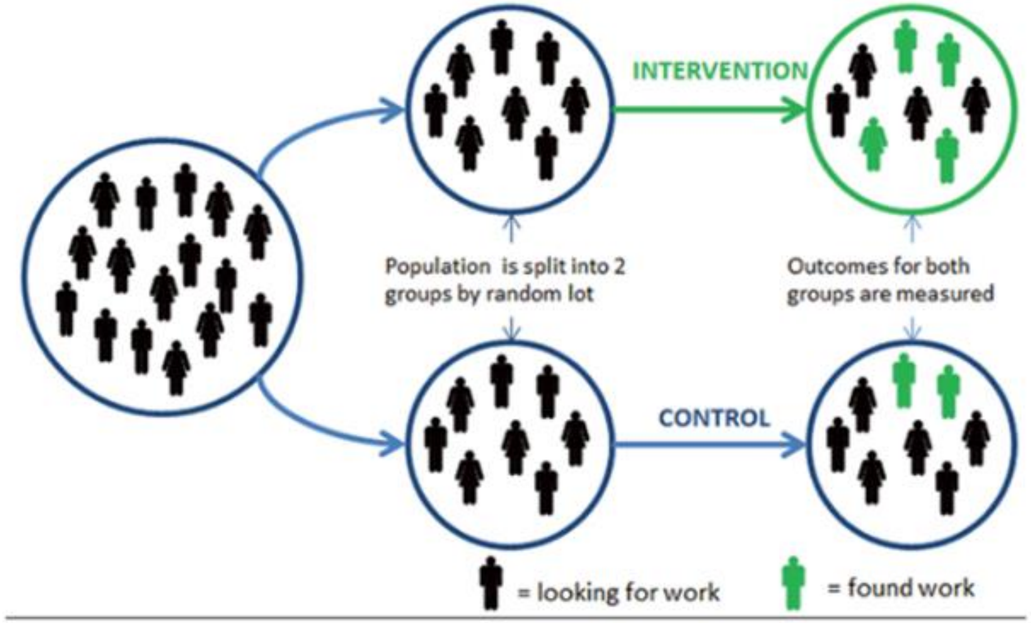
Topic 3: Impact evaluation in Economic Development



Plan for this 1h25

0. Brief recap from the previous lecture – 5’

1. Introducing impact evaluation – 30’

2. An RCT in practice: idea, design, intervention, evaluation, scaling-up/policy and follow-up – 45’

Recap and main points from lecture 2

1. Poverty traps probably exist.

2. Foreign aid could in principle solve them.

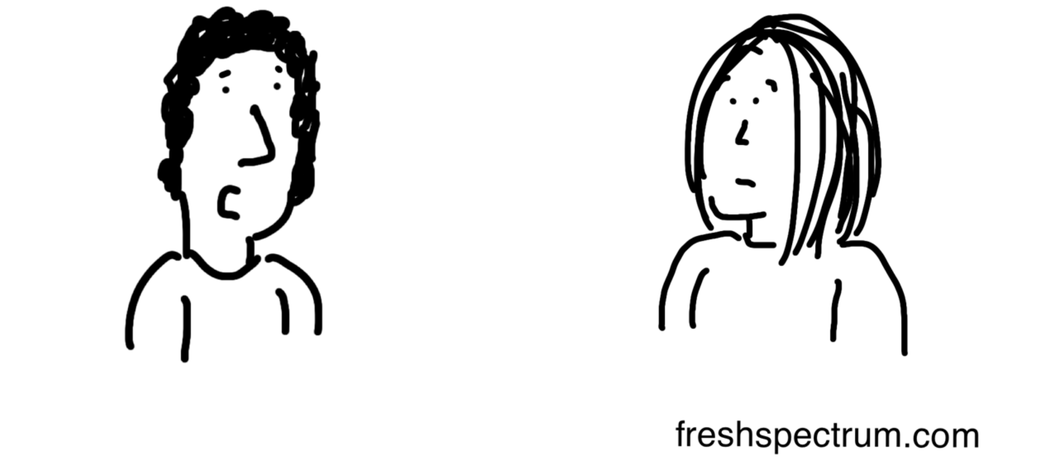
3. Rich country interests, corruption in recipient countries… aid debate: Sachs, Easterly, Collier, and Moyo.

4. Not much to show for aid effectiveness at the macro level.

5. Way out: **micro policy effectiveness**?

Topic 3.1. Introducing impact evaluation

WHAT DOES ACADEMIC RESEARCH HAVE TO SAY ABOUT AID EFFECTIVENESS?



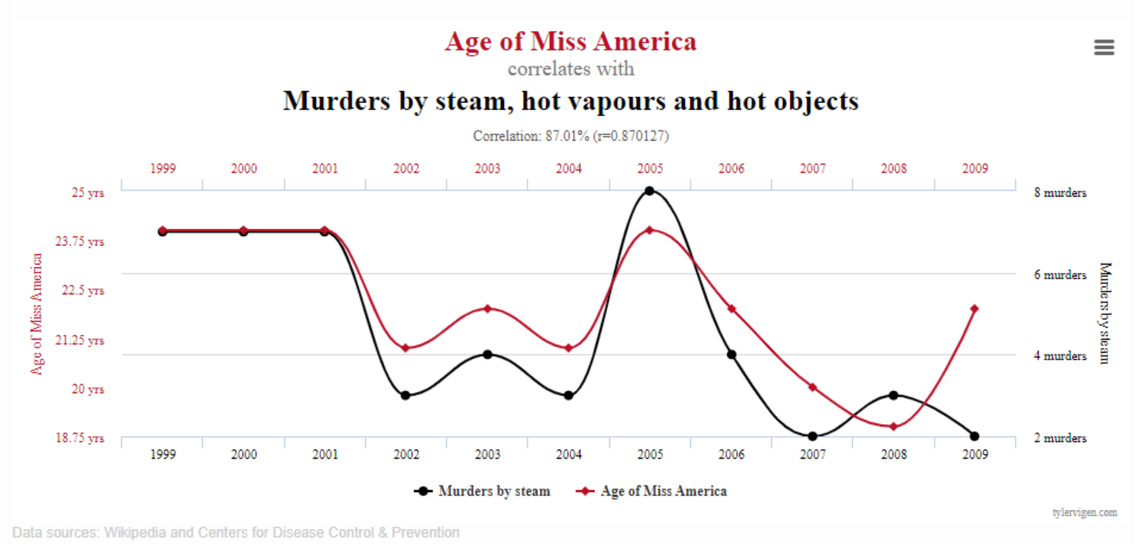
Causality and endogeneity – correlation vs causation

A METHODOLOGICAL REVISION

Having more sex makes you earn more money?

