

# The impact of extension services on farm incomes in rural Mozambique

UEM Seminar, Maputo

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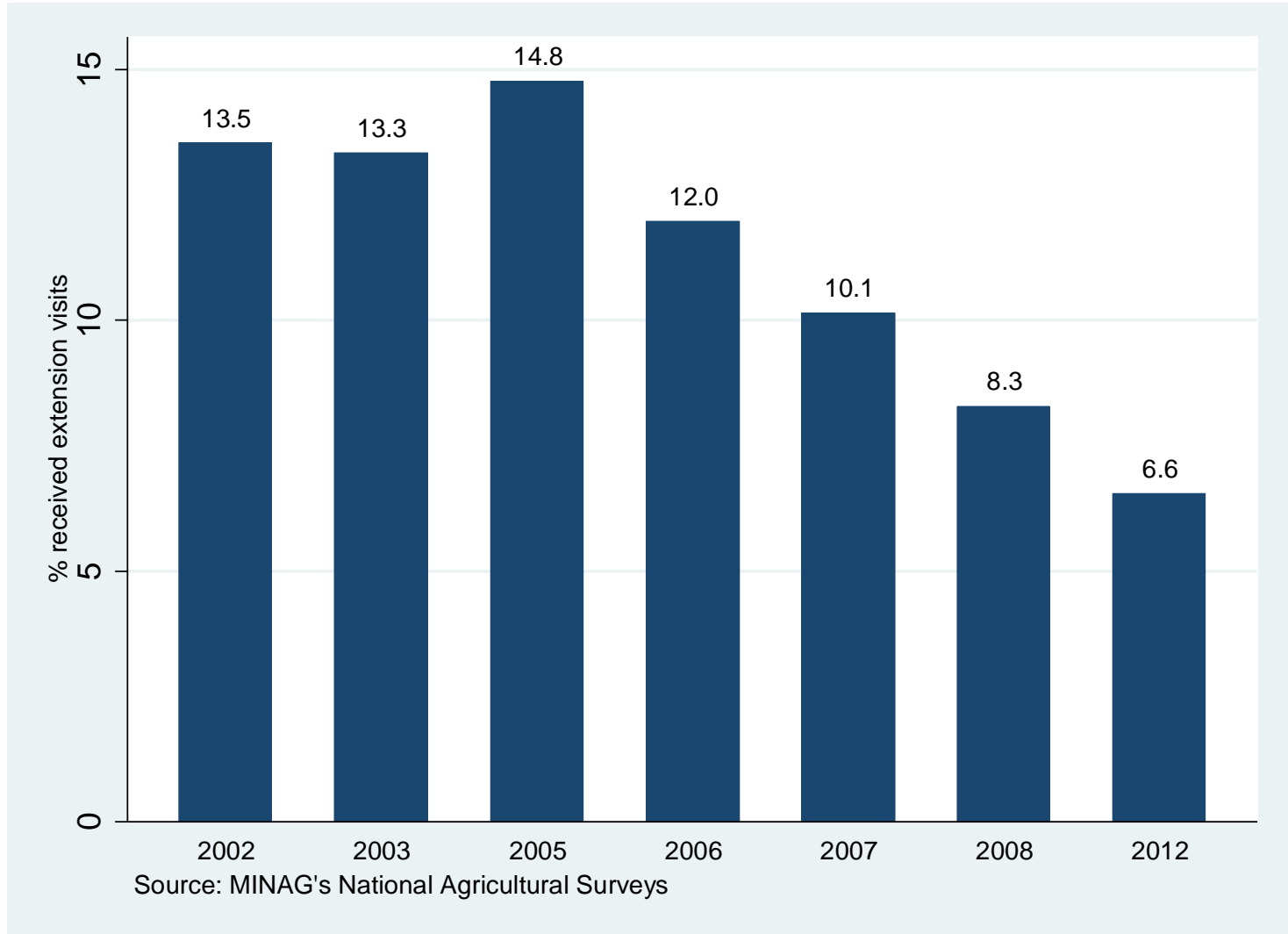
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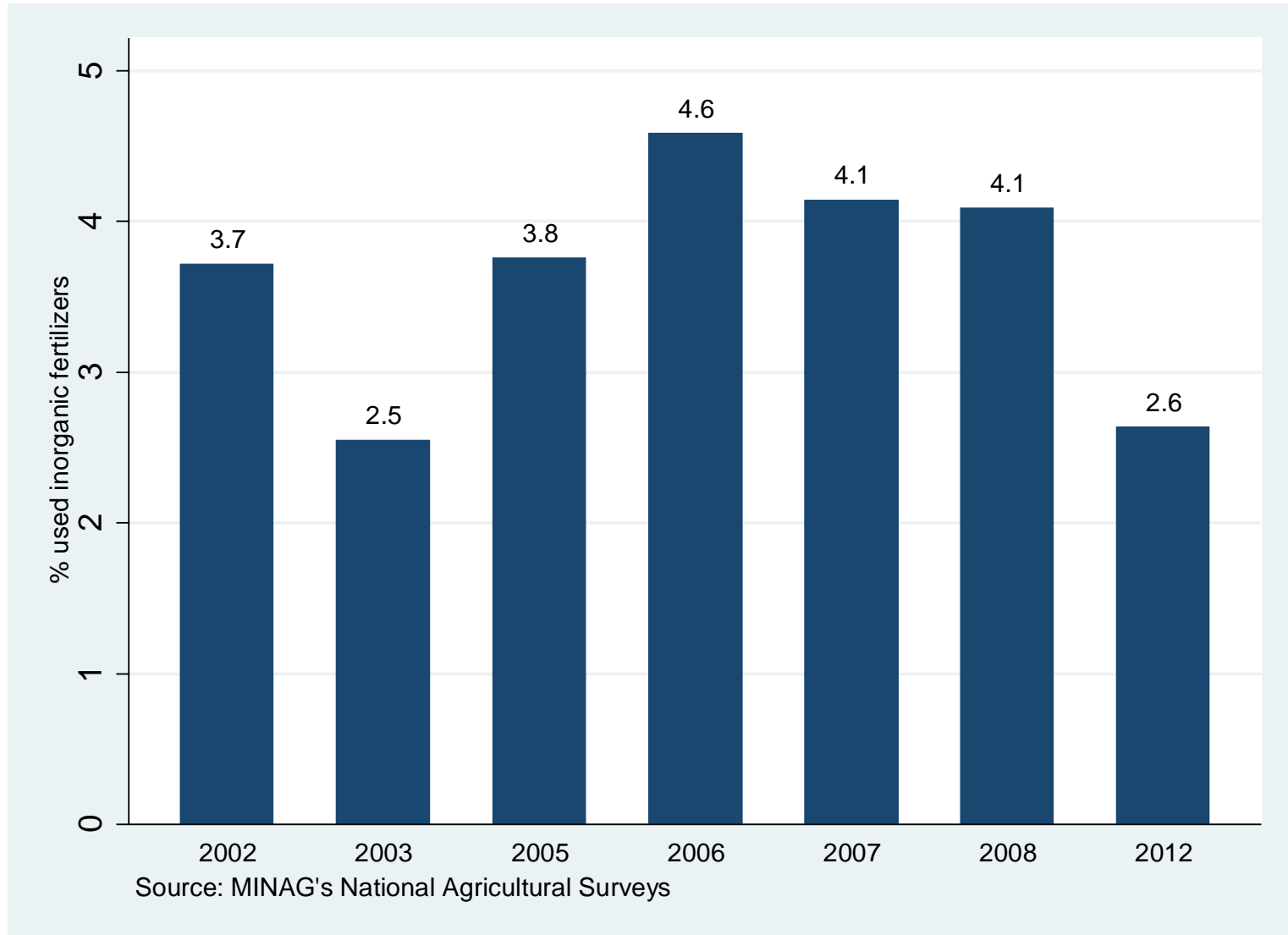
# Outline

