Poverty targeting, resource degradation and heterogeneous endowments – a micro-simulation analysis of a less favored Ethiopian village

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Poverty targeting, resource degradation and heterogeneous endowments – a micro-simulation analysis of a less favored Ethiopian village[#]

Persistent and widespread poverty in less favored areas (LFAs) is attributed to fragile natural resources and poor markets. Limited assets may keep households outside the reach of poverty policies targeted at LFAs. We explore in a stylized manner the role of heterogeneous household assets for (1) policies aimed at poverty reduction; (2) within-village income inequality; (3) soil erosion. With a farm-household micro-simulation model we analyze for each household in a remote Ethiopian village three sets of policies: technology improvement, infrastructure investment, and off-farm employment through migration or cash for work (CFW) programs. Combating poverty with a single policy, migration reduces the poverty headcount most. Because of self-selection, CFW programs performed best in terms of reaching the poorest of the poor. CFW also reduce within-village income inequality most, while a price band reduction increases income inequality. Only technology improvements imply a trade-off between poverty and soil erosion. Price band and off-farm employment reduce erosion while outperforming technology improvements in terms of poverty reduction. Combining two policies helps poorer households to overcome the limitations of their asset endowments. Combining a cash for work program with a reduction in price bands yields most in terms of poverty reduction and income inequality. This policy complementarity is less important for better endowed households. Reducing the reliance of households on agriculture offers a win-win situation of reducing poverty and maintaining natural resources. Combining policies helps to overcome asset limitations, to target policies to the poorest households and to reduce income inequalities.

Key words: less-favored areas; farm households; poverty; erosion; micro-simulation; Ethiopia

JEL codes: **C6** (mathematical programming); **Q12** (micro analysis of farm households); **Q56** (environment and development)

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Rural households living is less-favoured areas (LFAs) represent globally around a third of the chronic poor that are difficult to reach with standard programs for poverty alleviation (Ruben and Pender 2004; Hazell et al. 2005). Persistent poverty in less-favoured areas is usually attributed to a fragile natural resource base (compared to population density) and poor market linkages. Whereas spatial targeting can be effective for reducing absolute poverty due to adverse geographical conditions (Ravallion and Jalan, 1996), a large part of the variation in household income can be attributed to within-village differences in initial resource endowments (Jayne et al., 2003; Elbers et al., 2004).

Most of the poverty prevailing in LFAs has been characterised as 'asset poverty', where rural households possess limited resources (land, labour or cattle) to cope with adverse events and are extremely vulnerable to shocks that could lead to an irreversible breakdown of their asset base (Carter and Barrett 2005). Under these conditions, farmers typically engage in low-return activities and try to diversify their activity portfolio in order to be able to deal with unexpected income shortfalls (Zimmerman and Carter 2003). Overcoming such poverty traps is only possible when minimum asset thresholds can be reached (Lybbert et al. 2004). By affecting activity choices, heterogeneous asset endowments are likely to reinforce income inequality and could easily lead to biased policies where the better-off household capture the lion's share of the benefits (Van de Walle and Gunewardena, 2001; Lipton, 2005).

Strategies for poverty alleviation in LFAs should consider interactions between distribution and growth. Cross-country evidence shows that inequality of income and unequal distribution of assets lead to reduced growth rates (Deininger and Squire 1998; Birdsall and Londoño 1998; Keefer and Knack 2002). Within LFAs, it is likely that similar mechanisms are in force. Policies aiming at reducing both poverty levels and income equality may thus contribute most to sustained economic development in LFAs.

Targeting poor households requires insight in minimum asset thresholds and complementarities among assets and policies. Income distribution is also a matter of concern, with a view on future development. Furthermore, poverty in LFAs is often attributed to a fragile natural resource base, which may limit the scope for reducing poverty by intensifying agricultural production. Our objective is to explore in a stylized manner the role of heterogeneous household endowments for (1) policies aimed at poverty reduction; (2) within-village income inequality; (3) resource degradation. Using a micro-simulation model we analyze for each household in a remote Ethiopian village three sets of policies commonly put forward to reduce poverty: technology improvement, infrastructure investment, and off-farm employment through migration or local government programs.

We start by presenting the micro-simulation model and data of the numerical implementation. We then analyze the impact of single policies on poverty, income distribution and erosion, followed by an analysis of the role of households assets in the poverty impacts of policies. We proceed by analyzing the impact of combined policies. The last section concludes.

