioned in 1 group), and because men decided who within the household could be trained and where this person could be trained (mentioned in 1 group). On the other hand, participants in 1 group stated that men should be trained in milk collection and transportation because it is an activity conducted outside

home and requires bicycle and other mechanized or motorized transport means that are easier for men to access and use. Participants in 3 groups stated that women could attend the training but faced difficulty attending training outside the community because they were required to complete their daily household chores. Women from the study community also conformed to norms of female seclusion and rarely traveled out of their homes. In another 3 groups, however, participants stated that women could attend training away from home.

In all 11 groups, participants reported seeing positive changes owing to training. Women adopted improved practices, resulting in increased milk yields (mentioned in 6 groups); women can now diagnose diseases in cows and treat them immediately (mentioned in 2 groups); women became more careful cattle managers and can save more money; women are more knowledgeable and respected in society (mentioned in 2 groups); and owing to increased knowledge among women, more cattle are now in sheds than before (mentioned by 1 group).

Possible Trade-offs: Time Use

In this section, we explore the impact of the program on time allocation of household members. Because many survey questions focusing on gender were asked only in the follow-up survey, we are unable to use ANCOVA specifications (or difference-in-difference specifications) for these estimates and must use single-difference specifications instead. Since the key advantage of ANCOVA or difference-in-difference specifications is to account for differences in preprogram characteristics between beneficiaries and non-beneficiaries, and the propensity score weights already help account for preprogram characteristics, single-difference estimates remain valid measures of impact.

We first assess how participating in the program affects the beneficiary households' overall time burden and how this time burden is shared across household members. One might expect program participation to lead households to allocate more time to certain dairy-related activities—particularly those promoted by the SDVCP—and for those responsibilities to fall upon the principal program beneficiary, who is typically the female spouse of the head. However, these responsibilities come in addition to domestic responsibilities, which also require significant time and typically belong to women.

Table 6.14 shows the program's impact on overall household time devoted to a range of activities related to dairy, reported regarding average weekly hours in the past 30 days. We find that, relative to Control 1, the program causes beneficiary households to spend slightly but significantly more time in taking animals to an animal hospital (or somewhere else) for artificial insemination and in cleaning the milking area. These are activities promoted by the SDVCP, suggesting that beneficiary households allocate more time to dairy-related tasks that they are taught are important. The small magnitude of impact is not surprising, since these activities are not required on a daily basis but rather are more infrequently required and may not have been relevant for every household in the past 30 days at the time of the endline survey. We note that few other impacts are relative to Control 1 households, indicating that Control 1 households have generally similar time allocations for dairy rearing and milk selling (possibly due to spillover effects of the SDVCP and the nearby presence of chilling plants), and the main differences are in dairy practices related to artificial insemination (a relatively new practice) and hygiene.

We find, meanwhile, that relative to Control 2, beneficiary households experience significant impacts on their time spent on a range of dairy-related activities: cleaning and draining the animal shed (nearly one hour more per week), washing animals (more than half an hour more per week), carrying fodder from the field (nearly two hours more per week), taking animals to the field for grazing and letting them graze (more than two hours more per week per activity), purchasing feed (more than half an hour more per week), preparing feed and feeding animals (more than one hour more per week), and other activities that take a few minutes more each week per activity (taking animals to the hospital or somewhere else for treatment, calling the doctor for treatment of animals, taking animals to the hospital or somewhere else for artificial insemination, and collecting money after selling milk). These findings suggest that relative to Control 2 households, the SDVCP participants experienced changes in time allocation ranging from increases in daily care of livestock (grazing, feeding, milking, and so forth) to

acquiring inputs for livestock health and hygiene (seeking treatment or artificial insemination, purchasing feed, cleaning sheds, washing animals, and so forth) to receiving payment for milk sales (collecting money). This range of impacts suggests that relative to the counterfactual situation proxied by Control 2, the program fundamentally shifted the time allocation of households that were dairy producers at baseline more strongly toward dairy production at endline.

Table 6.14 Program impacts on overall household time devoted to dairy-related activities in the past 30 days

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Average weekly hours spent cleaning/draining of animal shed	–0.147 (0.352)	0.898** (0.426)
Average weekly hours spent taking care of cows/animals	0.085 (0.080)	–0.730 (0.729)
Average weekly hours spent washing of animals	–0.510 (0.687)	0.732*** (0.217)
Average weekly hours spent collecting/carrying fodder from field	–0.253 (1.271)	1.727** (0.710)
Average weekly hours spent taking animals to the field for grazing	0.690 (0.718)	2.077*** (0.437)
Average weekly hours spent purchasing feed	0.189 (0.336)	0.691** (0.331)
Average weekly hours spent preparing feed and feeding the animals	–0.933 (0.806)	1.256* (0.752)
Average weekly hours spent taking the animals to hospital/somewhere else for treatment	0.050 (0.034)	0.082*** (0.028)
Average weekly hours spent calling doctor for treatment of animals	0.057 (0.059)	0.133** (0.052)
Average weekly hours spent taking the animals to hospital/somewhere for artificial insemination	0.012** (0.005)	0.014*** (0.005)
Average weekly hours spent calling doctor for artificial insemination of animals	0.001 (0.016)	–0.007 (0.022)
Average weekly hours spent cleaning of milking area	0.313** (0.140)	–0.170 (0.512)
Average weekly hours spent cleaning and drying of utensils before and after milking	–0.127 (0.246)	0.129 (0.168)
Average weekly hours spent carrying the milk for selling	–0.609 (0.653)	0.282 (0.199)
Average weekly hours spent collecting the money after selling milk	–0.638 (0.521)	0.222** (0.089)
Average weekly hours spent grazing animals in the field	0.701 (0.880)	2.057*** (0.555)
Average weekly hours spent taking the animals for vaccination and/or deworming	0.033 (0.029)	–0.045 (0.088)
Average weekly hours spent milking animals	0.030 (0.292)	0.312 (0.287)
Observations	844	813

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with a single-difference specification using propensity score–weighted regression.