- Brief background on Agriculture in Moz.
- Research question and motivation
- Data sources and methods
- Results and discussion
- Key findings

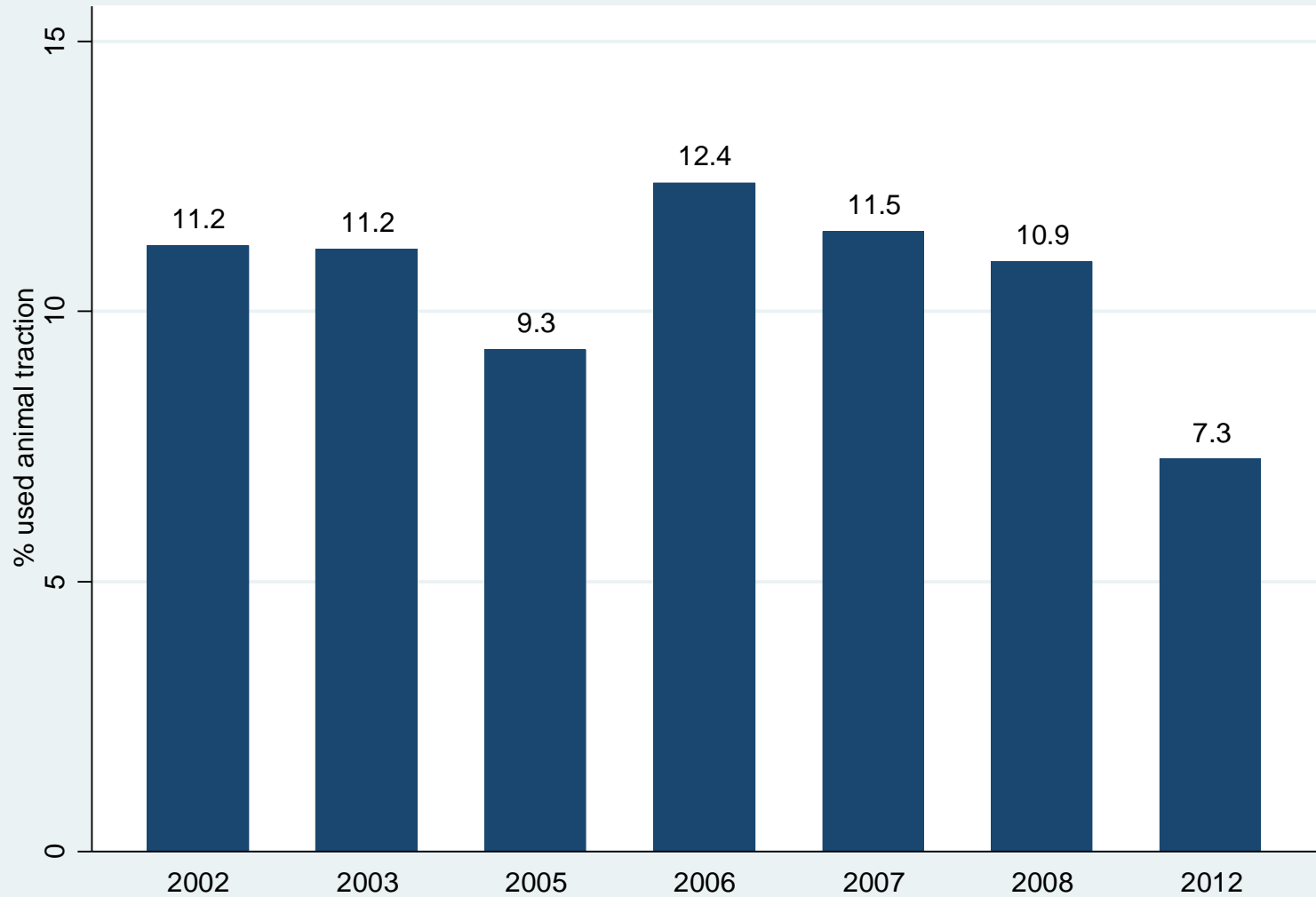
# Percent received extension visits



# Percent used inorganic fertilizers

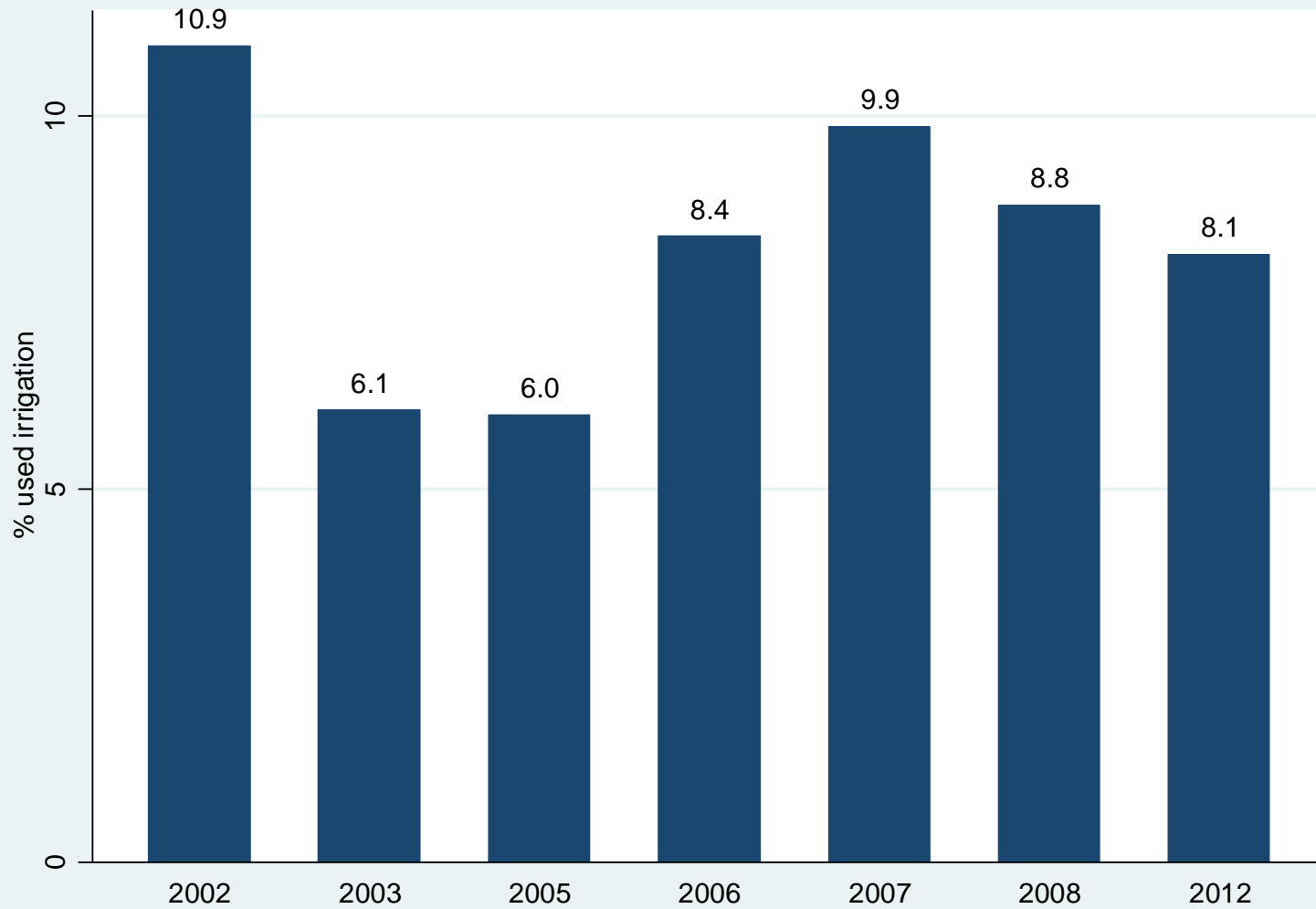


# Percent used animal traction



Source: MINAG's National Agricultural Surveys

# Percent used irrigation



Source: MINAG's National Agricultural Surveys

# Research question

- Given:
  - Low productivity
  - Low use of improved inputs
  - Low access to credit, irrigation, etc.
- What role (if any) can extension services play?

# Motivation

- Extension (and infrastructure) have a huge budget share in the current Agricultural Investment Plan (PNISA)
- Though we see declining coverage, so we want to see what are the impacts.



# Data source

- Data from the National Agricultural Survey of 2005 – for the paper
- Representative at provincial and agro-ecological zone
- Repeated the analysis using 2008 data

# Methods

- Descriptive statistics
- Matching and regression
  - Used to identify similar households that only differ by receipt of extension services
- Regression diagnostics
  - Model specification based on data resampling
- Matching diagnostics (diagrams, normalized differences, t-tests, etc.)

# Methods - matching

- First run a logit regression of extension visits
- Give a score to each household based on the probability of receiving extension visits
- Group similar scores (propensity scores)
