

Credit Constraints and Labor Availability: Effects of MGNREGA on Household Income Diversification Across Microenterprise and Livestock Ownership

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Abstract

Households diversify income through activities that differ in required input intensities. When a policy shock alters households' available endowments, it can change the composition across these activities. While existing literature typically examines how changes in a single input, such as capital or labor, affect participation in a specific activity like entrepreneurship, this study considers the MGNREGA work-for-wage policy that simultaneously affects both credit access and labor availability. Such a policy is expected to shift households' allocation between labor-intensive and capital-intensive activities. By relaxing credit constraints while reducing the labor availability for other income-smoothing pursuits, the policy is predicted to decrease engagement in labor-intensive microenterprises and increase participation in livestock ownership, a relatively capital-intensive activity. This theoretical prediction is consistent with the intuition of the Rybczynski theorem from international trade. Using IHDS data, the empirical analysis implementing a system of equations approach supports these expectations, with results remaining robust across alternative specifications.

Keywords: Credit constraint, Labor availability, MGNREGA, Household income diversification, Microentrepreneurship, Livestock ownership, Rybczynski theorem

JEL codes: D13, J22, J43, Q12, H53

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1. Introduction

In developing countries, rural households commonly engage in non-farm activities to diversify income sources (Lazarte et al., 2014). Among the most prevalent activities are family-owned microenterprises (Athaide & Pradhan, 2020; Mora & Espada Castro, 2024) and livestock ownership (Aryal & Holden, 2012), particularly in settings characterized by labor and credit market imperfections (Holden & Shiferaw, 2004). These activities differ markedly in their factor intensities: microenterprises are typically labor intensive and well known for absorbing household labor (Gindling & Newhouse, 2014), whereas livestock ownership is relatively more capital intensive, requiring substantial upfront investment but less ongoing labor².

Migration, remittances, and government programs that provide guaranteed wage employment represent important shifts in household endowments that can significantly influence income-generation choices. Wage-for-work programs, in particular, have been widely implemented as poverty-alleviation tools and are associated with several positive outcomes for vulnerable populations. Similar to remittance income, however, these programs alter household factor endowments by reducing the availability of household labor while simultaneously easing credit constraint.

Participation in MGNREGA can ease credit constraints (Saraswat, 2011; Bhattarai et al., 2014; Sehgal, 2025) and influence household investment decisions by providing a stable source of wage income for rural households. The program guarantees up to 100 days of employment annually, which helps reduce income volatility and allows households to smooth consumption (Deininger & Liu, 2013). A more predictable income stream improves households' perceived repayment capacity, making them more likely to access formal credit markets and easing liquidity constraints. NREGA participation also reduces reliance on high-interest informal lenders, which are a common source of credit in rural areas. Empirical evidence shows that households participating in the program experience a decline in overall debt (Patwardhan & Tasciotti, 2023), particularly from non-institutional sources such as moneylenders. By lowering dependence on costly borrowing and improving household balance sheets, the program relaxes financial constraints that typically limit investment opportunities.

While there exists literature that focuses on the effects of credit relaxation, simultaneous changes in household credit and labor endowments have important implications for

² <http://www.fao.org/3/X6627E/x6627e01b.htm>

how rural households allocate resources across different income-generating activities. Some research has examined the effects of such policies on individual household activities like microenterprise (Lahiri & Daramola, 2023); this study instead evaluates its impact on multiple income-generating choices. To derive clear predictions, we draw on the Rybczynski theorem, commonly applied in international trade theory, and adapt it to the context of rural household production. Analogous to its trade-theoretic implications, a wage-for-work program that increases capital availability while reducing labor supply is expected to shift household production away from labor-intensive activities and toward capital-intensive ones. Accordingly, we hypothesize that government-sponsored wage-for-work programs will reduce participation in microenterprises and increase livestock ownership. We test this hypothesis using data from India and find evidence consistent with these theoretical predictions.

2. Theoretical motivation: General Equilibrium approach for Microenterprises and Livestock-ownership

Microenterprises are a way of utilizing surplus household labor to generate some household income. Livestock ownership by poor households is another economic activity often undertaken by households facing credit and labor market imperfections and is similarly mostly dependent on household labor and credit availability. It provides similar benefits to households in terms of income generation and income smoothing in the face of economic fluctuations, with the main difference being that livestock ownership is less labor intensive and more capital intensive compared to microenterprises. Since microenterprise and livestock ownership require labor and financial capital inputs that are mostly mobile across these two activities, we can use the Rybczynski theorem to provide the intuition behind the predicted effects. We predict the labor market tightening and credit constraint relaxation effects for livestock ownership, based on the endowment-based theoretical prediction of the Rybczynski theorem.