We then look at how time on household activities is affected. Table 6.15 shows the impact of the program on overall household time devoted to a range of household maintenance activities, reported regarding average weekly hours in the past 30 days. We find that relative to Control 1, the program causes beneficiary households to spend significantly less time in feeding children (more than one hour less per week) and looking after children (almost two hours less per week). Coupled with the impacts found above, these results suggest that relative to Control 1, the program causes a slight reallocation of time toward dairy-related activities and away from child-rearing.

Table 6.15 Program impacts on overall household time devoted to household maintenance activities in the past 30 days

Outcome	Impacts relative to Control 1	Impacts relative to Control 2
Average weekly hours spent feeding young children	–1.254*	1.209
	(0.669)	(0.779)
Average weekly hours spent looking after young children	–1.694**	1.934**
	(0.825)	(0.765)
Average weekly hours spent cooking	–0.617	3.625*
	(0.988)	(2.104)
Average weekly hours spent washing clothes	0.016	–0.257
	(0.486)	(0.510)
Average weekly hours spent cleaning the home	–0.159	–0.527
	(0.498)	(0.982)
Observations	844	813

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with a single-difference specification using propensity score–weighted regression.

Interestingly, relative to Control 2, the program appears to cause significant *increases* in time spent looking after children (almost two hours more per week) as well as time spent cooking (more than three hours more per week). Taking the situation of Control 2 households as the counterfactual, we can interpret the SDVCP as increasing participant households' incentive to remain in dairy production, which by its nature requires presence on the homestead to take care of livestock. Given that a household member's productive work is on the homestead (as opposed to in the fields), it is also likely that the individual is more easily able to spend additional time on other tasks that can be done simultaneously while on the homestead, including looking after children and cooking. Thus, relative to Control 2, the SDVCP appears to cause households to spend more time on activities such as child-rearing and cooking, likely because it reduces time spent outside the home.

We then consider how these impacts on overall household time allocation are shared across different members of the household. Table 6.16 shows the impact of the program in terms of the time that adult women and adult men (age 18 and older), as well as young girls and young boys, devote to a range of dairy activities, reported regarding average weekly hours in the past 30 days. We also construct a measure of the total hours that adult women devote to these activities. Adult women are the primary program participants in beneficiary households; therefore, it is of interest to see how much of the increased time households allocate to dairy activities is borne by the adult women. We find that relative to adult women in Control 1, those in beneficiary households spend slightly more time calling a doctor for artificial insemination of animals (about 1 minute more per week) and cleaning the milking area (about 1 minute more per week), but the differences are statistically significant. Tying into the impacts shown above, these results suggest that similar impacts seen at the household level (increases in time spent on livestock health and hygiene) are found for adult women. The impact on total weekly hours devoted to dairy activities by adult women is not statistically significant. Again, because the activities for which we see increased time allocation are not required daily, the small average impacts are not surprising.

Table 6.16 Program impacts on time that adult women, adult men, young girls, and young boys devote to dairy-related activities in the past 30 days

	Adult women		Adult men		Young girls		Young boys	
Outcome	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**
Average weekly hours spent cleaning/draining of animal shed	–0.266 (0.366)	0.705 (0.436)	0.029 (0.037)	0.078** (0.030)	0.028** (0.014)	0.028** (0.014)	0.003 (0.003)	0.003 (0.003)
Average weekly hours spent taking care of cows/animals	0.016 (0.016)	–0.812 (0.725)	0.003 (0.002)	0.003 (0.002)	0.079 (0.078)	0.079 (0.078)	—	—
Average weekly hours spent washing of animals	0.048 (0.189)	0.130 (0.193)	–0.609 (0.772)	0.564** (0.222)	0.006 (0.005)	0.006 (0.005)	0.018** (0.008)	0.006 (0.015)
Average weekly hours spent collecting/carrying fodder from field	–0.688 (0.877)	0.695** (0.288)	0.365 (0.860)	1.000 (0.639)	—	—	0.050** (0.020)	0.013 (0.041)
Average weekly hours spent taking animals to the field for grazing	0.366 (0.398)	0.928*** (0.269)	0.283 (0.448)	1.134*** (0.276)	—	—	0.021** (0.010)	–0.003 (0.026)
Average weekly hours spent purchasing feed	–0.002 (0.110)	0.117* (0.063)	0.191 (0.376)	0.550* (0.334)	—	—	–0.014 (0.033)	0.009 (0.010)
Average weekly hours spent preparing feed and feeding the animals	0.132 (0.651)	0.886 (0.768)	–1.104 (1.027)	0.409* (0.215)	0.014 (0.011)	–0.084 (0.097)	—	—
Average weekly hours spent taking the animals to hospital or somewhere else for treatment	–0.001 (0.030)	0.028 (0.023)	0.037*** (0.010)	0.039*** (0.010)	—	—	—	—
Average weekly hours spent calling doctor for treatment of animals	0.039 (0.052)	0.067 (0.049)	0.018 (0.030)	0.065*** (0.017)	—	—	—	—
Average weekly hours spent taking the animals to hospital/somewhere for artificial insemination	0.003 (0.002)	0.003 (0.002)	0.009** (0.004)	0.011*** (0.004)	—	—	—	—
Average weekly hours spent calling doctor for artificial insemination of animals	0.011* (0.007)	0.011* (0.007)	–0.010 (0.014)	–0.018 (0.022)	—	—	—	—
Average weekly hours spent cleaning of milking area	0.313** (0.140)	–0.203 (0.512)	0.015 (0.009)	0.015 (0.011)	–0.014 (0.021)	0.006 (0.005)	—	—
Average weekly hours spent cleaning and drying of utensils before and after milking	–0.131 (0.250)	0.100 (0.167)	0.018** (0.008)	0.019** (0.008)	–0.015 (0.021)	0.005 (0.005)	—	—