The headline “More Buck For Your Bang: People Who Have More Sex Make The Most Money”. The author Max Rivlin-Nadler writes: “Scientists… found that people who have sex more than four times a week receive a 3.2 percent higher paycheck than those who have sex only once a week. God forbid you don’t have sex at all.”

Based on a study by Nick Drydakis which does not claim causality, but is called The **Effect** of Sexual Activity on Wages.

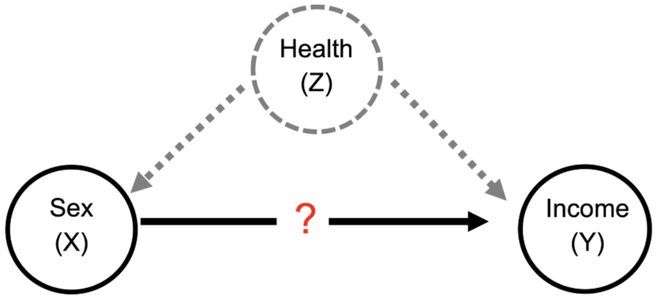


Picture from spurious correlations

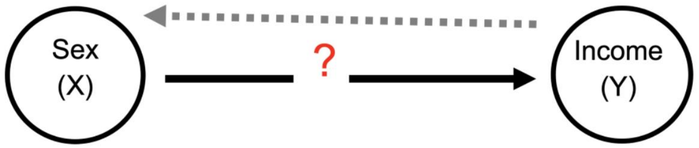
4 reasons why correlation might not imply causation

TAKEN FROM TOWARDS DATA SCIENCE, HERE, FROM AN ARTICLE (NOT SCIENTIFIC) THAT CLAIMS THAT MORE SEX CAUSES HIGHER INCOME

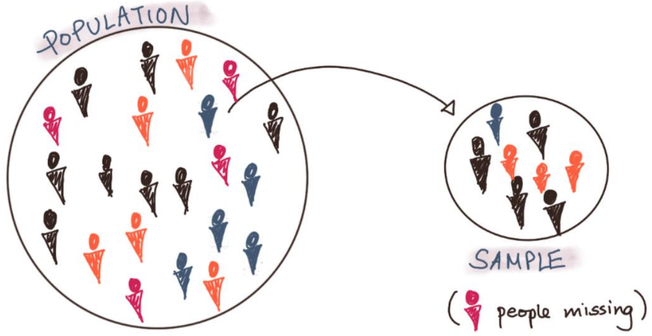
1. We are missing an important factor – **Omitted variable bias**



2. We got things the other way around – **Reverse causality**



3. You are looking at unusual people – **Sample selection bias**



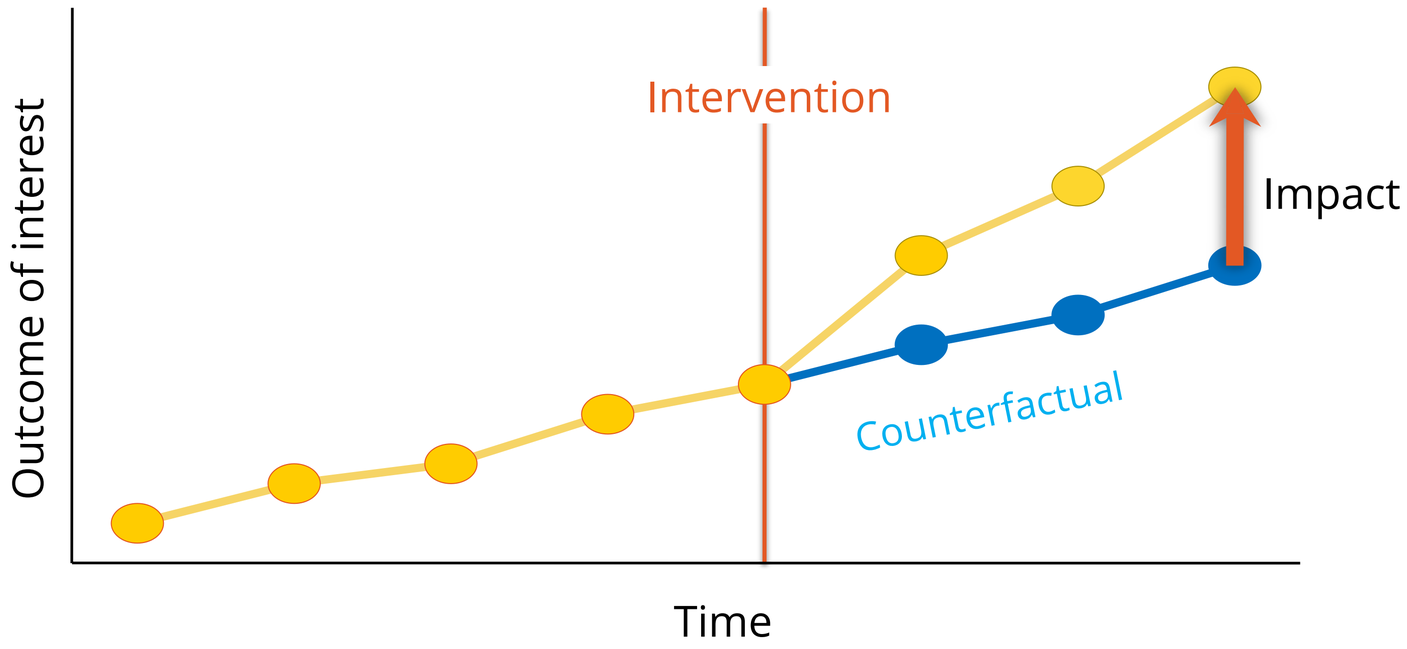
4. It's difficult to measure things – **Measurement error**

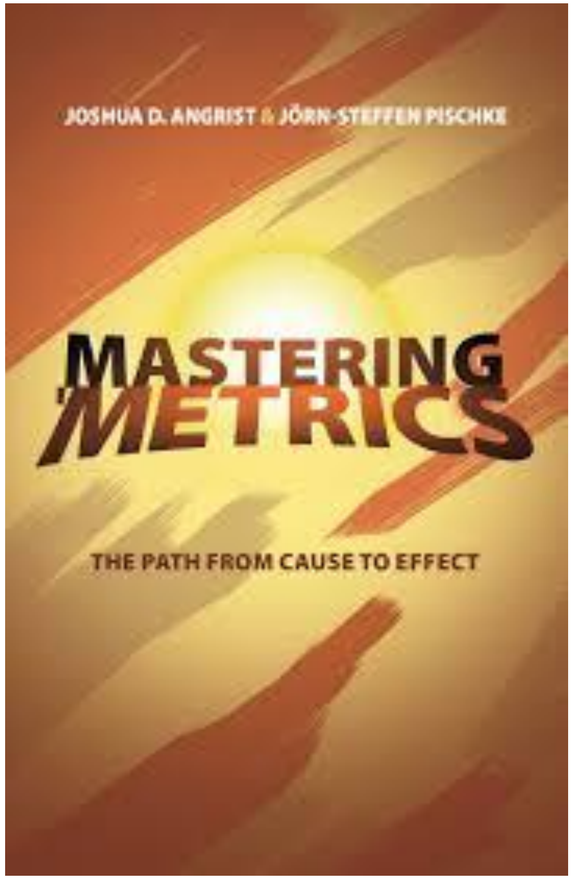
A particularly important concern when you ask people to report:

- About controversial or sensitive topics: who they vote for or attitudes towards various contentious issues. Experimenter demand effect.