- Test for differences between those groups
- Trim if necessary
- Find final matches
- Compute average effects between matches

Table 2: Descriptive Statistics of Variables Used in the Propensity Score Estimation

	All sample		Did not receive extension		Received extension		P-value*
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	
Head's years of schooling	2.54	2.57	2.48	2.56	2.95	2.64	0.000
Head's age in years	44.19	14.89	44.31	15.03	43.41	13.96	0.697
HH is widow-headed (1 = yes)	0.09	0.28	0.09	0.29	0.06	0.24	0.004
HH is female non-widow-headed (1 = yes)	0.18	0.38	0.18	0.38	0.14	0.35	0.000
HH size (adult equivalent scale)	3.92	2.00	3.86	1.94	4.28	2.29	0.000
Number of members engaged in non-farm	0.40	0.77	0.38	0.73	0.54	0.98	0.000
Head is engaged in non-farm (1 = yes)	0.61	0.49	0.60	0.49	0.68	0.47	0.000
Used inorganic fertilisers (1 = yes)	0.01	0.12	0.01	0.10	0.04	0.20	0.000
Used improved maize seeds (1 = yes)	0.04	0.20	0.04	0.19	0.07	0.26	0.002
Used animal traction (1 = yes)	0.09	0.29	0.09	0.29	0.12	0.32	0.000
Cropped area in hectares	1.50	1.53	1.45	1.15	1.82	3.00	0.000
TLU	0.92	2.81	0.87	2.67	1.24	3.59	0.000
Household owns a bicycle (1 = yes)	0.31	0.46	0.30	0.46	0.42	0.49	0.000
HH owns a radio (1 = yes)	0.53	0.50	0.51	0.50	0.63	0.48	0.000
Membership to farmers' association (1 = yes)	0.06	0.23	0.04	0.19	0.19	0.39	0.000
HH vaccinated chickens (1 = yes)	0.02	0.14	0.02	0.12	0.04	0.21	0.000
Tarred road runs through the village (1 = yes)	0.66	0.47	0.66	0.47	0.70	0.46	0.142
Number of observations	5,076		4,305		771		