A stylized micro-simulation farm household model

To analyze the impact of heterogeneous resource endowments and income distribution we employ a micro-simulation model. We formulate a standard farm household model in the tradition of Sing, Squire and Strauss (1986). Households maximize utility,

$$U_h = \sum_j \mu_j \ln QC_{hj} \,, \qquad \forall\ h,\ j \in C \qquad (1)$$

where U_h is household utility, μ_j is the budget share of good j, QC_{hj} is the quantity consumed of good j and J is the set of all commodities in the model of which C is a subset of consumed commodities. We use a Cobb-Douglas utility function for reasons of tractability.

Utility maximization is first of all constraint by the available production technologies, described by Leontief technologies that make full use of technical data available for the case study area. For each activity (a) we define input use and output supplied in relation to an activity level ($QA_{h,a,tech}$):

$$QI_{h,j} = \sum_a \sum_{tech} \alpha_{a,j,tech} QA_{h,a,tech} \qquad \forall\ h,\ j \in I \qquad (2a)$$

$$QO_{h,j} = \sum_a \sum_{tech} \beta_{a,j,tech} QA_{h,a,tech} \qquad \forall\ h,\ j \in O \qquad (2b)$$

In case of crop activities $QA_{h,a,tech}$ refers to the cultivated area, in case of livestock activities to the number of animals. Activities can be performed with different technologies (*tech*). For crop activities technology consists of a combination of soil types, technology (choices regarding use of fertilizer and type of traction) and levels of intensity. In case of livestock activities there is only a choice in energy intake. The input ($\alpha_{a,j,tech}$) and output ($\beta_{a,j,tech}$) coefficients determine input demanded ($QI_{h,j}$) and output supplied ($QO_{h,j}$) of each activity.

Next to crop output, each crop technology has a level of erosion associated with it. We compute the total amount of erosion at village level (E),

$$E = \sum_h \sum_a \sum_{tech} \varepsilon_{a,j,tech} QA_{h,a,tech}$$

to asses the impact of household production decisions on soil erosion.

Household utility maximization is further constrained by commodity balances. The extent to which these affect household decision-making depends on the level of tradability. Goods that are household nontradable (HNT) cannot be bought or sold. Household demand thus needs to satisfy household supply,

$$QC_{h,j} + QI_{h,j} + \sum_{off} Qoff_{h,j,off} \leq QO_{h,j} + \omega_{h,j}\,, \qquad \forall\ h, j \in HNT \tag{3}$$

where in addition to the variables defined before, $QC_{h,j}$ is household consumption, $Qoff_{h,j}$ are inputs (labor) used in off-farm employment and cash for work programs (off is the set of off-farm activities); $\omega_{h,j}$ are household endowments.

In case of goods that can be bought or sold, two different types of commodities are distinguished. There are goods that are only traded locally, for which there are no transaction costs driving a wedge between buying and selling prices. These are household tradables and village nontradables (VNT). There are also goods that are traded outside of the village for which the households do incur transaction costs. Buying prices of these village tradables (VT) then exceed selling prices. Since these goods can be both bought and sold by the household not the commodity balance, but the cash constraint restricts utility maximization,

$$\sum_{j \in vnt} p_j QMS_{h,j} + \sum_{j \in vt} ps_j QS_{h,j} + \sum_{off} Y_{h,off} \leq \sum_{j \in vt} pp_j QP_{h,j} \qquad \forall\ h \tag{4}$$

with,

$$pp_j < ps_j \qquad \forall\ j \in VT$$

$$Y_{h,off} \leq \sum_j w_{j,off} Qoff_{h,j,off}\,, \qquad \forall\ h, off$$

$$Qoff_{h,j,off} \leq offav_{h,j,off} \qquad \forall\ h, j, off$$

where $p_{,j}$ is the is the price of village nontradables; $QMS_{h,j}$ is the marketed surplus of village nontradables; for village tradables we have $ps_{h,j}$ is the price received when selling, $QS_{h,j,vt}$ the amount sold of a village tradable; $pp_{h,j}$ the price paid when buying and $QP_{h,j,vt}$ is the amount purchased. Households can earn income by engaging in off-farm activities ($Y_{h,off}$), which can either be off-farm employment or cash for work programs. There is an upper bound on the availability of off-farm employment ($offav_{h,j,off}$). We thus assume segmented labor markets which limit the access of households to off-farm employment.