Do not claim relations are causal unless you are using causal inference methodologies

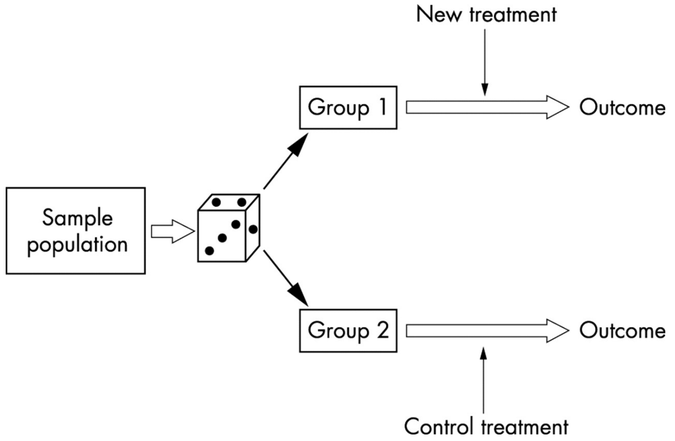
Causal inference



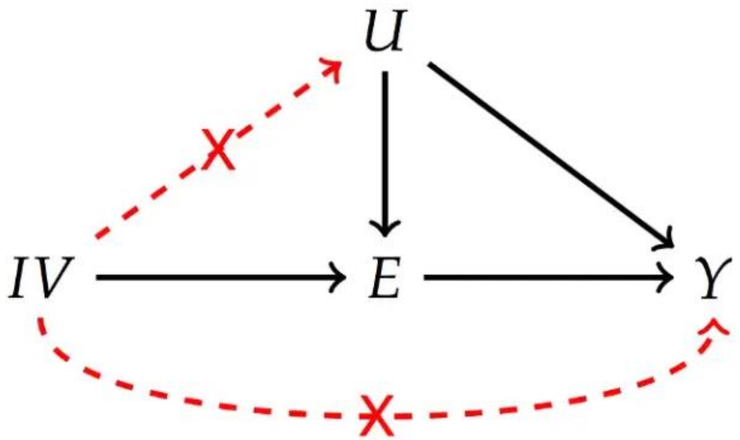


Methodologies for causal inference

1. Experiments – Lab and Field (RCTs): the gold standard

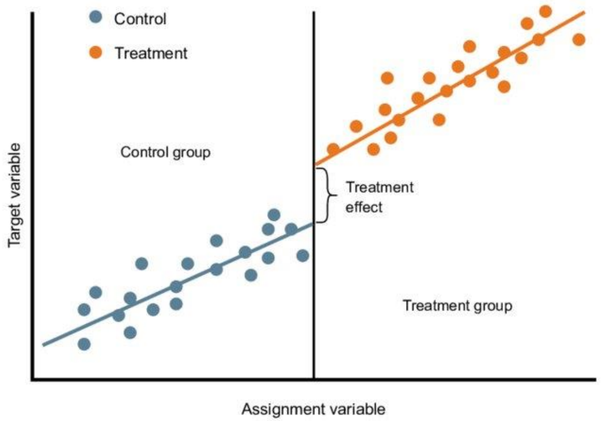


2. Instrumental variables (**IV**)

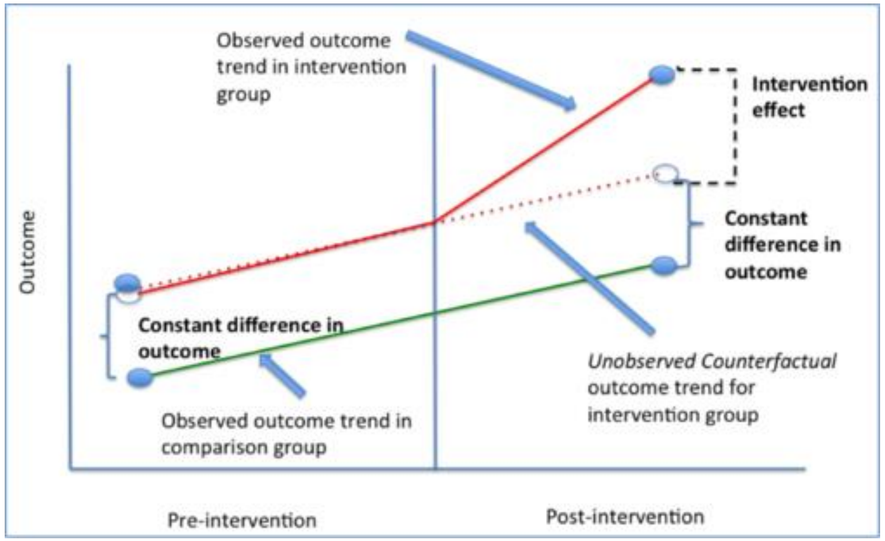


References here and Mastering Metrics' chapter 3

3. Regression discontinuity designs (**RDD**)



4. Differences-in-differences (**DiD**)



RCTs – examples of topics studied in Development Economics

- Cash transfers
- Microfinance
- Mobile money – electronic money
- Education
- Health
- Agricultural development
- Access to energy
- Social protection…