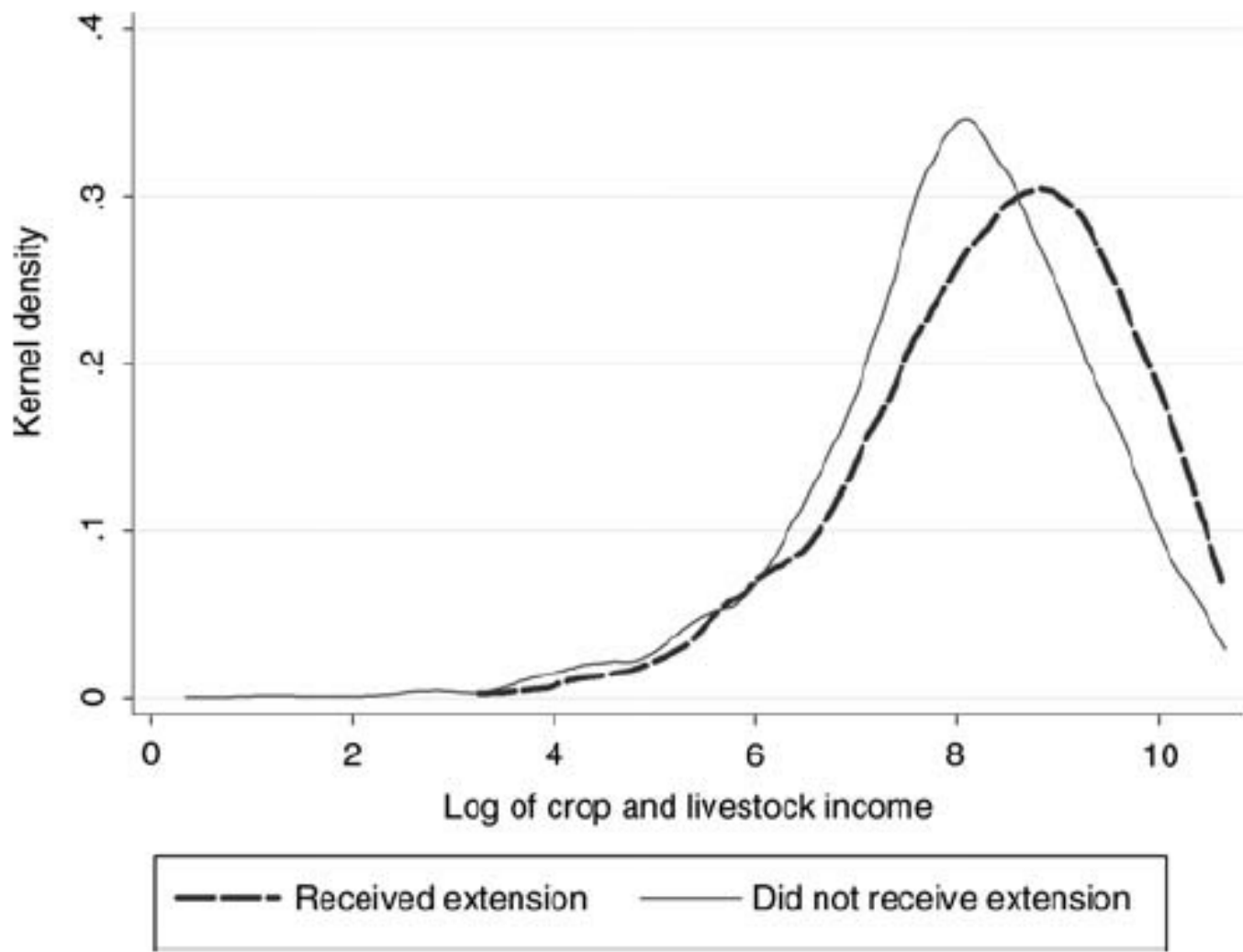


Figure 1: Kernel Density of Total Household Income by the Receipt of Extension Services.

