



# Impact of agricultural market linkages on small-scale farmers' welfare: Evidence from Tanzania

André Bueno Rezende de Castro

Universität Bonn, Center for Development Research (ZEF)

## Introduction

**Agriculture:** dominant economic activity and employment generator in Tanzania. But poverty and food insecurity are still widespread in small subsistence farms. Food processing is still done in low scale and with limited capital and technology.

**Potential solution:** transition of food systems -> integration of small-scale farmers (SSFs) into output markets via agricultural value chains.

**Constraints to agricultural growth:** poor infrastructure and market access, limited technology/inputs, expensive credit, weak government support.

## Research questions & Contribution

- RQ1:** How crop marketing improves SSFs welfare?
- RQ2:** How agricultural vertical market linkages mediate the welfare enhancement effects of crop commercialization?
- Objective 1** -> Provide empirical evidence for the effect of participation in **vertical market linkages (VMLs)**.
- Objective 2** -> Analyze a wider variety of indicators: agricultural production (crop yield and crop commercialization) and household welfare (income, poverty, food security, and subjective well-being).

## Materials & Methods

**Variable of interest – VMLs** -> Captures market channels for crops sales in the NPS-LSMS, divided in two groups:

*Group 1* -> Outgrower schemes (contract farming, cooperatives, nucleus estate, etc.).

*Group 2* -> Small processors and local merchants.

**Selection Bias -> Propensity score matching (PSM):** excludes observations that fall outside of the common support area; provides a robustness check with average treatment effects on the treated (ATTs).

**Panel regressions** -> Fixed effects + First differences: control for unobserved heterogeneity, time-variant covariates, and time fixed effects.

## Conceptual Framework

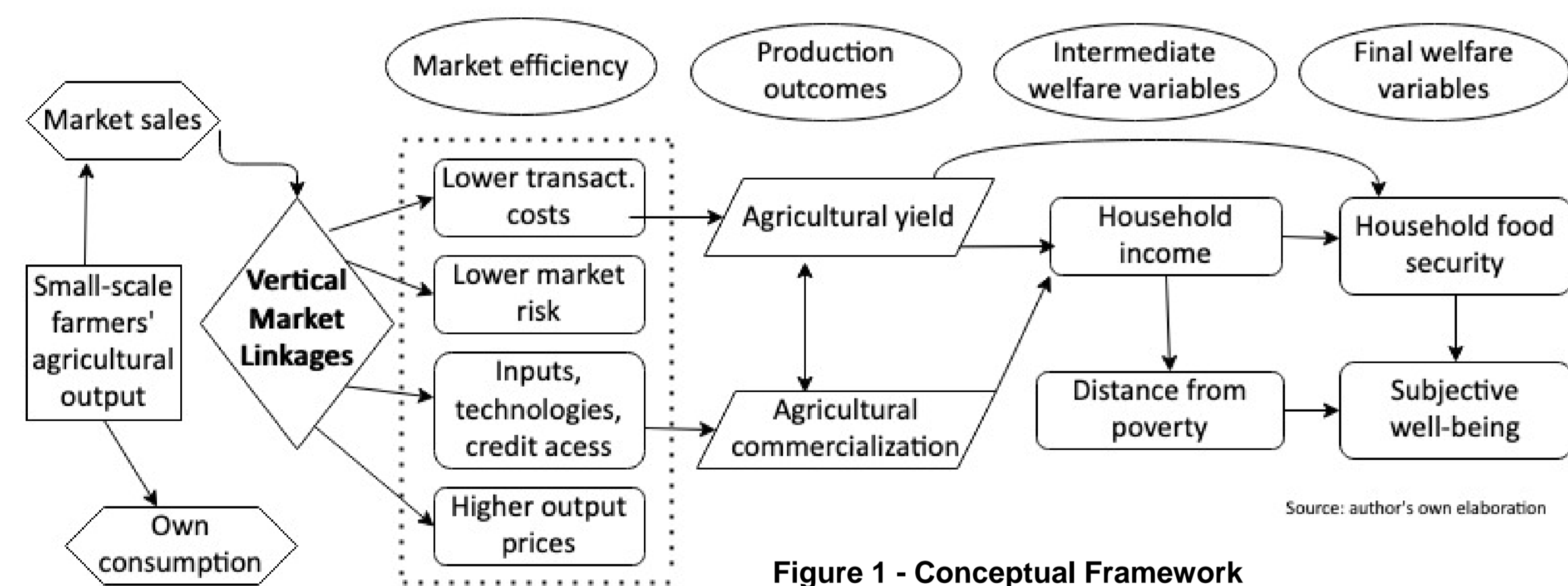


Figure 1 - Conceptual Framework

$$FE \rightarrow Y_{it} = \beta_0 + \beta_1 VML1_{it} + \beta_2 VML2_{it} + \beta_3 (VML1_{it} \times VML2_{it}) + \beta_4 X_{it} + \gamma_i + \delta_t + u_{it}$$

$$FD \rightarrow \Delta Y_{it} = \alpha_1 \Delta VML1_{it} + \alpha_2 \Delta VML2_{it} + \alpha_3 \Delta X_{it} + \Delta v_{it}$$