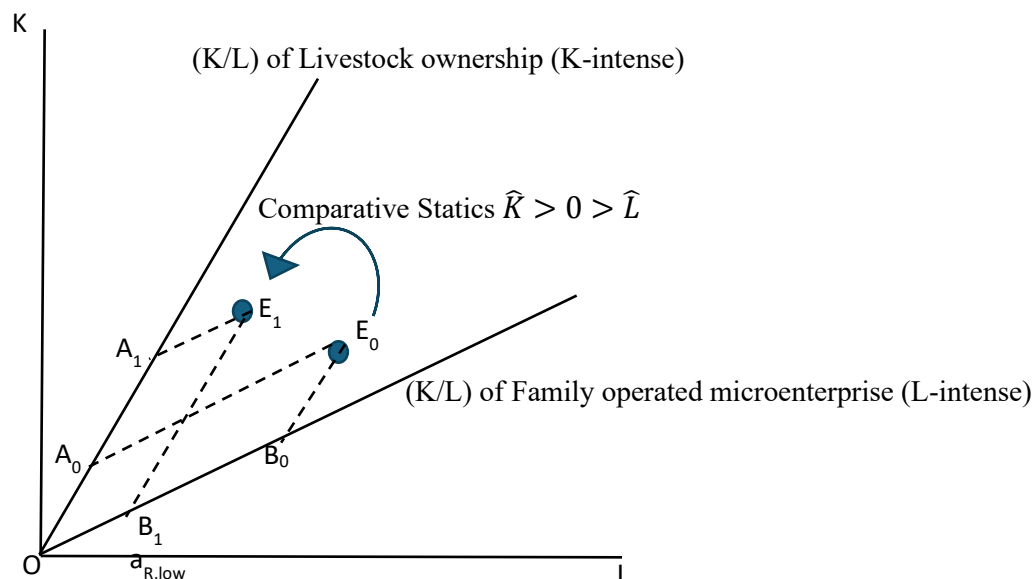


Fig.1: Livestock-ownership goes up (OA_0 to OA_1) and Microenterprise goes down (OB_0 to OB_1) in response to the comparative static change

When participation in a government employment guarantee program absorbs some household labor and, in turn, infuses financial capital into the household, this can be depicted as household resources available for other income-generating activities moving from E_0 to E_1 in **Fig. 1**. To make use of these resources, households reduce their engagement in microenterprises from OB_0 to OB_1 while simultaneously expanding their engagement in livestock ownership from OA_0 to OA_1 , similar to the prediction of Rybczynski (1955).

Hypothesis 1: A policy shock that relaxes household credit constraint ($\hat{K} > 0$) while simultaneously tightening household labor constraint ($\hat{L} < 0$), would cause households to move away from relatively labor-intensive micro-enterprise $\hat{B} < 0$ and toward relatively capital-intensive livestock-ownership ($\hat{A} > 0$) activities.

$$\hat{A} > \hat{K} > 0 > \hat{L} > \hat{B}$$

The above prediction can alternately be captured using a simple mathematical equation. Let $(\frac{K}{L})_A$ and $(\frac{K}{L})_B$ represent the capital intensity of livestock ownership and household microenterprise, with $(\frac{K}{L})_A > (\frac{K}{L})_B$, where these input intensities of the respective production techniques are assumed to not be affected by the policy under consideration. Further let and $(\frac{K}{L})_H$ capture the endowment ratio for the household which does get affected by the workfare policy. Let s_A represent the share of household

effort in livestock ownership and $(1-s_A)$ represent the share of household effort in microenterprise. Full employment of household resources implies the following condition.

$$s_A \left(\frac{K}{L}\right)_A + (1 - s_A) \left(\frac{K}{L}\right)_B = \left(\frac{K}{L}\right)_H$$

The workfare program increases household endowment of credit while simultaneously reducing household labor availability, implying $d\left(\frac{K}{L}\right)_H > 0$. Differentiating the above equation to extract the change in the composition of household activity, provides

$$\left\{\left(\frac{K}{L}\right)_A - \left(\frac{K}{L}\right)_B\right\} ds_A = d\left(\frac{K}{L}\right)_H$$

This implies $\frac{ds_A}{d\left(\frac{K}{L}\right)_H} > 0$. Hence higher credit to labor availability ratio moves households toward capital intensive activities and away from labor intensive activities.

The above result is also useful in considering a heterogeneity exercise. Among households participating in the workfare program, the relatively wealthier ones start with a higher $\left(\frac{K}{L}\right)_H$ ratio. Hence, a workfare program that allows households to participate at the same absolute level effectively constitutes a smaller change in the endowment ratio for relatively less-poor households. As a result, these households are expected to exhibit weaker responses in terms of changes in their economic activities. This intuition is summarized in my second hypothesis.