Table 3: OLS Results on Farm Incomes

Independent variables	Coefficient	Standard error	P-value
HH received extension (1 = yes)	0.197	0.060	0.001
Head's years of schooling	0.029	0.021	0.175
Head's years of schooling (squared term)	-0.006	0.003	0.027
Head's age in years	0.006	0.007	0.388
Head's age (squared term)	0.000	0.000	0.341
HH is widow-headed (1 = yes)	-0.106	0.076	0.162
HH is female non-widow-headed (1 = yes)	-0.139	0.055	0.012
HH size (adult equivalent scale)	0.019	0.012	0.103
Number of members engaged in non-farm	0.013	0.026	0.614
Head is engaged in non-farm (1 = yes)	-0.053	0.041	0.196
Cropped area in hectares	0.327	0.021	0.000
Cropped area in hectares (squared term)	-0.005	0.000	0.000
TLU	0.067	0.010	0.000
TLU (squared term)	-0.001	0.000	0.000
HH owns a bicycle (1 = yes)	0.171	0.043	0.000
Drought risk index	-0.327	0.175	0.062
Flood risk index	0.095	0.316	0.763
Animal risk index	0.065	0.112	0.561
Membership to farmers' association (1 = yes)	0.112	0.089	0.210
Used inorganic fertilisers (1 = yes)	0.269	0.145	0.065
Used improved maize seeds (1 = yes)	0.148	0.091	0.102
Used tractor (1 = yes)	0.553	0.159	0.001

**Table 4: Logit Model Results**

	Original data			Simulated data		
	Coefficient	Standard error	<i>P</i> -value	Mean	95% Confidence interval	
Head's years of schooling	0.014	0.055	0.803	0.014	0.012	0.017
Head's years of schooling (squared term)	-0.002	0.006	0.797	-0.002	-0.002	-0.001
Head's age in years	0.013	0.021	0.529	0.016	0.015	0.017
Head's age (squared term)	0.000	0.000	0.415	0.000	0.000	0.000
HH is widow-headed (1 = yes)	-0.408	0.244	0.095	-0.447	-0.458	-0.436
HH is female non-widow-headed (1 = yes)	-0.118	0.174	0.497	-0.128	-0.135	-0.120
HH size (adult equivalent scale)	0.000	0.031	0.998	-0.002	-0.003	0.000
Number of members engaged in non-farm	0.072	0.071	0.312	0.079	0.076	0.082
Head is engaged in non-farm (1 = yes)	0.200	0.126	0.111	0.206	0.200	0.211
Used inorganic fertilisers (1 = yes)	0.845	0.360	0.019	0.889	0.872	0.906
Used improved maize seeds (1 = yes)	0.635	0.259	0.014	0.658	0.646	0.669
Used animal traction (1 = yes)	0.185	0.219	0.398	0.202	0.193	0.212
Cropped area in hectares	0.170	0.058	0.004	0.182	0.179	0.185
Cropped area in hectares (squared term)	0.000	0.001	0.948	-0.001	-0.001	-0.001
TLU	-0.006	0.026	0.816	-0.005	-0.007	-0.004
TLU (squared term)	0.000	0.000	0.913	0.000	0.000	0.000

Table 5: Balance Improvement: Descriptive Statistics of Matches

	All sample		Did not receive extension		Received extension		$\Delta$
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	
Head's years of schooling	3.01	2.59	3.08	2.56	2.94	2.62	0.00
Head's age in years	43.77	14.16	44.05	14.35	43.49	13.98	0.00
HH is widow-headed (1 = yes)	0.06	0.24	0.07	0.25	0.06	0.24	0.00
HH is female non-widow-headed (1 = yes)	0.13	0.34	0.12	0.32	0.14	0.35	0.02
HH size (adult equivalent scale)	4.38	2.27	4.47	2.25	4.29	2.29	-0.02
Number of members engaged in non-farm	0.56	0.95	0.58	0.92	0.55	0.98	-0.01
Head is engaged in non-farm (1 = yes)	0.68	0.47	0.68	0.47	0.67	0.47	0.00
Used inorganic fertilisers (1 = yes)	0.04	0.21	0.05	0.22	0.04	0.19	-0.02
Used improved maize seeds (1 = yes)	0.06	0.24	0.06	0.23	0.07	0.26	-0.02
Used animal traction (1 = yes)	0.11	0.31	0.1	0.31	0.12	0.32	0.02
Cropped area in hectares	1.82	2.4	1.81	1.55	1.83	3.01	-0.02
TLU	1.32	3.78	1.4	3.96	1.24	3.6	-0.04
HH owns a bicycle (1 = yes)	0.44	0.5	0.46	0.5	0.41	0.49	-0.04
HH owns a radio (1 = yes)	0.65	0.48	0.66	0.48	0.63	0.48	-0.02
Membership to farmers' association (1 = yes)	0.18	0.38	0.17	0.38	0.19	0.39	0.01
HH vaccinated chickens (1 = yes)	0.06	0.23	0.07	0.25	0.04	0.21	-0.03
Tarred road runs through the village (1 = yes)	0.73	0.45	0.75	0.44	0.71	0.46	-0.03

Note:  $\Delta$  = Normalised difference =  $[\text{mean}(x_1) - \text{mean}(x_0)] / [\text{standard deviation}(x_0) + \text{standard deviation}(x_1)]^{1/2}$ .