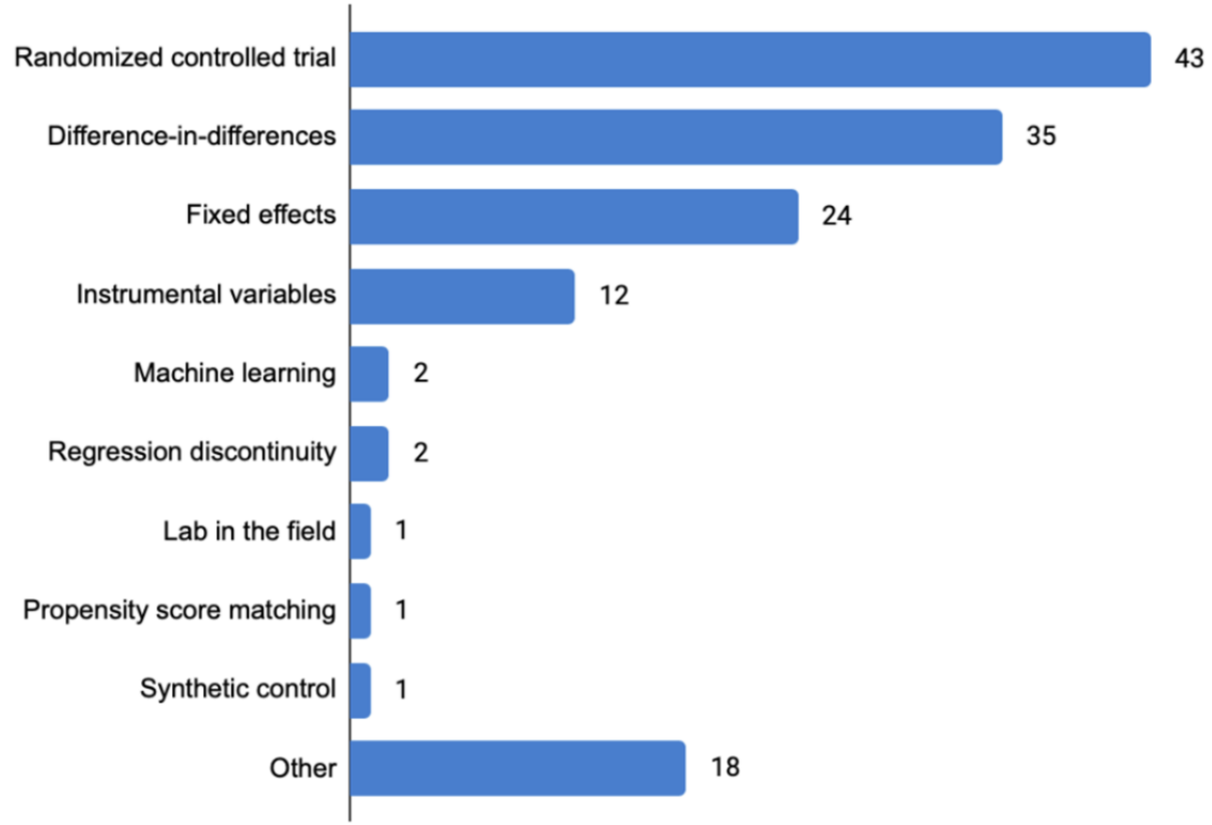
GiveDirectly

Send money directly to the extreme poor.

RCTs – the gold standard in causal inference

NEUDC 2022:

Figure 2: What empirical methods do recent development economics papers used?



[World Bank Blog]

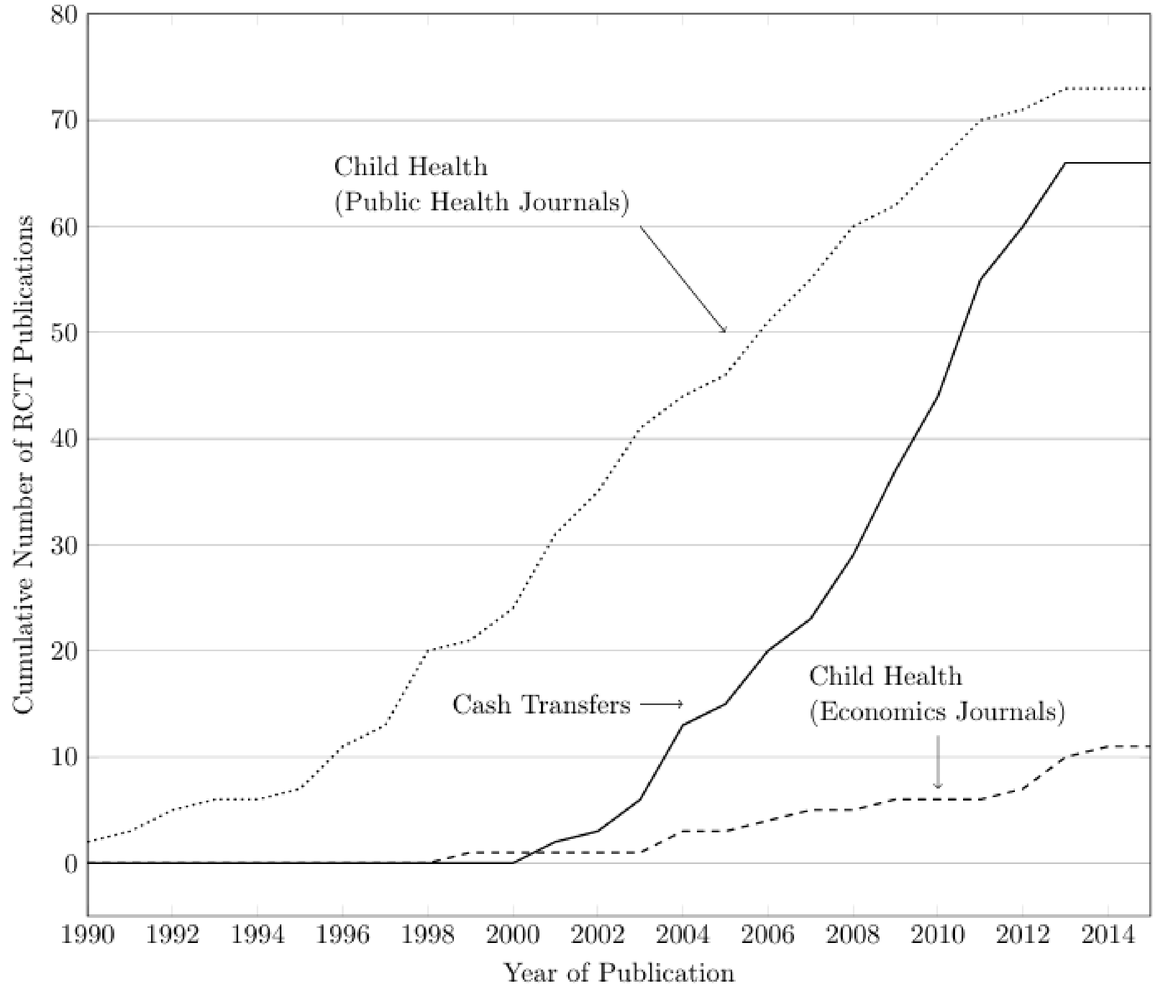
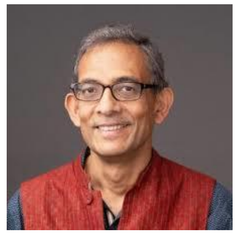