Table 1: Summary results of panel regressions

Outcome variable/Statistical significance	VML 1			VML 2		
	OLS	FE	FD	OLS	FE	FD
Log of yield	14.55%	0.50%	3.35%	36.94% ***	23.47% ***	25.23% ***
HH commercialization	0.120 (16.82%)***	0.006 (8.88%)	0.015 (2.09%)	0.010 (14.05%)***	0.037 (5.16%) *	0.037 (5.14%) **
Log of income	73.17% ***	43.66% **	21.58% *	75.21% ***	51.06% ***	44.01% ***
Poverty dummy	-0.044 (5.02%)	-0.078 (8.86%)	-0.055 (6.28%)	-0.076 (8.71%) ***	-0.074 (8.43%) ***	-0.056 (6.37%) ***
HDDS	0.201 (2.81%)	0.033 (0.47%)	0.101 (1.41%)	0.251 (3.50%) ***	0.290 (4.05%) ***	0.262 (3.66%) ***
HFIAS	-3.964 (41.53%)***	-0.097 (1.02%)	-1.299 (13.61%)	-2.348 (24.60%)***	-2.470 (25.87%) **	-2.224 (23.29%) **
Subjective well-being	0.070 (1.77%)	0.113 (2.84%)	0.040 (1.00%)	0.028 (0.71%)	0.070 (1.77%)	0.092 (2.32%)

## Conclusions

Outside of subsistence, only a small fraction of SSFs participate in outgrower schemes, whereas the majority sell through cooperatives or small processors and merchants. SSFs benefit by participating in vertical market linkages thereby increasing crop production outcome and, subsequently, household welfare. We estimate the coefficients for these outcome variables by employing a methodology that addresses selection bias and unobserved heterogeneity. Although we cannot claim external validity, the characteristics of Tanzania are similar to other low-income countries, especially in Sub-Saharan Africa, thus lessons can be drawn. Further research is needed on the estimation of the specific pathways linking rural household welfare and VMLs with agro-processing firms and outgrower schemes.

## Results

Integration to VMLs increases household welfare for all outcome variables in the processors' selling group – effects are particularly strong for yield, income, and food insecurity. In the outgrowers' selling group, effects are dampened and lose statistical significance, except for income and the OLS benchmark.

We observe smaller effects on dietary diversity and agricultural commercialization. The effects of VMLs on subjective well-being are not statistically significant, which might indicate measurement problems and potential missing pathways. Following a generally satisfactory matching, which attenuates selection bias, the ATTs estimated with PSM corroborate the panel results, with relatively smaller effect sizes.

Table 2: Summary results of PSM ATTs for VML 1

Outcome variable / Matching technique	Nearest neighbor		Radius		Kernel	
	ATT	Critical hidden bias	ATT	Critical hidden bias	ATT	Critical hidden bias
Income (log)	0.537*** (0.148)	1.4 – 1.5	0.379*** (0.099)	1.6 – 1.7	0.395*** (0.107)	1.7 – 1.8
Yield (log)	0.282** (0.122)	> 2	0.232** (0.091)	1.2 – 1.3	0.182** (0.093)	1.1 – 1.2
Poverty	-0.033 (0.039)	< 1	-0.003 (0.029)	1.3 – 1.4	-0.022 (0.032)	< 1
Commercialization	0.081** (0.033)	1.1 – 1.2	0.091*** (0.022)	1.6 – 1.7	0.092*** (0.024)	1.8 – 1.9
Subjective welfare	0.085 (0.135)	< 1	0.060 (0.103)	< 1	0.067 (0.106)	< 1
HFIAS	-0.394 (1.404)	< 1	-1.988 (1.128)	< 1	-3.408** (1.373)	> 2
HDDS	0.099 (0.200)	1.0 – 1.1	0.024 (0.140)	< 1	0.036 (0.166)	< 1

Table 3: Summary results of PSM ATTs for VML 2

Outcome variable / Matching technique	Nearest neighbor		Radius		Kernel	
	ATT	Critical hidden bias	ATT	Critical hidden bias	ATT	Critical hidden bias
Income (log)	0.754*** (0.096)	> 2	0.667*** (0.065)	> 2	0.671*** (0.064)	> 2
Yield (log)	0.299*** (0.068)	1.4 – 1.5	0.277*** (0.054)	1.7 – 1.8	0.283*** (0.053)	1.8 – 1.9
Poverty	-0.066*** (0.021)	1.2 – 1.3	-0.080*** (0.017)	< 1	-0.077*** (0.016)	< 1
Commercialization	0.073*** (0.022)	1.2 – 1.3	0.088*** (0.016)	1.5 – 1.6	0.089*** (0.015)	1.5 – 1.6
Subjective welfare	0.020 (0.075)	< 1	0.015 (0.060)	< 1	0.019 (0.058)	< 1
HFIAS	-0.878 (0.898)	1.1 – 1.2	-1.536** (0.705)	> 2	-1.619** (0.691)	> 2
HDDS	0.199* (0.108)	1.0 – 1.1	0.267*** (0.082)	1.4 – 1.5	0.275** (0.081)	1.3 – 1.4

