One cow per poor family: Effects on the growth of consumption and crop production

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ABSTRACT

This study estimates the effects of the one cow policy on per capita consumption and the value of per hectare crop production in Rwanda using a random sample of households observed twice (2010 and 2014). A model that accounts for heterogeneity across households and the selection bias and placement effect associated with the policy is estimated. Findings show that receiving a cow has a positive effect on crop production indicating that the cattle has enabled households to become more productive on the farm. Results point to the importance of household's knowledge and experience of rearing livestock for the outcome of receiving a cow.

1. Introduction

Agricultural productivity growth is often recognized as one of the most important factors to alive poverty and achieve economic growth in the context of developing countries (Johnston & Mellor, 1961; Jalan & Ravallion, 2002). This follows the evidence that there are backward and forward linkages between the agricultural sector and other sectors of the economy and that agricultural productivity growth spurs growth in the economy as a whole (Haggblade, Hazell & Reardon, 2010). In Rwanda, most poor households are found in rural areas and they depend on agriculture as their primary source of income and employment. Specifically, around 80% of the population live in rural areas and rural poverty is estimated to be almost three times as high as urban, 44% versus 16 (National Institute of Statistics of Rwanda (NISR), 2016). Hence, poverty and living standards of rural households in Rwanda, as in most of sub-Sahara, are strongly related to agricultural assets, such as land and livestock holdings (Abdulai & CroleRees, 2001).

With the intent to reduce poverty, the government of Rwanda have introduced the social protection programme 'One cow per poor family program', also referred to as Girinka. This is a program that distributes dairy cows with the overall goal to reduce poverty and provide a source of nutrition, fertilizers and additional income among the poorest households. Since its introduction in 2006, Girinka has distributed around 300 thousand dairy cows, with the intention to reach more than 350 thousand by the end of 2017 (Republic of Rwanda, 2015). Similar livestock-oriented policy programs are gaining popularity across Africa and several countries have introduced policy programs, alike the Girinka, to increase livestock ownership with poverty alleviation as the main goal.[1]

Despite the significant amount of public resources allocated through Girinka, the evidence of its economic impact is still scarce, particularly its ability to improve the well-being of poor households. Klapwijk et al. (2014) study the 'One cow per family' program in Rwanda and show that poor households are unable to provide sufficient fodder to feed a cow. They suggest that a shift to animals that require less fodder, such as goats, would better target the poor and improve the effectiveness of the program. Argent, Augsburg and Rasul (2014) show that the transfer of livestock assets through Girinka has a positive impact on milk production and other indicators of household wealth, particularly of those households that are also offered training on how to utilize the livestock.[2] This study contributes to the knowledge of policy induced livestock transfer by focusing on the Girinka program and its effects on household consumption and crop production. The study addresses heterogenous treatment effects which is an attempt to examine if there are outcome differences of program participation

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[1] For example, the 'Chickens for poverty alleviation' program in Eastern Uganda and the promotion of dairy cattle and dairy goats among smallholder farmers in Malawi and the 'Pigs for Peace' program in the Democratic Republic of the Congo.

[2] There are also studies that address the role of livestock assets for poverty alleviation and households risk minimizing strategies in the context of developing countries (Fafchamps, Udry & Czukas, 1998; Hoogeveen, 2002; Kazianga & Udry, 2006).

depending on household characteristics. Having access to data that track households over time enables us to unravel if such effects exist while controlling for time-invariant unobservable factors. We also estimate if the results are sensitive to natural conditions. Besides topography and climate variability across Rwanda, the strong heterogeneity in soil fertility may influence fodder production and households' ability to rear livestock (Byiringiro & Reardon, 1996).

Assessing the impact of policies on welfare indicators is challenging from a methodological point of view. One may risk a selection bias in terms of type of participants, potentially based on educational- or skill levels, geographical location etc. This means that it can be difficult to interpret the effect of the 'One cow policy' as it may not be randomly dispersed but targeted to poor households. The poorest are, however excluded from the program since they do not meet the pre-stated requirements, but there might still be a risk of a placement bias. Our approach is to apply first difference estimations and the recently developed Coarsened Exact Matching (CEM) method to estimate control households to the cow receiving households (Iacus, King & Porro, 2009, 2011, 2012; Nilsson, 2018a). With access to representative household-level data across Rwanda, through the integrated household living conditions survey (EICV) of 2010 and 2014, the study estimates the average treatment effect on treated. This means a comparison of the outcome between households that received a dairy cow between 2010 and 2014 and similar households that never received a dairy cow through the program. Unlike Klapwijk et al. (2014) and Argent et al. (2014), we attempt to model the selection bias and placement effect associated with the policy and explore the causal link between policy induced transfer of cattle and indicators of household wealth.