Figure 2: Cumulative Number of RCT Publications in Cash Transfer and Child Health in the AidGrade Database (http://www.aidgrade.org)

Bouguen et al 2018

Randomization in the real world – Randomists

J-PAL
ABDUL LATIF JAMEEL POVERTY ACTION LAB



Funded and headed by Esther Duflo and Abhijit Banerjee - MIT

ipa Innovations for Poverty Action

Funded by Dean Karlan – Northwestern University

DIME
DRIVING GLOBAL IMPACT

Development Impact Evaluation Department
World Bank

NOVAFRICA

Funded and headed by Pedro Vicente and Cátia Batista – Nova SBE

Advantages – in Development Economics

- Causality identified in a clean way.

- Simple and powerful methodology, also time intensive:
  - It allows to develop capacity in many different tasks and levels.
  - Relatively easy to communicate to a non-technical audience and policymakers who are not specialists.

- Together with evaluating the impact of interventions, it allows for piloting larger projects, facilitating:
  - Choosing more effective and efficient policies.
  - Improve elements of implemented policies.

Critics and criticisms.

- Angus Deaton: Problems of external validity and generalization
- Lant Pritchett: Limited applicability to complex policies
- Dani Rodrik: Lack of attention to context and mechanisms
- Martin Ravallion: Publication bias and ethical issues
- James Heckman: Limitations in understanding long-term processes
- Nancy Cartwright: Lack of a solid theoretical foundation
- David McKenzie: High costs and long execution times

Topic 3.2. An RCT in practice

IDEA, DESIGN, SETTING UP THE PROJECT, INTERVENTION, EVALUATION, DATA CLEANING AND ANALYSIS, WRITING, DISSEMINATION, SCALING-UP/POLICY AND FOLLOW-UP

Idea	Policy context - Scientific literature
Design	Research team - Research design
Intervention	Partnerships - Grant(s) application
Intervention	Development of materials - Training - Implementation
Evaluation	Training of enumerators - Survey pilots - Baseline survey - Endline survey
Writing	Research paper - Policy briefs
Dissemination	Workshops - Conferences - Publication
Scaling-up	Scaling-up/Policy Implementation
Follow-up	Follow-up

Idea – the problem

- **Real world problem – knowledge of the local context**: cashew nut producers getting low prices for their cashew nuts, with those with more years of education getting higher prices.

- **Scientific literature - problem**: isolated market participants in remote areas might have poor access to market information, resulting in suboptimal marketing decisions and lower revenue.

Motivation

Primary commodity **prices fluctuate** substantially over time.

- Fluctuations impact many African economies, whose exports mostly depend on.
- In the case of Guinea-Bissau, cashew nuts alone make up 90% of total exports.

Often **producers are less informed** than buyers about market conditions.

- Market information can reduce price uncertainty:
  → increasing producers' bargaining power and prices.
- But competition could erode margins for information alone to change prices.

Of cashews and cash

Nut factories have made a cracking comeback

But farmers are being squeezed

Print edition | Middle East and Africa

Sep 12th 2019 | NAMPULA

The Bissau-Guinean Raw Cashew Nut Supply Chain

Cashews grow in trees after three years, between March and June

70,000 – 100,000 families of cashew producers pick them from the ground

Producers sell them in their village to 5,000 – 10,000 intermediaries

Intermediaries transport them through low-quality roads

... To sell them to 30-60 large intermediaries or exporters

The raw cashew nuts are slowly exported to India and Vietnam

The National Raw Cashew Nut Market

Raw cashew nuts account for 90 percent of Guinea-Bissau's export revenue and about 25 percent of GDP. More than 80 percent of production goes into "raw" exports.

With a population of 2M and around 200,000 families, **about half of the families in the country own cashew plantations**.

Cashew is the main source of income for 80 percent of these families.

Many barriers prevent accurate information from reaching producers

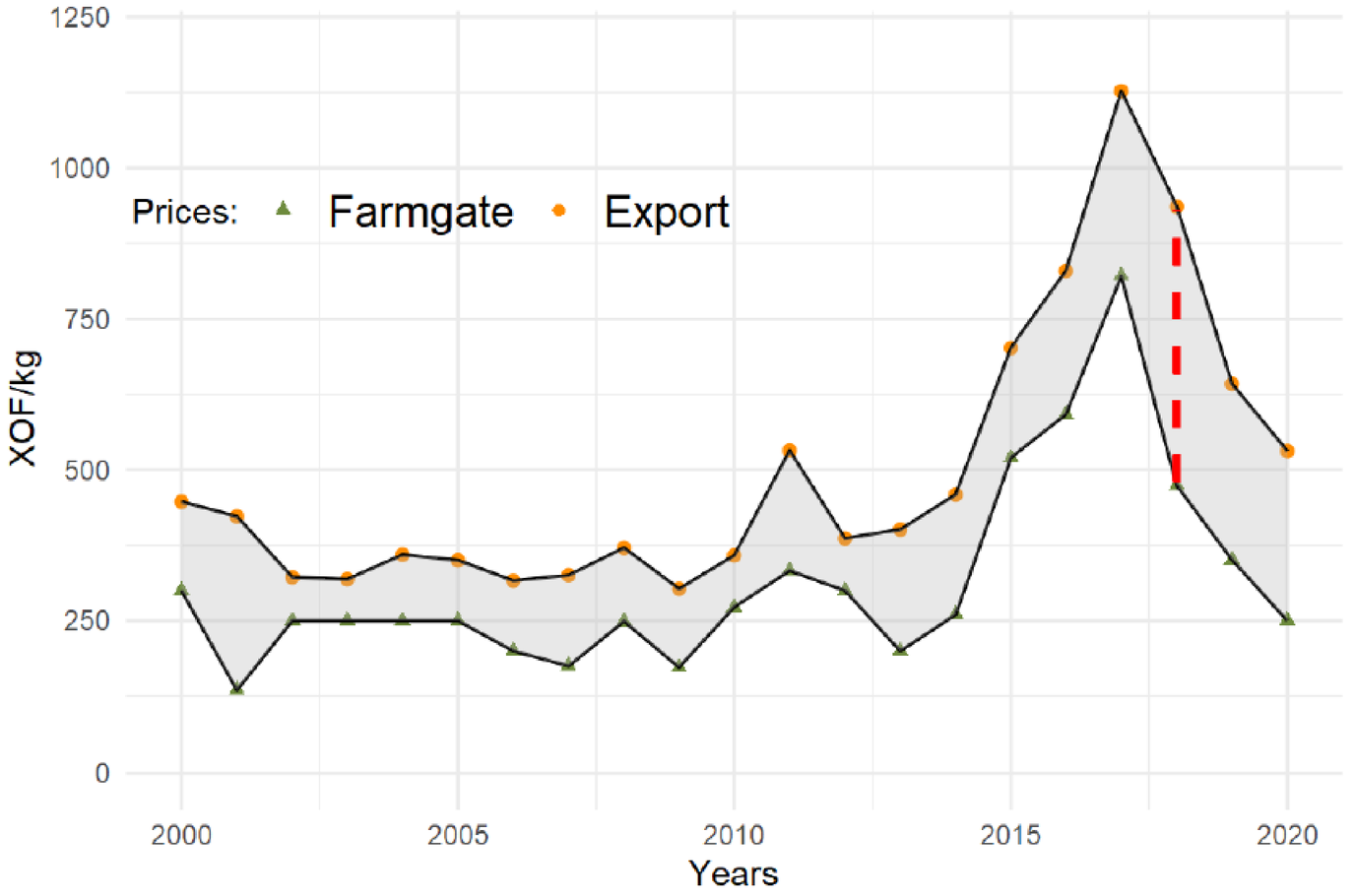
At the producer level:

- 70 percent **can't read**.
- 98 percent **sell their cashew nuts in the village**.
- They typically sell their cashew nuts in one **unique sale** per season.

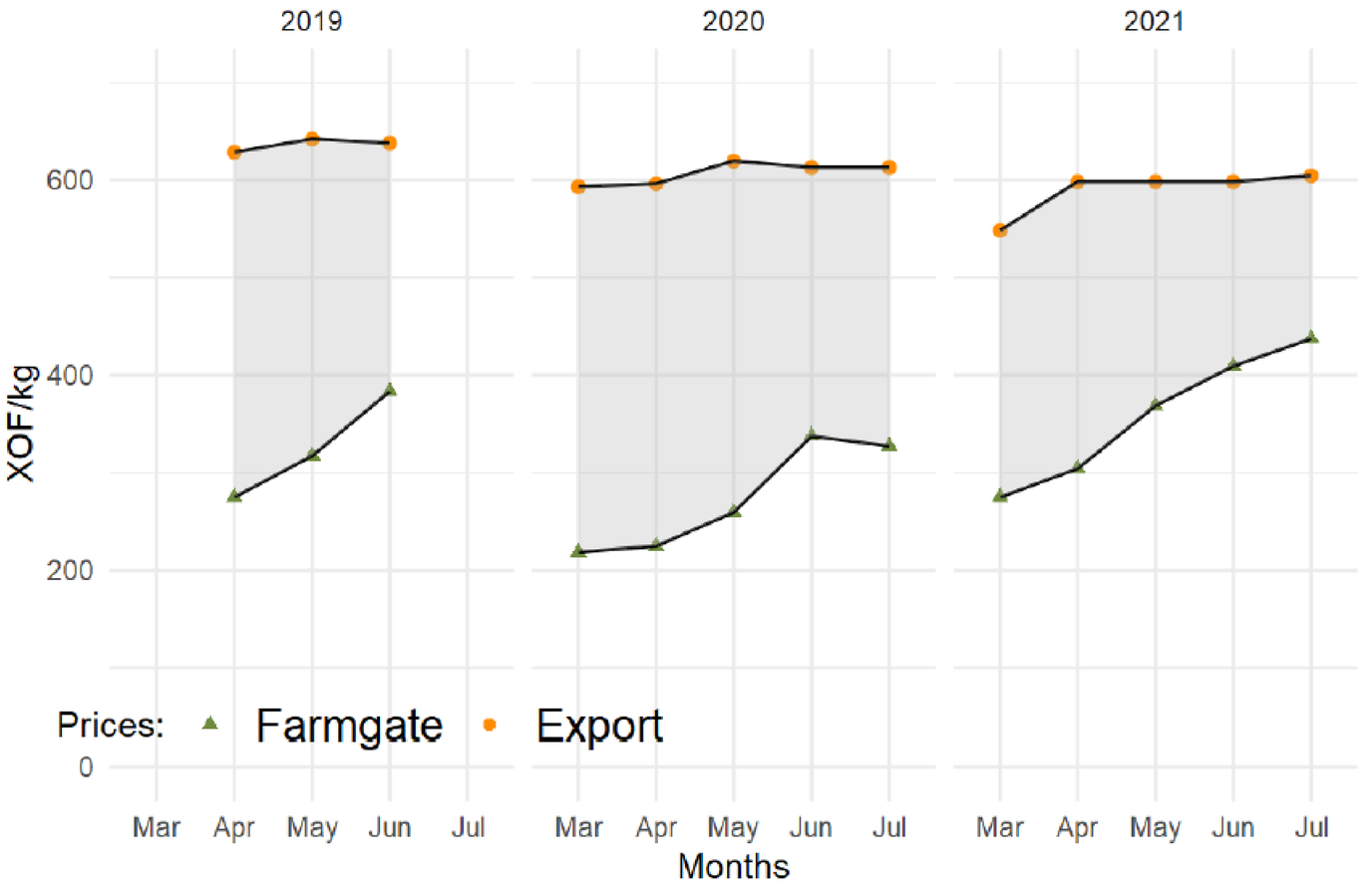
At the aggregate level:

- Guinea-Bissau is a **price-taker** in the world market of raw cashew nuts.
- There are **strong economic and political interests in the sector**.
- High **price volatility** across and within-seasons .

Price variation *across* seasons



Price variation *within* seasons



Idea – potential solution

Scientific literature – possible solution and gap: introducing a Market Information System – promising in remote contexts where producers have few market interactions.

Preliminary Design

- **Research team:** putting together a team of researchers with the necessary skills and background – combination of technical ability and knowledge of the context.
- - International researchers based in Guinea-Bissau.
- - National researchers based at ministries and universities.

- **Preliminary research design**: first definition of treatment arms, power calculations, sample, stratification…

Setting up the project

- **Partnerships**: implementing agencies, the National Cashew Agency, MTN (telecom), Nitidae (NGO specialized in Cashew Nuts), Ministry of Finance.