Table 6.16 Continued

Outcome	Adult women		Adult men		Young girls		Young boys	
	Impacts relative to Control 1	Impacts relative to Control 2	Impacts relative to Control 1	Impacts relative to Control 2	Impacts relative to Control 1	Impacts relative to Control 2	Impacts relative to Control 1	Impacts relative to Control 2
Average weekly hours spent carrying the milk for selling	–0.107 (0.102)	–0.072 (0.120)	–0.519 (0.697)	0.362** (0.162)	—	–0.003 (0.003)	0.020** (0.009)	–0.008 (0.026)
Average weekly hours spent collecting the money after selling milk	–0.115 (0.152)	0.038 (0.044)	–0.526 (0.550)	0.179*** (0.068)	—	—	0.006** (0.003)	0.003 (0.004)
Average weekly hours spent grazing animals in the field	0.443 (0.526)	1.020*** (0.354)	0.192 (0.605)	0.970*** (0.336)	—	—	0.049* (0.026)	0.049* (0.026)
Average weekly hours spent taking the animals for vaccination and/or deworming	0.007 (0.027)	0.027 (0.022)	0.025** (0.012)	–0.072 (0.085)	—	—	—	—
Average weekly hours spent milking animals	0.099 (0.255)	–0.062 (0.276)	–0.056 (0.234)	0.357*** (0.100)	—	—	0.005 (0.005)	0.005 (0.005)
Average weekly total hours spent on dairy activities	0.168 (2.695)	3.606* (1.910)	–1.637 (3.272)	5.667*** (1.513)	0.096 (0.094)	0.035 (0.128)	0.158*** (0.056)	0.076 (0.087)
Observations	844	813	844	813	844	813	844	813

Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with a single-difference specification using propensity score–weighted regression. — denotes too few nonzero values across the treatment and control groups for estimation.

Relative to Control 2, the program appears to cause significant increases in adult women's time spent on a broad range of dairy-related activities: collecting and carrying fodder from the field (more than half an hour more per week), taking animals to the field for grazing (nearly one hour more per week), grazing animals in the field (more than one hour more per week), and a range of activities that require a few minutes more per week for each activity (purchasing feed, calling the doctor for artificial insemination of animals). The impact on total weekly hours devoted to dairy activities is weakly statistically significant (about three hours more per week). As with the household results, these impacts are broader than those relative to Control 1. Notably the activities for which adult women experience significant impacts are primarily based on the homestead (for example, calling a doctor for artificial insemination versus taking the animal to the hospital for artificial insemination).

Are these increases in time allocation to dairy activities shared by *adult men*, including the male spouses of female program participants? In Table 6.16 we see that relative to Control 1, adult men in beneficiary households spend slightly more time on various dairy-related activities (e.g., a few minutes more per week on taking animals to the hospital or somewhere else for treatment, artificial insemination, or vaccinations; cleaning and drying utensils before and after milking), but that these differences are statistically significant. Again, these results suggest similar impacts seen at the household level relative to Control 1—in particular, increases in time spent on livestock health and hygiene—and again, because the activities are not required on a daily basis, the small average impacts are not surprising. The impact on total weekly hours devoted to dairy activities by adult men is not statistically significant. However, notably, most of the increases in men's time are related to activities that require leaving the homestead, such as taking animals for treatment, artificial insemination, or vaccinations. Taken together with the impacts on adult women's time in dairy activities, these results suggest that women and men in SDVCP households may to some extent specialize in taking on the extra dairy activities, relative to Control 1—with women taking on more of the activities that can be undertaken on the homestead, and men taking on more of the activities that require leaving the homestead.

Relative to adult men in Control 2, those in the program show significant increases in time spent on a broad range of dairy-related activities: taking animals to the field for grazing (more than one hour more per week), grazing animals in the field (nearly an hour more per week), washing animals (more than half an hour more per week), purchasing feed (more than half an hour more per week), and other activities that each take only a few more minutes per week (cleaning and draining the animal shed, preparing feed and feeding animals, taking animals to the hospital or somewhere else for treatment or artificial insemination, calling the doctor for artificial insemination of animals, cleaning and drying utensils before and after milking, carrying the milk for selling, collecting the money after selling milk, and milking animals). The impact on total weekly hours devoted to dairy activities by adult men is highly statistically significant (about five hours more per week). The broad impacts, mirroring the broad impact seen relative to Control 2 at the household level, suggest that the time burden of the program appears to be shared considerably between spouses. Moreover, relative to Control 2 households, the activities in which male spouses contribute appear to span both those based on the homestead (such as milking animals) and those based off the homestead (such as carrying the milk for selling and collecting the money from milk sales).