The stylized household model limits the variation across households to variation in household resource endowments. All households are thus assumed to have access to the same technologies and holding identical preferences (as can be seen from the absence of a household index in the production and utility functions). Restricting heterogeneity to household endowments implies that our assessment of the impact of household heterogeneity on policy impacts can be taken as a lower bound estimate. We furthermore use a static household model in which households are not saving or investing in new assets[1]. Despite the static nature of the model we can explore the impact of asset thresholds by relying on the variation in endowments across households. It allows us to explore whether (combinations) of policies can overcome the restrictions of limited assets. Finally, we do include the possibility of locally traded goods, renting of land and animal traction within a village. We do however not account for local markets. We faced a trade-off between the use of technical data to model production and its impact on soil erosion versus well-behaved functional forms needed to arrive at a local market equilibrium. Given the importance of fragile natural resources in LFAs we gave precedence to analyzing the impact of agricultural activities on soil erosion, forcing us to ignore interactions among households in local markets.

A village in the Northern Highlands of Ethiopia

To study the impact of heterogeneous household endowments we rely on census data covering the endowments of all 200 households in an Ethiopian village. The village is located in the Eastern part of Tigray, a poor region in Ethiopia with limited agricultural potential due to poor soils and erratic rainfall.

[1] Introducing saving behavior in a static model amounts to including a fixed saving propensity. This would reduce the available income for consumption but would not qualitatively alter the results of the model.

The village has an average rainfall of 450 mm and lacks irrigation structures, limiting agricultural opportunities. Fertile land is limited to a small valley bottom set amidst steep slopes and high plateaux. Erosion (including gully erosion) is a severe problem in the village as a result of the steep slopes and loss of vegetative cover. In addition to limited natural endowments, the village has no roads to the nearest town. As a result of these unfavorable conditions many households in the village cannot satisfy their own food requirements (Meijerink 2002).

To implement the model numerically we need data on consumption and technologies. We use secondary data from Ethiopia on household expenditure patterns for rural households in the lowest 5 quintiles (Diao, Gautam et al. 2004) to compute budget shares (μ_j). This resulted in the following expenditure pattern by category: cereals 0.42, non-cereals 0.21; purchased food 0.15, milk and meat 0.05 and leisure 0.18. We use technical data of production systems in Tigray to derive input and output coefficients, including the effect of production on soil erosion (Hengsdijk 2003). In the stylized farm household models each household can choose from five crops (barley, millet, sorghum, wheat and pulses) and three types of livestock (cows, sheep and goats) each producing two types of output (milk and meat). For each activity households can choose between different technologies, as explained in the mathematical exposition of the model.

Although endowments play a central role they do not completely bind households. Household endowments of land and oxen can be rented in or out (against fixed prices, in the absence of a village market in the model). Household labor and livestock endowments (goats, sheep and cows) are assumed to be nontradable. Livestock products can be sold locally without a price-band between buying and selling prices. Crop outputs are sold and purchased outside the village with a price-band representing transaction costs of buying or selling. There is no local market for crop output since all households are facing the same periodicity in crop production. Finally, there is a cash for work program in place providing a base income to all households in the village.

To analyze poverty we need to define a poverty line. Given the stylized nature of the model we use a relative poverty line from a rapid diagnostic appraisal. According to a wealth ranking by villagers, 74 percent of the households is considered poor (Meijerink 2002). We use income per adult equivalent (to account for differences in household size and composition) from the base run to determine a poverty line such that 74 percent of the households is considered very poor. This results in a poverty line of 760 *birr* per capita per year, translating to 2.04 dollar per day[2]. The household classification by villagers thus appears to correspond rather well with the international poverty line of 2 dollar per day. If we would use the a one dollar per day poverty line, 45 percent of the households would be classified as poor.