Our approach is useful from a methodological as well as a policy perspective. It applies a matching technique to handle selection bias and can thereby provide new evidence on the heterogeneous effects associated with Girinka. Using the CEM matching technique, we can reduce the heterogeneity in the distribution of pre-treatment covariates in the treated and control groups by a magnitude of 1.5. Findings show that the Girinka program has a positive effect on the value of per hectare crop production, indicating that the livestock has enabled households to improve their agricultural productivity. The effect on consumption depends importantly on households' ownership of agricultural assets (land and livestock) and hence their knowledge and experience of rearing livestock. These results point to the importance of wealth and learning effects for the outcome of receiving a dairy cow through Girinka. Results also indicate that the program may not be able to target the poorest participants as they typically lack sufficient resources and experiences to make productive use of a cow. Although the results in this study are consistent with the idea that cattle are productive resources on the farm (Pender, Nkonya, Jagger, Sserunkuuma, & Ssali, 2004; Kato, Ringler, Yesuf, & Bryan, 2011), the analysis cannot unravel the mechanisms behind this because of data limitations. In this respect, this study opens for further studies that attempts to disentangle the underlying effects, through qualitative approaches and interviews with Girinka beneficiaries.

2. Background

The overall purpose of the 'One cow policy' is to reduce poverty and assist poor households to improve their well-being through income generation and reduced malnutrition. The policy was implemented in November 2006, as a part of the Rwandan vision 2020 to move from a low-income to a middle-income country (Republic of Rwanda, 2000). The program is launched and designed by the Rwandan government and implemented through several

governmental authorities including the Ministry of Agriculture and Animal Resources (MINAGRI). Alongside the governmental agencies, several non-governmental organizations (NGOs) have been involved in the program.[3] The program logic is that one poor household receive a dairy cow and, as a refund to the government, they give their first female calf to another member of the community (the bull-calves are usually sold for meat production and the money should be used to buy a heifer). This is called a credit revolving scheme (kuziturirana).

In Rwanda, livestock is considered a key factor in poverty reduction and there is a strong cultural factor embedded in the ownership of dairy cows. They signal wealth, prestige and social status and the giving and receiving of a cow in the Rwandan culture is attached with strong value and meaning (Ezeanya, 2014).

To be relevant for the program, the household needs some land, and some shed for the animal. This means that the very most poor and vulnerable households cannot enter the program since they often lack access to such resources. The selection of Girinka beneficiaries is conducted at the local level and each village together decide which households should be selected. Besides being part of the village, the following criteria are regulated by the government of Rwanda and are used to assess eligibility:

- The beneficiary has no cow already;
- The beneficiary has a constructed cow shed;
- The beneficiary has at least between 0.25 and 0.75 ha of land, some must be planted with fodder (those who do not have enough land may join with others in the community);
- The beneficiary is considered as poor by the community and has no other source of income;
- The beneficiary should show good farming activities.

2.1. The role of livestock in poverty reduction

There are several reasons that livestock is considered a source of advantages for rural households that depend on agriculture. Livestock improves food security through the supply of high value protein, milk and meat, which are often limited in the diets of the poor (Rawlins, Pimkina, Barrett, Pedersen, & Wydick, 2014). Livestock is also a productive asset on the farm that can assist cropping activities and supply organic manure and soil nutrients, which are cost-effective and sustainable fertilizers (Tilman, Cassman, Matson, Naylor, & Polasky, 2002; Kato et al., 2011). The water retention capacity of organic manure has the effect of reducing the risk of soil erosion (Lal, 2004), which is a significant problem in Rwanda due to topography, terracing and vulnerability to climate change (Byiringiro, & Reardon, 1996; Calzadilla, Zhu, Rehdanz, Tol, & Ringler, 2013). Liu et al. (2013) show that organic manure is crucial for the maintenance of agro-ecosystems in areas with widespread terracing as it leads to improved water retention capacity as it increases the soil water storage in no growing seasons. Ownership of livestock is also positively associated with agricultural productivity. Pender et al. (2004), for instance, address strategies to increase agricultural productivity and reduce land degradation in Uganda. They show that households with fewer livestock units have lower agricultural productivity. Households can also use livestock as a buffer for consumption smoothing against the risk to generate income. Hayami and Ruttan (1970) develop a framework

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[3] The largest NGOs involved in this program were Heifer International and Send a Cow. The NGOs have played a large role in the implementation of the program and the project initiated by Heifer International in the early 2000's was used to provide inputs when designing the program (Umurerwa, 2015). The NGOs have also in some cases gone beyond just being the supplier of the cattle but viewed their engagement as one that follows over several years which has had a positive outcome for the beneficiaries (Argent, Augsburg, & Rasul, 2014).