With respect to intrahousehold time allocation of dairy activities, we next look at whether these impacts are also shared over young girls and young boys age 17 or younger. Table 6.16 also shows program impacts on young girls' time spent on dairy activities. For many activities, very few young girls are reported to allocate any time in either treatment or control groups. We do see that relative to young girls in Control 1 and Control 2, those in the program slightly but significantly increase the amount of time spent cleaning and draining the animal shed (a few minutes more per week). The impact on total weekly hours devoted to dairy activities by young girls is not statistically significant. These results suggest that young girls do not tend to directly share much of the burden in beneficiary households' increased time allocation to dairy activities.

Finally, Table 6.16 shows program impacts on young boys' time spent on dairy activities. Again, for many activities, very few young boys are reported to allocate any time in either treatment or control groups. We do see that particularly relative to young boys Control 1 and also in some cases Control 2, those in the program slightly but significantly increased the amount of time spent on dairy-related activities (by a few minutes per week): washing animals, collecting and carrying fodder from the field, taking animals to the field for grazing, carrying milk for selling, collecting money after selling milk, and grazing animals in the field. Relative to Control 1, the impact on total weekly hours devoted to dairy activities by young boys is highly statistically significant (a few minutes more per week). These results suggest that young boys do play a small role in dairy-related program activities, although young girls do not.

We then turn to assessing how program impacts on household activities are shared within the household. Table 6.17 shows program impacts on time that adult women, adult men, young girls, and young boys spend on household activities, capturing the effect on the likely program participant. We find that parallel to the results at the household level and relative to Control 1, the program significantly decreases the time adult women spend on feeding young children (about 1.4 hours less per week) and on looking after young children (about 1.6 hours less per week). The impact on total weekly hours devoted to household activities by adult women is not statistically significant. Meanwhile, relative to Control 2 and again parallel to the household-level results, women in the program significantly increased their time spent on looking after young children (about 1.7 hours more per week) and on cooking (about 4 hours more per week). The impact on total weekly hours devoted to household activities is weakly statistically significant (about 7 hours more per week). These results suggest that relative to Control 1, compared with which the program caused narrow impacts on specific dairy practices, women slightly reallocated their time toward these practices and away from child care. Meanwhile, relative to Control 2, compared with which the program caused considerably more households to remain engaged in dairy farming as a livelihood, women spent increased time looking after children and cooking, possibly due to their being more likely engaged in productive work on the homestead.

Table 6.17 also shows program impacts on adult men's time spent on household activities, capturing the effect on the male spouse of the likely program participant. We find that relative to Control 1 and Control 2, the program has few impacts on the time adult men spend on household activities. Relative to Control 1, men appear to spend a few more minutes per week cooking, and the impact on total weekly hours devoted to household activities is weakly statistically significant (a few minutes more per week). However, broadly, while men do appear to contribute significantly to time spent on dairy-related program activities, they appear not to generally share in household activities.

Finally, we explore whether the program causes some shift of household activities to young girls and young boys ages 17 and under. Also in Table 6.17 are the program impacts on young girls' time spent on household activities. We find that, relative to Control 1 and Control 2, the program causes slight but significant increases in the time young girls spend on household activities including feeding young children, looking after young children, and cooking—although the impact on total weekly hours devoted to household activities by young girls is not statistically significant. Taken together with the program impacts on adult women's time on household activities, these results suggest that while the program causes adult women (at least relative to Control 1) to reallocate some time from household activities to dairy activities, young girls in turn increase their time in these household activities.

Finally, Table 6.17 shows program impacts on young boys' time spent on household activities. We find that relative to both Control 1 and Control 2, the program causes no significant impacts on the time young boys spend on household activities. Impacts on total weekly hours devoted to household activities by young boys are not statistically significant. These results suggest that while the program causes young boys in beneficiary households to contribute time to dairy activities, they do not contribute time to household activities.

Table 6.17 Program impacts on time devoted by adult women, adult men, young girls, and young boys to household maintenance activities in the past 30 days

	Adult women		Adult men		Young girls		Young boys	
Outcome	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**	**Impacts relative to Control 1**	**Impacts relative to Control 2**
Average weekly hours spent feeding young children	–1.347** (0.671)	1.065 (0.775)	0.037 (0.024)	0.037 (0.024)	0.083** (0.039)	0.083** (0.039)	0.002 (0.002)	0.002 (0.002)
Average weekly hours spent looking after young children	–1.574* (0.835)	1.703** (0.765)	0.079 (0.057)	0.079 (0.057)	–0.119 (0.249)	0.120** (0.052)	0.003 (0.003)	0.003 (0.003)
Average weekly hours spent cooking	–-0.913 (1.004)	4.172* (2.149)	0.132** (0.066)	–0.706 (0.798)	0.315*** (0.115)	0.041 (0.269)	–0.014 (0.052)	0.028 (0.028)
Average weekly hours spent washing clothes	0.150 (0.498)	0.343 (0.583)	0.011 (0.014)	–0.650 (0.636)	–0.125 (0.110)	0.004 (0.067)	–0.015 (0.023)	0.006 (0.006)
Average weekly hours spent cleaning the home	–0.255 (0.496)	0.310 (0.893)	0.025 (0.020)	–0.973 (0.955)	0.082 (0.056)	0.094 (0.059)	–0.018 (0.022)	0.003 (0.003)
Average weekly total hours spent on household activities	–3.939 (3.002)	7.593* (3.929)	0.283* (0.156)	–2.213 (2.391)	0.237 (0.407)	0.342 (0.414)	–0.042 (0.096)	0.043 (0.042)
Observations	844	813	844	813	844	813	844	813