Analyzing the poverty impact of single policies

We start by analyzing the poverty impact of three sets of policies often suggested to reduce poverty in less-favored areas:

1) **Technology**: improving technologies by raising production from 70 to 100 percent of the maximum attainable production level: (1a) *Fertilizer*: raise only productivity of technologies using fertilizer; (1b) *Non-fertilizer*: raise only productivity of technologies not using fertilizer; (1c) *All technologies*: raise productivity of all technologies.
2) **Prices**: infrastructure investments are assumed to reduce the price-band (*i.e.* the difference between buying and selling outside the village) by 50 percent: (2a) *Inputs*: reduce only price-band of agricultural inputs (fertilizer); (2b) *Consumption goods*: reduce only price-band of consumption goods; (2c) *All goods*: reduce price-band of all goods.
3) **Off-farm**: increased off-farm employment through: (3a) *Migration:* allow households with an adult male to have up to one migrant; (3b) *Cash for Work (CFW):* double the availability of local employment through the cash for work program from 30 to 60 days per household

These policy shocks applied to the model are extreme, designed to explore the potential impact on different households. In the migration scenario, for example, we allow any household with an adult male to migrate[3]. In practice there will be barriers in terms of (social) capital that will limit the access to migration for poor households. We furthermore run a number of sub-scenarios, like only reducing the price-band for inputs, in order to decompose the impact of different policy-components.

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[2] We use a purchasing parity exchange rate of 1.02 *birr* per dollar derived from Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

[3] We lack data on the education levels of household members. Analyzing available data on whether children are send to school (assuming that this could serve as a proxy of the education of the parents) we found all households with an adult male to send their children to school. We therefore assumed that all households with an adult male could engage in migration if the opportunity would present itself.

Poverty impact of single policies

Analyzing the impact of single policies (upper part of table 1) we find that promoting fertilizers (through technology improvement or by lowering its price) stretches far beyond the households initially using fertilizer. But not all households benefit from fertilizer policies due to the cash constraint households face. In contrast, improvement of non-fertilizer technologies reaches all households in the village[4]. The impact of promoting migration is limited to households with an adult male that can migrate (40 percent of the households). Despite this limited reach, migration reduces the poverty headcount most. This is due to the assumption that all households with an adult male can participate in migration. No additional investments are needed that may in practice limit the access of poor households to migration. In terms of reaching the poorest of the poor, the CFW program outperforms all other policies, reducing the poverty gap 7 percent points and the severity of poverty by 6 percent points.

Single policies and income inequality

In the base run we find a Gini coefficient of 0.40. The CFW program performs best in terms of reducing income inequality, reducing the Gini to 0.36. This is not surprising since the poverty indicators showed that the CFW program targets the poorest of the poor. This is reflected in the income increases from the CFW program, which are 49 percent for the lowest income quintile and only 6 percent for the highest income quintile. This finding underscores the importance of the CFW programs for sustaining the living of the poorest households in the village.

A different pattern appears with a reduction in the price band of consumption goods. Compared to the other policies it performs rather well in terms of the poverty indicators, since the poor are net buyers of food. It does however also increase the Gini coefficient to 0.41. Richer households have more money to spend on consumption goods and thus benefit more from the price reduction.

Single policies and soil erosion

[4] This is due to the presence of a land rental market. In the absence of a land market the landless households (8 percent of the village) would not benefit from improved crop technologies.

A key question when combating poverty in LFAs is a possible trade-off combating poverty and maintaining fragile natural resources. In the case study village we focus on erosion, a key natural resource issue in the village. All policies except for the improved non-fertilizer technologies result in a decrease in erosion (last column in table 1). Non-fertilizer technologies have higher erosion levels and improved technologies result in more intensive land use. Improved fertilizer technologies reduce soil erosion because more households start using fertilizes. In terms of poverty impacts improved non-fertilizer technologies outperformed fertilizer technologies. Focusing only on technology improvements there thus seems to be a trade-off between combating poverty and maintaining the resource base.

The other policies all reduce erosion levels while having a stronger impact on poverty than technology improvement. These policies affect erosion through two pathways: access to fertilizer and less need to derive cash income from agriculture. Access to fertilizer is improved through a reduced fertilizer price (price band policy) or by cash income from migration or CFW. Improved access to fertilizer increases the number of households using less-erosive fertilizer technologies. A reduction in the price of consumption goods or alternative non-farm income (migration or CFW) reduces the pressure on households to derive (cash) income from agriculture. Reducing the intensity of agriculture also reduces soil erosion. Price band and especially off-farm policies thus offer more scope for both erosion and poverty reduction than improved (non-fertilizer) technologies.

Asset poverty and its implications for policy impacts

So far we focused on poverty defined in terms of household income. As discussed in the introduction, assets play a central role in poverty (Carter and Barrett 2005; Zimmerman and Carter 2003). With our static model we cannot examine changes in assets and poverty over time. We can however examine the relation between assets and income across households, which provides a cross-sectional look at the level of assets needed to move above the poverty line. Figure 1 presents the income per adult equivalent in combination with the asset endowments by income quintile.