***Hypothesis 2:** A policy shock where the relaxation of the household credit constraint is proportionate to the tightening of the labor constraint will cause relatively less-poor households to experience smaller declines in labor-intensive microenterprise activities and weaker increases in capital-intensive livestock ownership than relatively poorer households.*

3. Data

The empirical analysis draws on panel data from the India Human Development Survey (IHDS), conducted in 2005 and 2011–12 by the University of Maryland in collaboration with the National Council of Applied Economic Research (NCAER), New Delhi. The IHDS is a nationally representative survey spanning 384 districts across 33 states and union territories in India. These two survey waves provide observations from periods before and after the implementation of MGNREGA, a workfare program that

provides up to a hundred days of wage employment in a financial year to adult members of a rural household who are willing to perform unskilled work.

The 2005 and 2011–12 rounds interviewed 41,554 and 42,152 households respectively, with a balanced panel of 40,018 households surveyed in both waves. The use of panel data facilitates the inclusion of household fixed effects, which control for a multitude of unobserved, time-invariant household characteristics.

The variables of interest are household engagement in livestock ownership (IHDS question: “Do you own any livestock such as cows, buffalo, goats or chickens?”) and household microenterprise (IHDS question “Does anybody in this household run their own business, however big or small? OR Does anybody make something for sale, such as cloth / some food like pickles? OR Does anybody sell something in a market / to customers of any sort? OR Does anybody provide a service to others for a price, either a skilled service like a doctor or an unskilled service like a barber? OR Does anybody make an intermediate product at home for a private contractor/middleman?”).

As **Table 1** highlights, states differ substantially in their levels of engagement in microenterprises and livestock ownership, reflecting heterogeneity arising from geographical, economic, and cultural backdrops. This underscores the importance of controlling for regional variation, which is addressed by including state-by-district average controls in all estimations. The table further shows that at the national level, household level engagement in microenterprise as well as livestock ownership both declined somewhat in 2011 compared to 2005. The data also reveals that households with income levels above the sample average were substantially more involved in both microenterprise activities as well as livestock ownership compared to the relatively poorer households both in 2005 and in 2011.

Table 1: Summary statistics of average engagement in household microenterprise and livestock ownership across Indian states

STATE	2005		2011	
	Household Microenterprise	Livestock Ownership	Household Microenterprise	Livestock Ownership
Andhra Pradesh	12.2%	34.0%	9.5%	37.6%
Arunachal Pradesh	10.5%	7.9%	6.1%	61.4%
Assam	16.5%	45.8%	12.0%	59.1%
Bihar	21.7%	66.2%	14.2%	61.7%
Chhattisgarh	26.3%	78.2%	15.5%	67.6%

Dadra+Nagar Haveli	12.8%	59.0%	17.9%	56.4%
Daman & Diu	21.8%	10.9%	38.2%	10.9%
Delhi	28.6%	71.4%	42.9%	71.4%
Goa	25.5%	34.5%	16.4%	4.5%
Gujarat	11.9%	54.7%	10.5%	54.9%
Haryana	9.6%	66.9%	13.5%	65.1%
Himachal Pradesh	13.0%	88.7%	14.5%	81.5%
Jammu & Kashmir	14.5%	83.4%	21.8%	73.2%
Jharkhand	19.4%	59.2%	18.2%	67.3%
Karnataka	15.8%	53.2%	20.0%	49.2%
Kerala	12.1%	38.6%	14.4%	27.1%
Madhya Pradesh	17.8%	75.3%	16.1%	69.0%
Maharashtra	16.6%	63.5%	11.1%	48.7%
Manipur	31.6%	60.5%	15.8%	2.6%
Meghalaya	21.6%	45.5%	5.7%	36.4%
Mizoram	26.4%	67.9%	37.7%	62.3%
Nagaland	12.0%	22.0%	22.0%	80.0%
Orissa	18.3%	72.8%	14.4%	58.6%
Pondicherry	7.5%	18.9%	26.4%	20.8%
Punjab	15.0%	60.8%	16.8%	55.9%
Rajasthan	15.1%	81.2%	14.9%	74.6%
Sikkim	12.5%	20.8%	25.0%	62.5%
Tamil Nadu	13.3%	41.1%	10.9%	30.6%
Tripura	37.9%	47.6%	31.1%	52.4%
Uttar Pradesh	20.1%	77.3%	19.1%	73.3%
Uttarakhand	17.9%	82.1%	15.7%	73.9%
West Bengal	21.9%	67.7%	17.8%	49.1%
National Level	16.6%	64.7%	15.3%	58.7%

4. Empirical specification:

Our model predicts that household engagement in livestock-ownership as well as microenterprise engagement to be affected by participation in the workfare program. However, since households make the choice between these two activities simultaneously, they need to be estimated as a system of equations. Moreover, since

participation in the workfare program itself is an endogenous decision, this needs to be captured using instrumental variables as well.