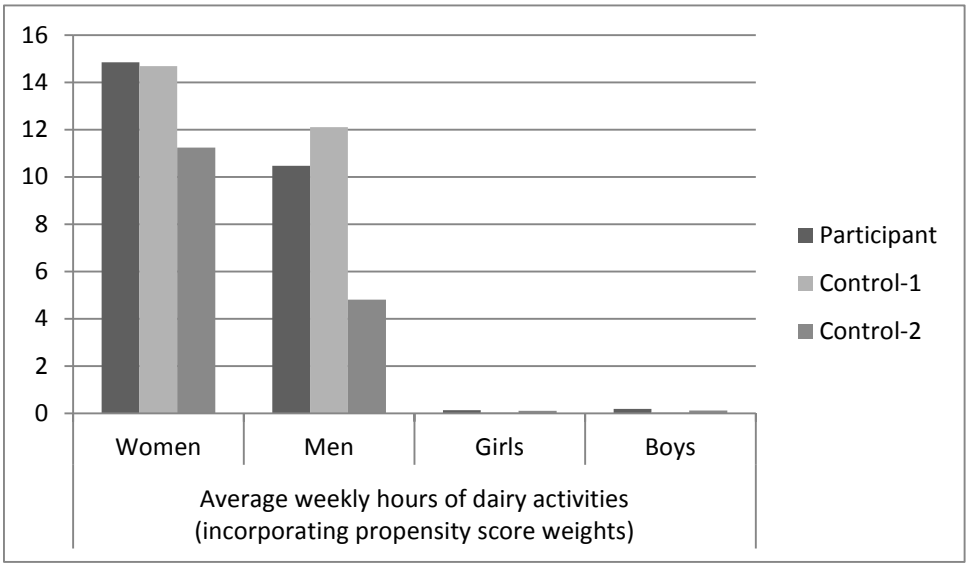
Source: Authors' computation.

Notes: Standard errors clustered at the village level appear in parentheses. * signifies statistically significant at the 10 percent level, ** signifies statistically significant at the 5 percent level, *** signifies statistically significant at the 1 percent level. Each cell contains an estimated program impact from a distinct regression, estimated with a single-difference specification using propensity score–weighted regression.

To provide context for these impacts, we show descriptive statistics of average time allocations at endline for adult women, adult men, young girls, and young boys. Since these averages are taken over the full unconditional sample, we account for the propensity score weights to make the treatment and control groups comparable in terms of baseline observable characteristics and compare across groups.

Figure 6.13 shows the average weekly hours of all dairy activities described above at endline, accounting for propensity score weights, for SDVCP participant households, for Control 1 households, and for Control 2 households. Figure 6.14 shows a similar breakdown for average weekly hours of all household activities described above at endline, and Figure 6.15 shows a breakdown of average weekly hours of all dairy and household activities described above at endline. We see across these figures that although program impacts may lead other household members to share some dairy or household activities with women (who are typically the primary SDVCP participants), women nonetheless tend to allocate the most time to both dairy activities and household activities. Within dairy activities, the sharing of responsibilities between men and women is somewhat similar (although women still allocate more time on average), but the time allocated to household activities is very disproportionately contributed by women. Across all categories, we see very small absolute contributions from girls and boys. Although we do find above that program impacts on contributions to household activities for girls and dairy activities for boys are significant, these figures highlight that the absolute contributions are still quite small. Thus, we note that even though impact estimates suggest that the SDVCP caused some intrahousehold sharing of dairy and household responsibilities, the burden of both dairy activities and household activities in absolute terms continued to fall largely on women even in SDVCP households.

Figure 6.13 Average weekly hours of dairy activities (incorporating propensity score weights)

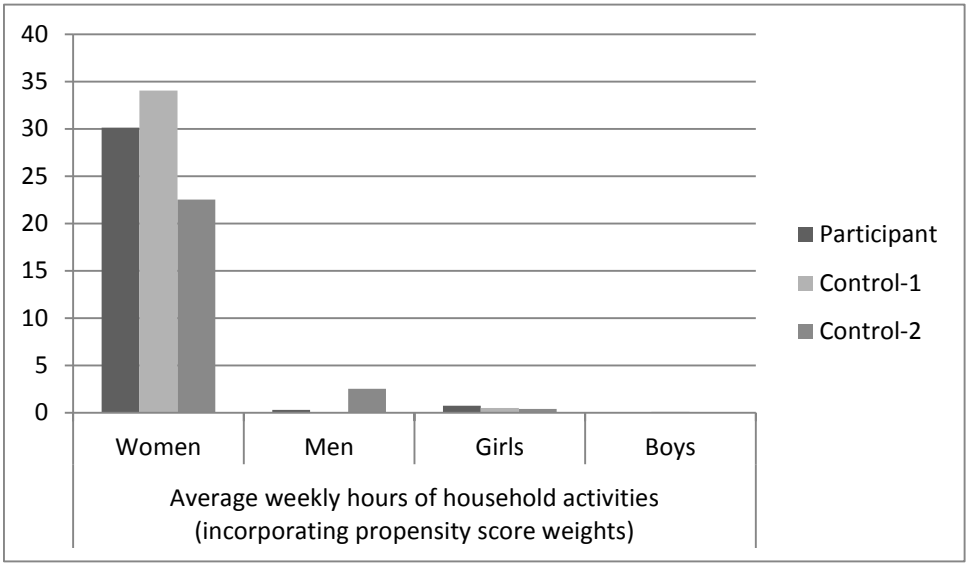


Source: Authors' computation.