- **Grant Applications**: PEP, PEDL.
  - Updated research design.
  - Work plan - timeline.
  - Budget.


pep partnership for economic policy
Impact Evaluation Mentoring for Governments in East & West Africa
WILLIAM + FLORA Hewlett Foundation
IDRC | CRDI
Canada
UKaid

Impact Evaluation Mentoring for Governments in East and West Africa
Proposal

Disseminating market information via mobile phones to cashew producers: an impact evaluation in Guinea-Bissau

Presented to

Partnership for Economic Policy (PEP)

By
Jeremias Pereira
Adewusi Mendonça
Debucada Sanca
Djanira Cabral Avelino
Nadia Ndafa Francisco Pereira
Mamadu Serra
Dayvikson Laval Tavares
Tatiana Martinez Zavala
Camila Franco Restrepo
Brais Álvarez Pereira
Sebastian Schäber
&
General Directorate for Forecasting and Economic Studies, Ministry of Economy and Finance
Cashew Regulatory Agency of Guinea-Bissau
Statistics Directorate, Ministry of Agriculture and Rural Development

Guinea-Bissau

July 29th, 2019

Mandatory template to submit Intervention Design

Setting up the project

- **Partnerships**: implementing agencies, the National Cashew Agency, MTN (telecom), Nitidae (NGO specialized in Cashew Nuts), Ministry of Finance.

- **Grant Applications**: PEP, PEDL.
  - Updated research design.
  - Updated intervention.
  - Work plan - timeline.
  - Budget.

Intervention

Co-coordinating the **planning, development and supply of the services or products to be provided** to the relevant sample: weekly voice messages to simple phones.

A new Market Information System: *n'kalô*

We partnered with the NGO Nitidæ, world-expert on cashew markets, the National Cashew Agency and the mobile operator MTN to provide a **voice-based version of the N'kalô service**.

N'kalô is a MIS providing information on agricultural markets in 13 countries.

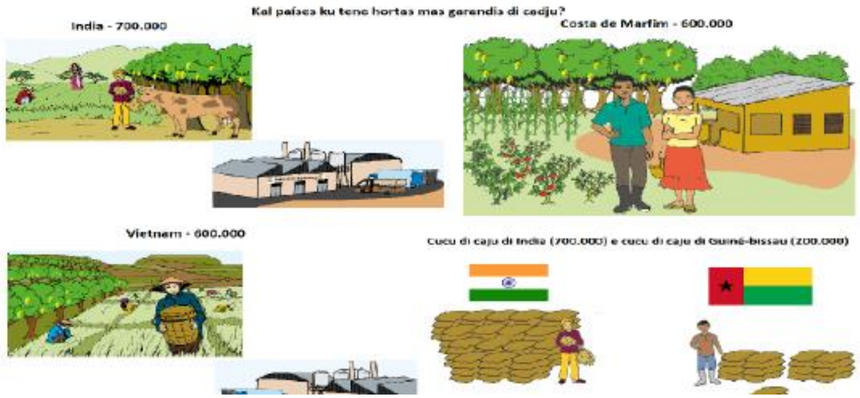
One of the **best sources of information on the cashew market worldwide**.

The weekly messages

We communicate producers one message per week, with:

- Synthesised and simplified **news about the national cashew market**.
- A **range of** the latest region-specific **farm-gate prices**.
- News about the international cashew market and **advice on whether it is a good time to sell**, based on a simple message describing the likely direction of prices.

Face-to-face training after baseline with treated producers



Message content

Example of voice message:

This is André from n'kalô to give you the last news of the cashew market. The demand for cashew is increasing all over the country as factories in India and Vietnam have re-opened. Prices at farm-gate are between 300 and 375 FCFA/kg around Biombo and Bissora, between 250 and 325 FCFA/kg in Bafata and Gabu and reach 300 to 400 FCFA/kg in Bonco close to the border with Senegal. As demand is growing prices are expected to go up, so we **advise not to sell before the price reaches 375 FCFA/kg**. N'kalô wishes you a very good week.

Evaluation

- Pre-registration

- **Pre-analysis plan**

- Ethics certificate – IRB.

7 Analysis

7.1 Treatment effects

We will estimate models of the form:

$$y_{iv} = treatment_{iv} \cdot \beta + spillover_{iv} \cdot \delta + y_{0iv} \cdot \gamma + \alpha_v + \epsilon_{iv} \quad (2)$$

where:

- i and v index individuals, and villages, respectively,
- y_{iv} denotes the outcome of interest measured in the follow-up,
- y_{0iv} denotes the outcome of interest measured in the baseline,
- $treatment_{iv}$ denotes individual-level assignment to the treatment group,
- $spillover_{iv}$ denotes individual-level assignment to the spillover group in treated villages,
- α_v denotes the randomisation triplet fixed effect (as described in section 5.1),
- ϵ_{iv} is the unobserved variation in the outcome

We will cluster standard errors at the village level.

Our coefficient of interest is β, the intent to treat (ITT) effect. The Stata code for our ITT specification (2) will be

```
reghdfe y treatment spillover y_0 , absorb(triplet_id) cluster(v_id)
```

To measure take-up of the intervention, we define a dummy variable equal to one if the respondent confirmed either reading or listening to the messages that were sent to them between April and May, denoted as $takeup_{iv}$, defined in section 6.3. To estimate the Local Average Treatment Effect (LATE), we will estimate a variant of (2), where we replace $treatment_{iv}$ with $takeup_{iv}$ instrumented by $treatment_{iv}$.

The Stata code for our LATE specification will be:

```
ivreghdfe y (takeup = treatment) spillover y_0 , absorb(triplet_id) cluster(v_id)
```