The most striking result is that the lowest two income quintiles do not own any oxen. Comparing this with the distribution of income across households in the top part of figure 1 we find that lack of oxen is associated with household income being below 1 dollar a day. The importance of oxen ownership is also apparent at the top part of the income distribution. Households in the top income quintile (which about corresponds to the households above the 2 dollar a day poverty line) own oxen. Oxen and other livestock are the only assets that show a consistent increase moving from the lowest to the highest income quintile. Land and labor endowments do not show a clear pattern, which may be a result of land reforms that occurred in the recent past. Oxen ownership does not provide a clear threshold separating the poor from the nonpoor. In between the two poverty lines we find about 30 percent of the village households. Halve of these households have oxen but limited land, and the other halve have land but lack oxen. Land endowments are thus complementary to oxen ownership and may even compensate for a lack of oxen.

Figure 1 suggests the presence of an asset threshold around the 2 dollar a day poverty line. Incomes of households above this poverty line show a much stronger increase when moving to the richer households than it decreases when moving to the poorer households. This suggests a minimum amount of assets for households to engage in productive activities. The relative flatness of the income line just below the 2 dollar a day poverty line implies that the reductions in the poverty headcounts in table 1 present a flattered picture. Improved technologies, for example, lead to minor income changes. Because of the shape of the income distribution this still results in a 2 to 4 percent reduction of the poverty headcount.

Analyzing the poverty impact of combined policies

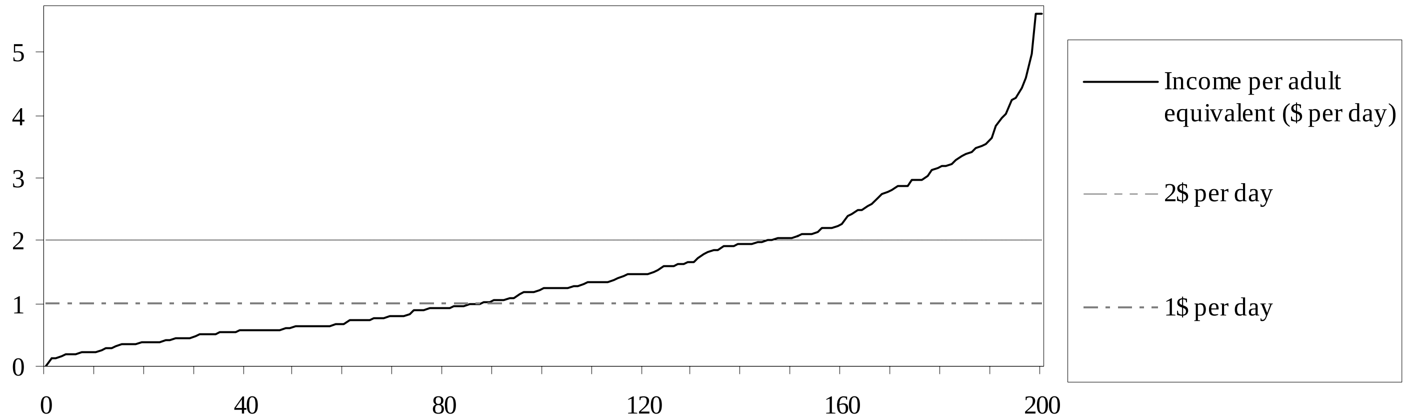
With single policies we find heterogeneous assets affecting the impact of policies. Combined policies could be more effective if complementarities between policies overcome asset limitations. We thus run combinations of the policies analyzed above. To limit the number of possible combinations we combine a change in all technologies (1c), in prices of al goods (2c) with the two off-farm income scenarios leaving us five different scenarios.