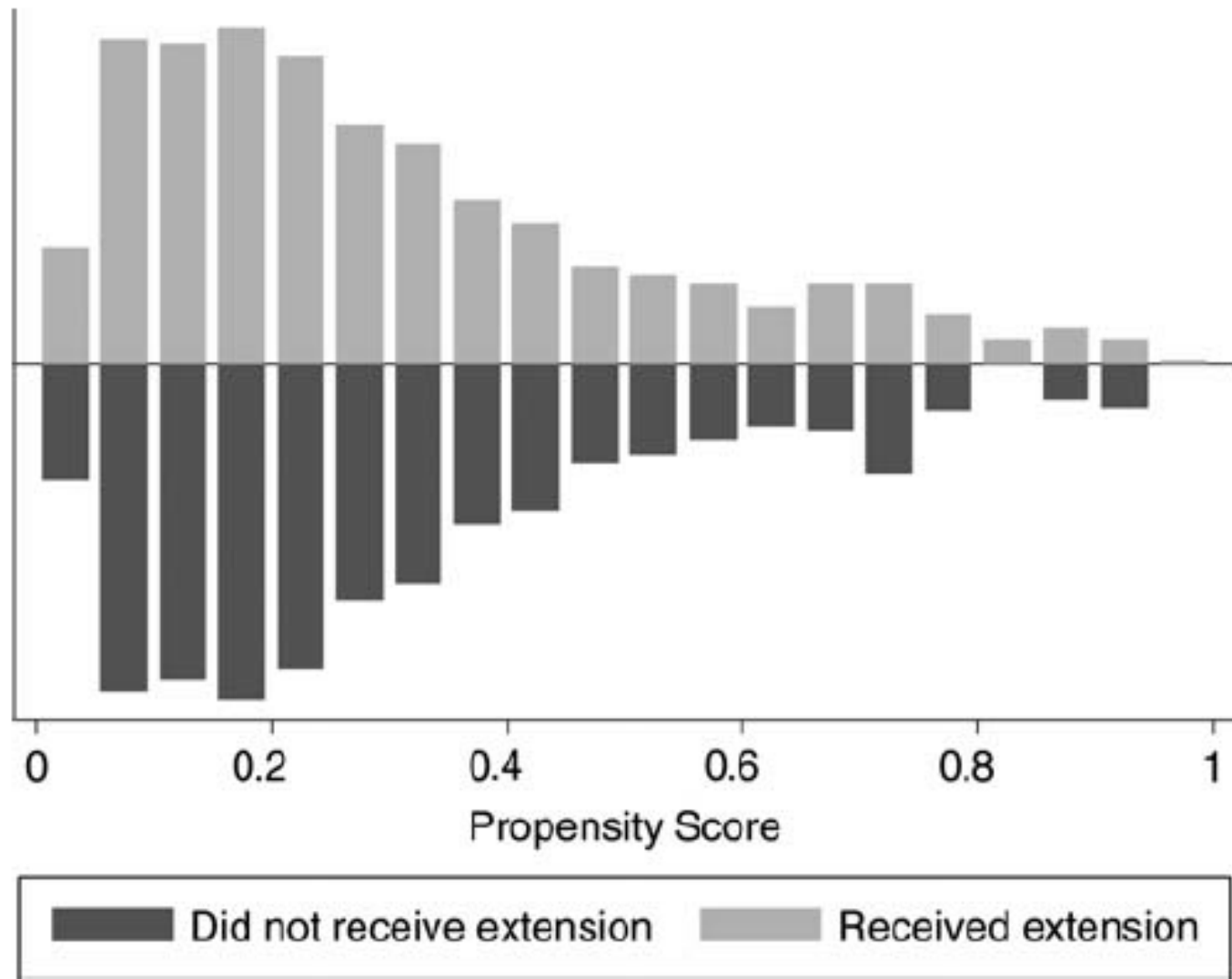


Figure 2: Distribution of Propensity Scores among Treated and Untreated Households.