As a whole, these results suggest that if we take Control 1 households as a proxy for the counterfactual situation of beneficiary households, the program increases overall time spent on several specific dairy-related activities regarding livestock health and hygiene. We interpret this finding as indicating that the program causes a slight increase in time spent on the livestock practices it promotes—relative to a situation where households were not SDVCP participants themselves but lived near chilling plants and experienced spillovers from the SDVCP (and therefore had exit rates from dairy comparable to SDVCP households). Meanwhile, it decreases time spent on childcare, including feeding and looking after young children, suggesting a slight reallocation of time from household activities to dairy activities. The increases in time spent on dairy activities appear to be borne primarily by adult women and adult

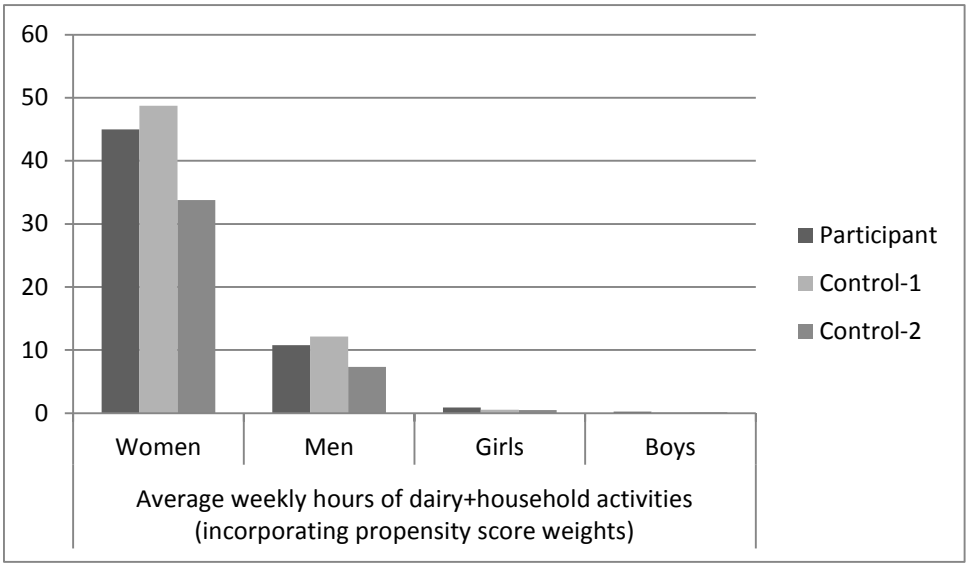
men, although young boys also appear to make a small contribution (while young girls do not). The decreases in time spent on household activities come primarily from adult women (and are not compensated by adult men or young boys), although young girls appear to contribute slightly more instead.

Figure 6.14 Average weekly hours of household activities (incorporating propensity score weights)



Source: Authors' computation.

Figure 6.15 Average weekly hours of dairy and household activities (incorporating propensity score weights)



Source: Authors' computation.

Taking Control 2 households as a proxy for the counterfactual situation of beneficiaries instead, we find significantly broader increases in time allocated to dairy activities. This finding suggests that, relative to a counterfactual situation in which many beneficiary households may have exited dairy by endline, the SDVCP caused considerably more time to be allocated to dairy production and dairy-related

activities. The program also causes increases in time spent on household maintenance (specifically, looking after children and cooking), relative to Control 2, likely because the SDVCP leads to productive work in dairy-rearing on the homestead, which facilitates multitasking on household tasks.

Intrahousehold dynamics in terms of program impacts appear similar in comparison to Control 1 and Control 2—adult women appear to increase time on dairy activities, adult men and young boys appear to contribute to dairy activities but not to household activities, and young girls appear to contribute to household activities but not to dairy activities. Broadly, these results suggest that adult women are likely to experience some disproportionate time burden from program participation, although some activities related to both dairy and household maintenance appear to be shared with or reallocated to other household members. Moreover, descriptive statistics for endline time allocation suggest that despite the program causing some intrahousehold reallocation, in absolute terms, adult women still contribute the largest amount of time in the household to both dairy-related and household maintenance activities. These quantitative results are supported by findings from the qualitative study: men say they are helping more because they appreciate the benefits of adopting new dairy technologies. Only one group said that boys and girls continued to help with work without specifying whether or not their workload had increased.

7. CONCLUSIONS AND IMPLICATIONS FOR DAIRY VALUE-CHAIN PROJECTS

The larger impact evaluation, which focused on households recruited in the first year of the project, found limited impacts on measures of overall household income, proxied by measures of household expenditure (Ahmed et al. 2013). Although some indications were that the project caused shifts in some categories of expenditure (including increases in spending on health and education among nonfood expenditures, as well as increases in spending on pulses and meats among food expenditures), relatively little impact was found on aggregate expenditure. This lack of aggregate impact is not surprising, because the project did not transfer livestock or cash to households, which might have significantly increased consumption expenditures. Also relatively few significant impacts were found on overall food consumption, including on calories available or on dietary diversity, although we again see small shifts in types of foods or food groups consumed. Note, however, that because this impact evaluation focused on first-year participants, these results would not be generalizable to households who participated in subsequent years of the program.