Table 1: Poverty, income, income inequality and erosion with different policy scenarios

	Reach[a)]	Poverty[b)]			Income inequality	Erosion[c)]
	(%)	*P0*	*P1*	*P2*	*Gini*	*(% change)*
Base run	n.a.	74	40	26	0.40	n.a.
Single policies						
1) Technology						
a fertilizer	66	72	39	26	0.40	-14
b non-fertilizer	100	68	37	24	0.39	3
c all techologies	100	68	37	24	0.39	3
2) Price band						
a inputs	68	71	39	26	0.40	-17
b consumption goods	100	66	35	22	0.41	-1
c all goods	100	66	34	22	0.41	-18
3) Off-farm						
a migration	40	64	34	22	0.39	-28
b CFW	100	70	33	20	0.36	-18
Combined policies						
Technology (1c) & prices (2c)	100	64	32	20	0.40	1
Technology (1c) & migration (3a)	100	63	31	20	0.38	-27
Technology (1c) & CFW (3b)	100	65	30	17	0.35	-14
Prices (2c) & migration (3a)	100	56	29	19	0.41	-41
Prices (2c) & CFW (3b)	100	57	27	16	0.37	-34

[a)] Percentage of households affected by the policy; [b)] Foster-Greer-Thorbecke poverty measures, P0 is the poverty headcount, P1 the poverty gap and P2 the severity of poverty; [c)] Change in erosion is computed in percentage with respect to erosion levels in the base run.

Figure 1: Income distribution and resource endowments by quintile

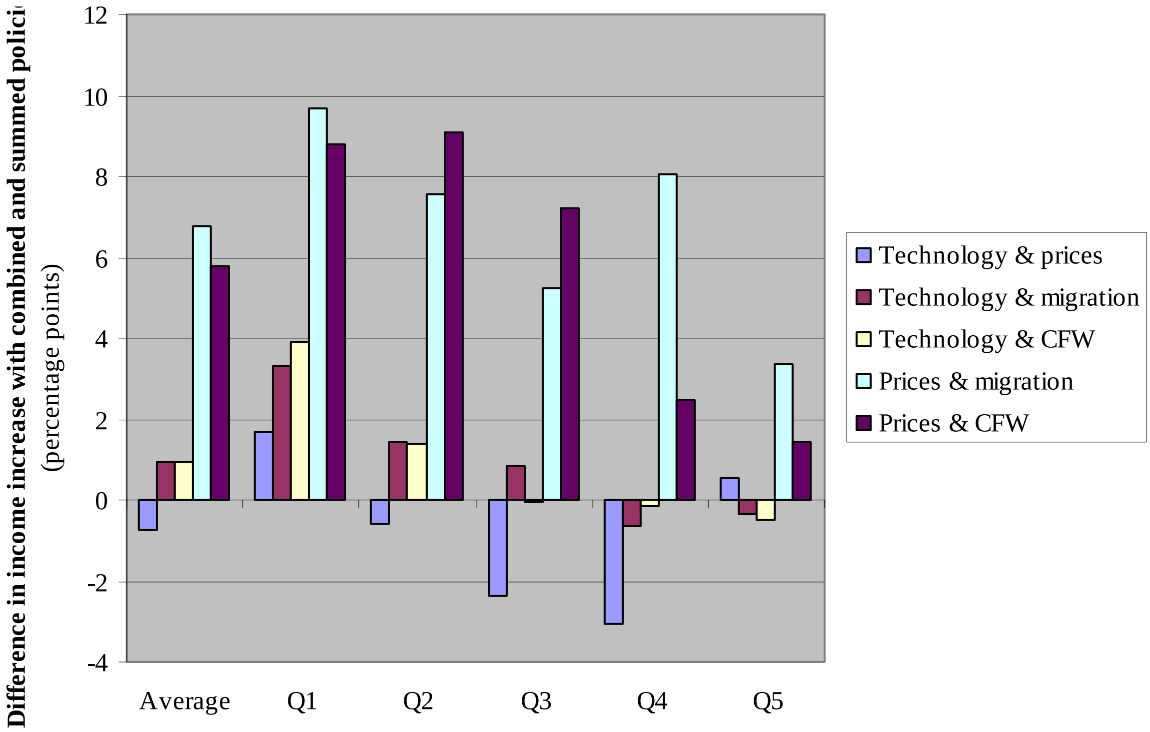


	Q1	Q2	Q3	Q4	Q5
Income ($ per day)	0.4	0.7	1.2	1.9	3.4
Land (ha)	0.3	0.2	0.3	0.4	0.2
- bad quality (% of total land)	63.7	55.2	40.6	45.7	40.2
- medium quality (% of total land)	19.4	35.0	34.6	40.9	28.1
- good quality (% of total land)	14.4	7.3	12.3	13.4	9.2
Land/labor ratio (ha/adult equivalent)	0.1	0.2	0.2	0.1	0.2
Labor (adult equivalent)	2.4	1.8	2.2	2.7	1.7
Number of oxen	0.0	0.0	0.3	0.9	1.1
Other livestock (TLU)	0.2	0.9	1.8	2.6	2.8

Poverty impact of combined policies

Comparing poverty indicators of single and combined policies there appear to be complementarities between the policies in terms of combating poverty. Any combination of two policies outperforms all single policies for all three poverty measures. Although no policy combination strictly dominates all other combinations in terms of poverty reduction, the combination of a price band reduction with the CFW program performs best in terms of reaching the poorest of the poor and is almost at equal stance with the prices and migration combination in terms of reducing the poverty headcount.