Community-level averages of various economic activities can serve as proxies for peer effects, capturing regional characteristics, information availability, or reductions in stigma (Coady et al., 2013; Dahl et al., 2014; Lazarte-Alcala et al., 2014) and are therefore useful instruments for participation in those activities. For instance, a region that is geographically unsuitable for livestock ownership will have the corresponding regional average correlated with household participation in livestock activities but is unlikely to directly affect engagement in microenterprises. Similarly, district-level average MGNREGA participation is likely to be strongly correlated with household-level participation, reflecting both the rollout infrastructure and reduced stigma associated with the program, while being unlikely to directly impact household livestock ownership. Furthermore, by incorporating household fixed effects, unobserved regional factors are effectively controlled for, making district-level averages a plausible candidate for exogenous instrumental variables.

District level prevalence of each of these three activities are considered as the excluded variables useful for identifying each equation, since the district level prevalence of workfare program participation, livestock ownership and microenterprise engagement are likely to pick up the regional characteristics w.r.t. these specific activities but are unlikely to affect household engagement in the other activities.

$$y_{A,i} = \beta_A^{POL} POL_i + \beta_A^{AVG} y_{A,S}^{AVG} + \alpha_A \mathbf{x}_{i,t} + \varepsilon_{A,i}$$

$$y_{B,i} = \beta_B^{POL} POL_i + \beta_B^{AVG} y_{B,S}^{AVG} + \alpha_B \mathbf{x}_{i,t} + \varepsilon_{B,i}$$

$$POL_i = \beta_{POL}^{AVG} POL_S^{AVG} + \alpha_{POL} \mathbf{x}_{i,t} + \varepsilon_{POL,i}$$

Let i denote household in period t in district s . Here $y_{A,i}$ and $y_{B,i}$ are binary variables representing household engagement in livestock ownership and microentrepreneurial activities respectively, while POL_i represents the number of weeks the household participated in NREGA. The theoretical prediction is $\beta_A^{POL} > 0$ and $\beta_B^{POL} < 0$. Additionally, the district level averages of each activity ($y_{A,S}^{AVG}$, $y_{B,S}^{AVG}$, POL_S^{AVG}) are expected to have a positive effect on household-level participation in the corresponding activity ($\beta_A^{AVG} > 0$, $\beta_B^{AVG} > 0$, $\beta_{POL}^{AVG} > 0$).

5. Results

Table 2 presents the household level effects of participation in the employment generation program. Additionally, I control whether the household in 2011 had participated in the same activity in 2005, since this captures multitude of unobserved factors explaining the household's engagement in the activity.

Table 2: Policy effect with lagged activity control

	(1) Livestock ownership	(2) Microenterprise engagement	(3) NREGA weeks
Lagged activity	0.2879*** [0.0064]	0.2871*** [0.0062]	
District average	0.5908*** [0.0311]	0.5253*** [0.0411]	1.0027*** [0.0218]
Number weeks NREGA	0.0008*** [0.0002]	-0.0012*** [0.0002]	
SC/ST/OBC			5.1398*** [0.6780]
Constant	-1.1236*** [0.0481]	-0.1816*** [0.0347]	-28.7811*** [3.9843]
Observations	22359	22358	22358
R ²	0.269	0.130	0.225

Note: Standard errors in brackets * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The estimated coefficients imply that each additional week a household devotes to NREGA work reduces the probability of engaging in microenterprise activities by 0.12% and increases the probability of livestock ownership by 0.08%. The results support that participation in the government sponsored employment generation program reduced microentrepreneurial activities though increasing livestock ownership: a shift in the composition of income diversification activities aligned with the Rybczynski predictions. Additionally, the results show that district level averages have a positive effect on household level participation in the corresponding activity, as expected.

Given concerns about the potential correlation between the lagged dependent variable and the error term, I estimate two alternative specifications as robustness checks, reported in **Table 3**. Columns (1) – (3) present results that include lagged household

income as controls, while columns (4)–(6) report estimates using the first-differenced dependent variable. The results remain consistent with the baseline estimates.