In contrast to the limited impacts on consumption and human capital investments, participation in the SDVCP had significant positive impacts on the *composition* of household assets, even if the overall value of the household portfolio did not differ between participants and nonparticipants. Relative to households living in areas without a chilling plant, participation in the SDVCP has increased the value of livestock assets. Apart from the (expected) increase in the value of livestock assets, participation in the program also seems to have induced significant reallocation within the households' asset portfolios. Relative to similar households within the areas where the SDVCP operates, participant households increased the value of both agricultural and nonagricultural productive assets, and estimated impacts on agricultural productive assets relative to households living in unions without a chilling plant are large and highly significant.

While participation in the program increased the value of men's assets, it also increased the value of jointly held assets. This suggests that women were able to build up assets, not by acquiring assets that they exclusively owned, but by acquiring jointly owned assets. Program participation increased the value of jointly held nonagricultural productive assets, consumer durables, and jewelry; it also increased the value of jointly held cattle, goats, and poultry, although larger increases were observed in the value of individually owned cattle owned by men. Because asset accumulation occurs over time, this is an indicator of the sustained impact of participation in the SDVCP.

Despite small program impacts that favor wives as primary decisionmakers regarding type of feed and where to purchase inputs and services and that favor other males as primary decisionmakers on decisions such as artificial insemination and vaccinations, the husbands are—across all groups and in all decision spheres—the large majority of primary decisionmakers. Thus, while the program appears to cause some shifts in dairy-related decisionmaking toward household members other than the husband, the dynamics nonetheless appear to remain strongly in favor of the husband. Decisions whether to buy, sell, or lease a cow remain dominated by husbands and remain unaffected by program participation. Nevertheless, the program has increased the proportion of households where the wife decides on dairy expenses. Decisions regarding milk sales are also made mostly by husbands, while decisions regarding the disposal of milk kept for own consumption are made by wives. Any significant impact, if at all, suggests that in participant households, other males have increased decisionmaking power to give milk to children and to others, relative to Control 1 households. However, similar to decisionmaking on dairy expenses, the magnitudes of these effects are small. By and large, decisions that involve financial outlays or inflows are made by husbands, regardless of program participation status, while those about the allocation of milk that is not for sale are made by wives.

Participation in the program also had a modest impact on men's and women's decisionmaking within the household, with a shift in decisionmaking patterns favoring greater participation of women in household decisions, whether solely or jointly with her husband. Participation in the program also increased women's control of money for household expenses, particularly in comparison to households in

areas without a chilling plant. Program participation also increased women's mobility, in terms of increasing the proportion of households where women participate in the decision to go to specific places inside and outside the community. It is noteworthy that one condition that allows a woman to leave the homestead to visit friends or health facilities—her having money to pay for the associated expenses—has increased significantly in participant households. Compared with households in areas without a chilling plant, households that participated in the program also experienced increased women's mobility and ability to access value-chain services (input dealers, livestock health workers, milk collection points) both inside and outside the community. These impacts on decisionmaking and mobility have persisted, or have been sustained, even after exiting the program.

Analysis of time allocated to dairy and other activities shows that time spent on specific dairy activities encouraged by the program increased, particularly activities related to livestock health and hygiene, with this time being supplied mostly by adult women. Adult women also increased their time spent on dairy activities located *within the homestead*, while adult men increased time spent on dairy activities that required leaving the homestead. Young girls do not directly share the burden of increased time spent on dairy activities, but young boys do play a small role. The increased allocation of adult women's time for dairy activities has come at the expense of their time in household activities, with young girls (but not boys) consequently increasing their time in domestic work.

Some observations emerge from this initial investigation. First, the small set of impacts we describe generally appears to be on an *intensive* margin rather than an *extensive* margin. The project does not significantly increase total expenditures, but it does appear to shift the types of expenditures. Similarly, the program does not significantly increase the *number* of cattle owned; it appears to increase the *value* of cattle owned, by increasing the number of higher-value crossbred cattle and reducing the number of lower-value indigenous cattle. The results of this impact evaluation also highlight the importance of considering a broad range of indicators related to poverty reduction and well-being when targets for program performance are set. Impacts can occur outside the domain directly targeted by the intervention. In the case of the SDVCP, a narrow focus on dairy income would suggest the program has few impacts. However, expanding the focus of the evaluation to other relevant indicators, such as asset portfolios, household dynamics, and gender norms, indicates a richer story with considerable positive impacts. Neglecting these other outcomes would underestimate the potential for dairy value-chain projects to be a catalyst for positive social change in rural areas.

APPENDIX: STEPS IN IMPLEMENTING PROPENSITY SCORE-WEIGHTED REGRESSION

We first identify a set of non-beneficiary households similar to participant households on a range of observable dimensions, referring to this set as our *comparison group*. In this evaluation, two different comparison groups were defined in the course of data collection as described above—Control 1 and Control 2. We refer to the comparison of participants (treatment) versus Control 1 (comparison) as Treatment Definition 1: = 1 if treatment, = 0 if comparison. We refer to the comparison of participants (treatment) versus Control 2 (comparison) as Treatment Definition 2: = 1 if treatment, = 0 if comparison. We then consider from a conceptual standpoint which baseline characteristics of households may plausibly be correlated with both program selection and our key outcomes. Selection criteria for the program are included in this set of characteristics, as we know they should be correlated with treatment status, and we imagine they may additionally be correlated with key outcomes. For this evaluation, we include a very large set of baseline characteristics related to household location, demographics, dwelling conditions, labor-force participation, household expenditures, food consumption, health status, history of shocks, loans and savings, asset ownership, landownership, livestock ownership, livestock feeding practices, and milk sales practices.