Figure 2: Comparing the income effects of combined policies to the sum of separate policies



Note: table entries are the income increase (in %) from combined policies minus the sum of the income increase (in %) of separate policies.

Combined policies and income inequality

To analyze the presence of interaction effects of policies we examine combinations of policies. There are three possible outcomes: *competing* policies (income of combined policies is less than the sum of separate policies), *no interaction* (income of combined policies is equal to the sum of separate policies) and *complementary* policies (income of combined policies exceeds to the sum of separate policies). We present the results by income quintile, which because of the close link between income and assets found above, indicates whether combined policies help overcome the asset restrictions of poor households (figure 2).

The most striking finding in figure 2 is that for the poorest income quintile all policy combinations are complementary. Moreover, the effect is consistently stronger for the poorest income quintile than for any of the other quintiles. This strong positive impact of combined policies on the poorest households drives the reductions in Gini coefficients found for combined policies. Complementarity of policies can thus help in overcoming limited assets. This is more important for asset-poor households and thus aids in targeting policies at the poorest households.

Combined policies and soil erosion

In terms of soil erosion only the combination of price band and technology policies yields unexpected results. Given the reduction percentages with the single policies one may expect the price band effect (-17 percent) to dominate the technology effect (+3 percent). Their combined effect however is a one percent increase in erosion. The improved non-fertilizer technologies reduce the shift to using fertilizer when its price is reduced. More important however is the combination of policies which changes the choice of fertilizer technologies. With improved technology and a reduced fertilizer price households opt for a fertilizer technology without the use of oxen (prices of oxen are fixed). Technologies without oxen are more erosive than those with oxen and thus the amount of erosion increases. Changing technologies as well as relative prices of inputs thus affects technology choice in such a way that the combination of policies leads to a different result than the summing of their separate effects would suggest.

Conclusions

We explored the implications of heterogeneous household asset endowments for policies aimed at reducing poverty in LFAs. Analyzing the poverty impact, we found that combining policies helps poorer households to overcome the limitations of their asset endowments. This complementarity of policies is less important for better endowed households. As a result, combining complementary policies helps in targeting the poorest households, thus reducing income inequalities.

The importance of assets has implications for the distributive consequences of policies. We found a reduction in price bands to reduce poverty while at the same time increasing income inequality. Many households thus benefit, but richer households benefit disproportionally. The opposite holds for the CFW program which, through self-selection, targets the poorest household. Combining the CFW program with a price band reduction was found to benefit the poorest households most while still reducing income inequality in the village. This combination of policies was also found to result in the strongest reduction in erosion, thus providing a win-win option for combating poverty and reducing natural resource degradation in the village.

The simple stylized micro-simulation model we employed in this paper is insightful because of its tractability. The simple nature of the model and the rather extreme scenarios the analysis cannot be relied upon for direct policy advice. The model does not account for limited access to new technologies or migration that are likely to exist for the poorest households. These scenarios therefore overestimate the impact of technology or migration on poverty reduction as well as the associated reductions in income inequality. The model also lacks risk, which Zimmerman and Carter (2003) found to be an important impediment for poor households to engage in more profitable activities. The absence of risk in our model implies that we overestimate the poverty impacts of single policies. In terms of combined policies we may be underestimating the poverty impact. Combining an improved technology with a CFW program may put the technologies within the reach of the poor households, not only by providing the cash needed for inputs (we find increased adoption of improved technologies employing oxen), but also by allowing the households to take more risk by providing a minimum income. With our static model we are unable to analyze the dynamics of asset accumulation. By analyzing individual households, however, we have a cross-sectional perspective on the role of assets. Given the lack of availability of panel data for most developing countries, such a cross-sectional analysis of the role of assets provides an important first look a the role of assets for poverty reduction policies.

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