# The impact of extension on farm incomes

Table 6: Estimates of the Average Treatment Effect Using Different Econometric Approaches

Dependent variable	Log of farm income (Meticais)		
	Coefficient	Standard error	<i>P</i> -value
OLS with no control of endogeneity	0.197	0.060	0.001
Doubly robust estimator	0.120	0.060	0.051
Matching and regression	0.154	0.081	0.058

*Source:* Authors' calculations based on TIA05 data.

# Should we target extension services?

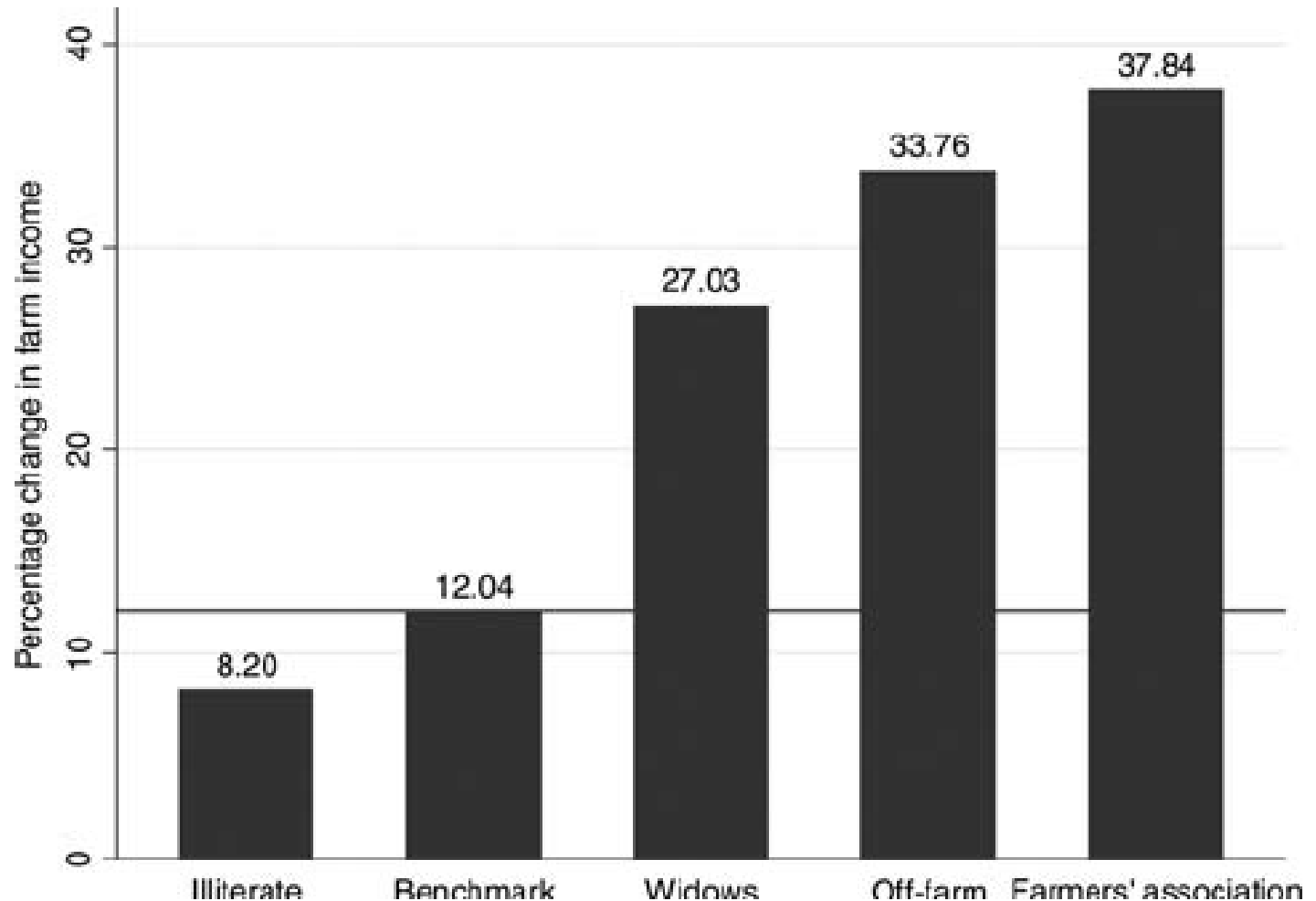


Figure 3: The Impact of Targeting Based on Household Typology.

# Key findings

- Extension investments are important
- The impact of receipt of extension is positive and significant, although relatively small in magnitude
- Targeting scenarios should be considered

Obrigado/Thanks