Table 3: Policy effect with lagged control, and first-differenced dependent variable

	(1) Livestock ownership	(2) Micro- enterprise	(3) NREGA weeks	(4) Livestock ownership	(5) Micro- enterprise	(6) NREGA weeks
Lag Income	0.000 [0.000]	0.0000*** [0.0000]	-0.0000*** [0.0000]			-0.0000*** [0.0000]
Dist. Avg.	0.883*** [0.032]	0.8444*** [0.0424]	1.0016*** [0.0218]	-0.1204*** [0.0381]	-0.2594*** [0.0513]	1.0035*** [0.0218]
NREGA weeks	0.0003 [0.0002]	-0.0008*** [0.0002]		0.0009*** [0.0003]	-0.0013*** [0.0002]	
SC/ST/OBC			4.8459*** [0.6825]			4.9404*** [0.6773]
Constant	-1.1763*** [0.0503]	-0.2525*** [0.0362]	- 26.9013*** [3.9933]	-1.0229*** [0.0602]	-0.0352 [0.0439]	- 27.1364** [3.9930]
Observations	22358	22358	22358	22358	22358	22358
R²	0.203	0.054	0.227	0.060	0.002	0.227

Note: Standard errors in brackets * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4 presents the results useful in testing Hypothesis 2, with columns (1)–(3) having lagged household income as a control, while columns (4)–(6) using the lagged dependent variables as controls³. We use a dummy variable to indicate high income households above the average household income of INR 43,200 in 2005.

The estimated coefficients show that the reduction in microentrepreneurial activities is weaker for the relatively wealthier households as the employment generation policy represents a less significant expansion of their credit constraints and hence less likely to draw household effort away from microenterprises.

³ I do not use them as controls within the same specification since they are likely to be highly multicollinear.

Table 4: Household income heterogeneity

	(1) Livestock ownership	(2) Micro- enterpris e	(3) NREGA weeks	(4) Livestock ownershi p	(5) Micro- enterpris e	(6) NREGA weeks
(High Inc.)	0.0001	0.0004**		0.0000	0.0004**	
X						
(NREGA)	[0.0003]	[0.0002]		[0.0002]	[0.0002]	
NREGA	0.0007***	-0.0013***		0.0008***	-0.0014***	
weeks	[0.0003]	[0.0002]		[0.0002]	[0.0002]	
Lag	0.0000	0.2844***	-0.0000***			-0.0000***
Income	[0.0000]	[0.0062]	[0.0000]			[0.0000]
Lag. DV				0.2879***	0.2861***	
				[0.0064]	[0.0062]	
Dist. Avg.	0.8790***	0.5313***	0.9997***	0.5908***	0.5275***	0.9979***
	[0.0320]	[0.0410]	[0.0218]	[0.0312]	[0.0411]	[0.0218]
SC/ST/OB			4.7974**			4.7948**
C			[0.6805]			[0.6794]
Constant	-1.1673***	-0.1829***	-26.8156***	-1.1235***	-0.1843***	-26.7872***
	[0.0505]	[0.0347]	[3.9932]	[0.0483]	[0.0348]	[3.9931]
Obs.	22358	22358	22358	22358	22358	22358
R²	0.202	0.132	0.227	0.269	0.129	0.227

Note: Standard errors in brackets; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6. Discussion

The main findings of our model indicate that participation in the Mahatma Gandhi National Rural Employment Guarantee Program may have reduced micro-entrepreneurial activities among participating households while simultaneously increasing household ownership of livestock. This arises because the employment guarantee program absorbs household labor and reduces households' proclivity to engage in labor-intensive microenterprises, indicating that the program is more

attractive, likely due to the guaranteed wage being higher than the marginal return to labor engaged in microenterprise activities. Simultaneously, the relaxation of credit constraints due to participation in the government employment program encourages households to engage in livestock ownership, which requires greater financial investment but relatively less household time. This suggests a shift in the composition of income diversification activities as a means of smoothing income flows. Our second set of results shows that the decline in micro-entrepreneurial activity is significantly weaker among relatively less-poor households, for whom the policy represents a smaller endowment shock. These results underscore the importance of evaluating policy impacts from a broader perspective, as partial-equilibrium analyses, while sometimes necessary, may fail to capture the full range of economic responses.

The findings indicate that while employment guarantee programs can increase livestock ownership as a means of income smoothing, they may also have unintended consequences by reducing rural entrepreneurship. This highlights the importance of comparing workfare programs like MGNREGA, which require time-intensive labor to earn wages, with alternative interventions such as job training programs that incentivize the development of self-sufficiency and entrepreneurial skills. Policymakers should carefully consider the trade-offs between providing guaranteed employment and promoting long-term household productivity and enterprise development when designing rural labor interventions.

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