



Appendix: Closing the Rural Credit Divide

Methodology



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MARCH 2026

The results outlined in this publication were obtained using linear regressions, with the dependent variable being the municipal share of smallholder farmers who accessed PRONAF, according to the 2017 Agricultural Census. The complete specification included state or regional dummies (fixed effects), cooperative members in the municipality (2017 Agricultural Census), and ATER in the municipality (2017 Agricultural Census).

Table 1. Quantitative Results of the PRONAF Access Model

Dependent Variable: PRONAF Share							
Northern Region							-0.02*** (0.005)
Northeast Region							-0.02** (0.006)
Southeast Region							-0.01** (0.004)
Southern Region							0.06*** (0.005)
Midwest Region							-0.01 (0.005)
Cooperatives	0.24** (0.01)		0.17** (0.01)		0.16** (0.01)	0.13** (0.01)	0.14** (0.01)
ATER		0.27*** (0.01)		0.21** (0.01)	0.20** (0.01)	0.16** (0.01)	0.15** (0.01)
State Fixed Effects			SIM	SIM		SIM	
Observations	5,498	5,505	5,498	5,505	5,343	5,343	5,343
R ²	0.20	0.29	0.40	0.40	0.38	0.45	0.42
Adjusted R ²	0.20	0.29	0.39	0.40	0.38	0.45	0.42
Residual Std. Error	0.10 (df = 5496)	0.10 (df = 5503)	0.09 (df = 5470)	0.09 (df = 5477)	0.09 (df = 5339)	0.08 (df = 5313)	0.09 (df = 5335)
F Statistic	1,416.56*** (df = 1; 5496)	2,218.79*** (df = 1; 5503)	133.46*** (df = 27; 5470)	137.28*** (df = 27; 5477)	1,071.54*** (df = 3; 5339)	149.49*** (df = 29; 5313)	554.76*** (df = 7; 5335)

*p<0.1
**p<0.05
***p<0.01

The linear model was estimated to use the ordinary least squares estimator. State or regional fixed effects were used to capture the impact of states/regions on access to PRONAF in Brazilian municipalities. All other variables, including the dependent variable, share_PRONAF, are municipal shares that indicate the proportion of smallholders in the municipality who access PRONAF, are associated with a cooperative and have received ATER in relation to the total number of smallholders in the municipality. Illiteracy was treated as a control variable, but it did not yield significant results for any of the regions.

Note: Cooperatives: percentage of farmers who are members of an association in the municipality, according to the 2017 Agricultural Census. ATER: percentage of farmers in the municipalities who accessed ATER, according to the 2017 Agricultural Census.

Source: CPI/PUC-RIO based on data from the 2017 Agricultural Census, 2026

Table 2. Simulation Results

Dependent Variable: PRONAF Share			
ATER	0,3223*** (0,0083)		-0,0762*** (0,0168)
Cooperatives		0,3510*** (0,0084)	-0,0120 (0,0163)
ATER*Cooperatives			0,5992*** (0,0320)
Observations	5357	5350	5343

* $p < 0.1$

** $p < 0.05$

*** $p < 0.01$

The linear model was estimated using the ordinary least squares estimator. For the simulation described in the text, the model in the last column was used. Regional fixed effects were used in this estimation. All other variables, including the dependent variable, *share_PRONAF*, are municipal shares that indicate the proportion of smallholders in the municipality who access PRONAF, are associated with a cooperative and have received ATER in relation to the total number of smallholders in the municipality. Illiteracy was considered a control variable; however, it was not used in the simulation and is therefore not reported.

Source: CPI/PUC-RIO with data from the 2017 Agricultural Census, 2026

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This work is supported by a grant from Porticus Foundation. This publication does not necessarily represent the view of our funders and partners.

The authors would like to thank Kirsty Taylor, Giovanna de Miranda, and Camila Calado for editing and revising the text and Meyrele Nascimento and Nina Oswald Vieira for formatting and graphic design.

Suggested citation

Leal, Alan, Juliano Assunção, and Natalie Hoover. *Appendix: Closing the Rural Credit Divide. Methodology*. Rio de Janeiro: Climate Policy Initiative, 2026.

MARCH 2026

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