Next, for each of the two treatment definitions, we estimate a propensity score for a household being in the treatment group rather than in the comparison group, allowing for all household characteristics described in the second step to be included as covariates. The propensity score is estimated using a simple logit specification with the treatment indicator as the dependent variable and all covariates as independent variables. Figure A.1 shows the distributions of estimated propensity scores for treatment and comparison households for each treatment definition.

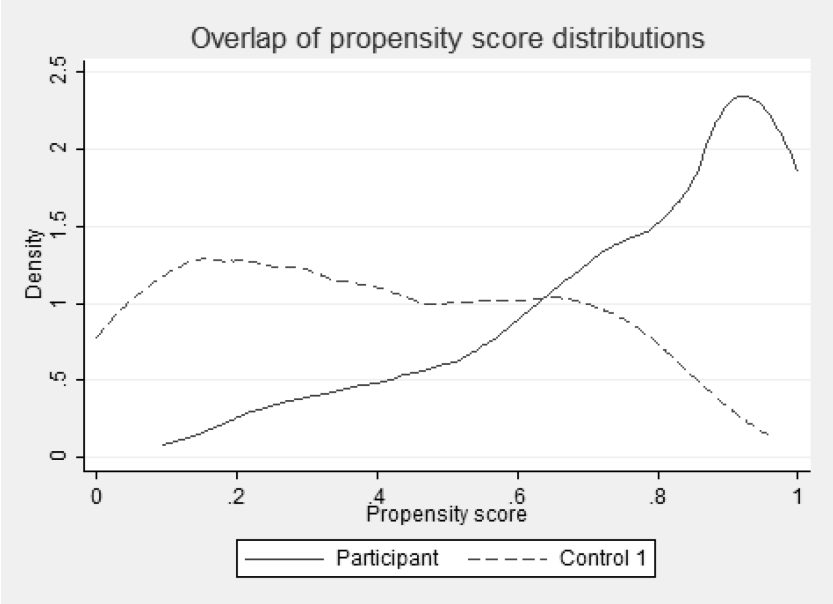
Within each treatment definition, we then use the estimated propensity scores, p, to weight each comparison group household. Each treatment household is weighted with 1, and each comparison group household is weighted with $p/(1–p)$. In effect, this method assigns more weight to comparison group households that are more similar to treatment households in terms of the observable characteristics we believe to be potentially correlated with both program receipt and key outcomes, and assigns less weight to those that are less similar. The result is that with the weights applied, all observable characteristics we perceive to be correlated with key outcomes are better balanced across the treatment and comparison groups. Again, the crucial assumption for this method is that when these differences in observable characteristics are accounted for, no remaining differences are correlated with both treatment status and key outcomes. If this assumption holds, propensity score–weighted regressions should yield unbiased impact estimates. For both treatment definitions, we find that while preprogram observable characteristics were not balanced across the treatment and comparison groups without the propensity score weights applied, most are balanced when the weights are applied, giving us confidence to proceed with analysis.

Finally, for each treatment definition, we conduct impact estimation using regression specifications, with the applicable propensity score weights applied.[16]

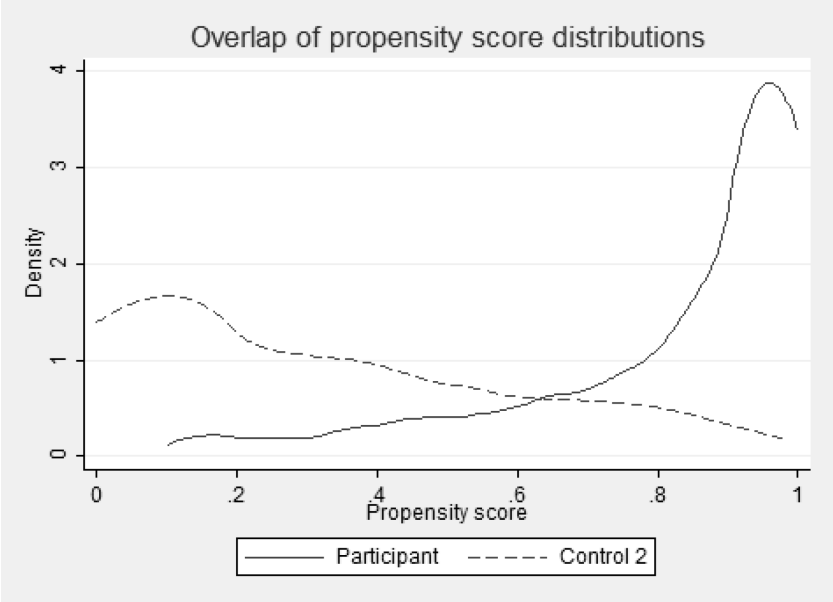
[16] Hirano, Imbens, and Ridder (2003) note that the covariates used to estimate propensity scores can also be included directly in the regressions. Inclusion of these covariates should not change the point estimates of the treatment coefficient if the identifying assumption for propensity score weighting is satisfied, but can potentially improve precision. For our estimation, we run specifications both with and without covariates, finding very little difference in results, but because of the very large set of covariates we include, standard errors are somewhat larger with covariates. Therefore, in our main presentation of results, we show estimates without additional covariates.

Figure A.1 Overlap of propensity score distributions

(a) Under Treatment Definition 1



(b) Under Treatment Definition 2



Source: Authors' computation.

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