7.2 Inference and multiple-hypothesis testing adjustments

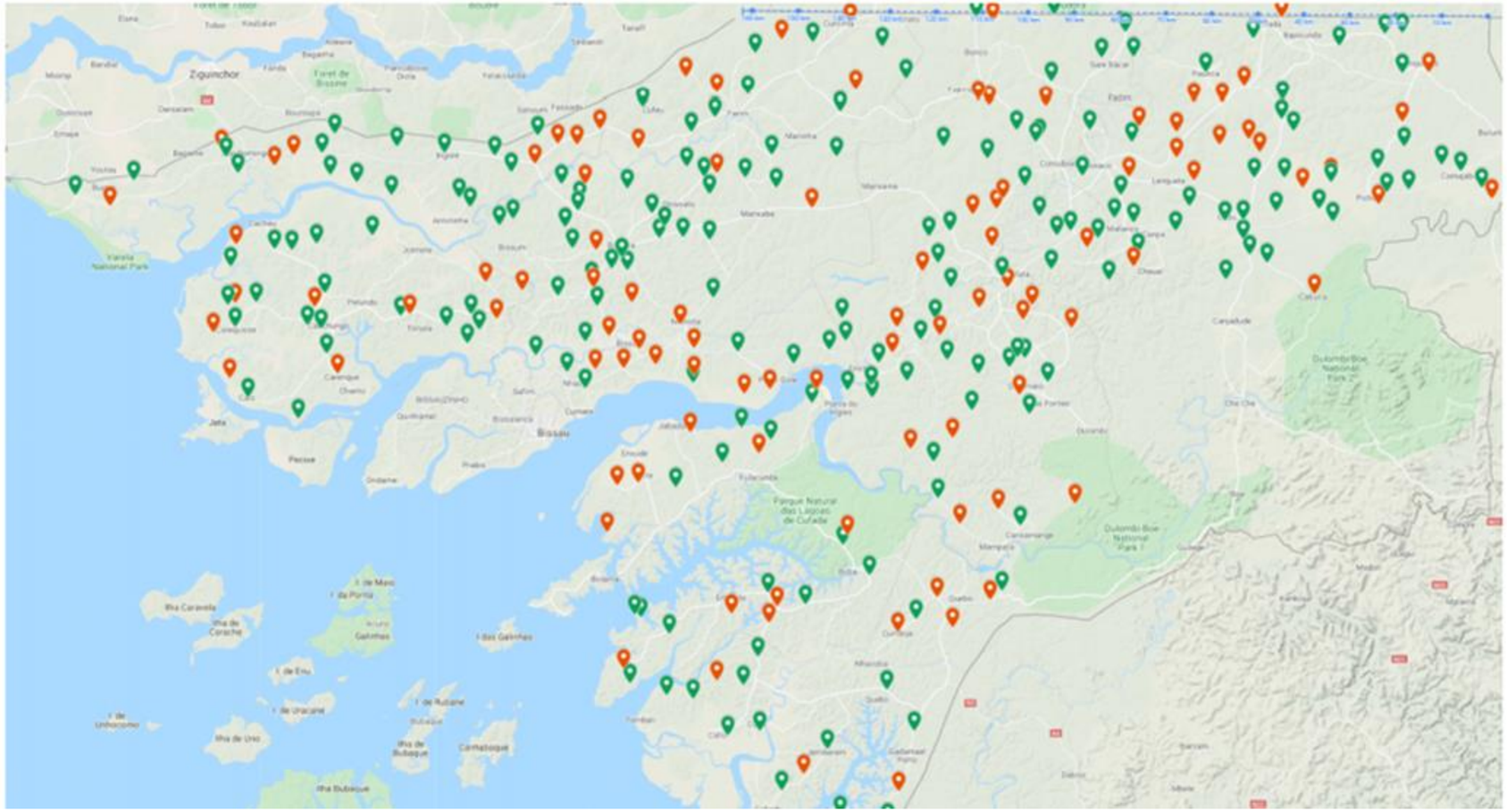
For each outcome listed in section 6, we will test the following hypothesis:

(i). $H_0 : \beta = 0$: The intervention had no effect;

(ii). $H_0 : \delta = 0$: The intervention had no spillover effect;

For each of these hypothesis tests, we will report two values:

Evaluation – the sample

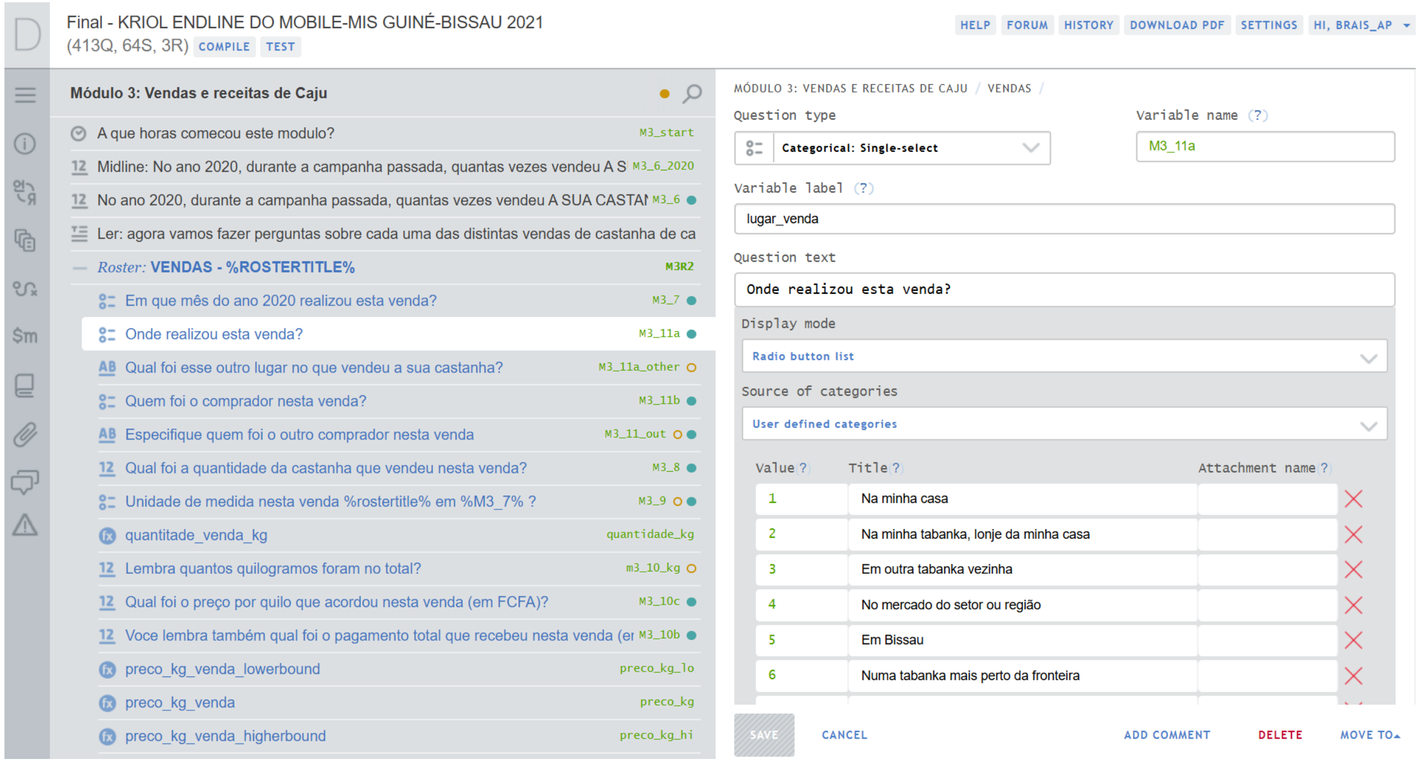


Evaluation - the survey questionnaires

Survey Solutions

SurveyCTO

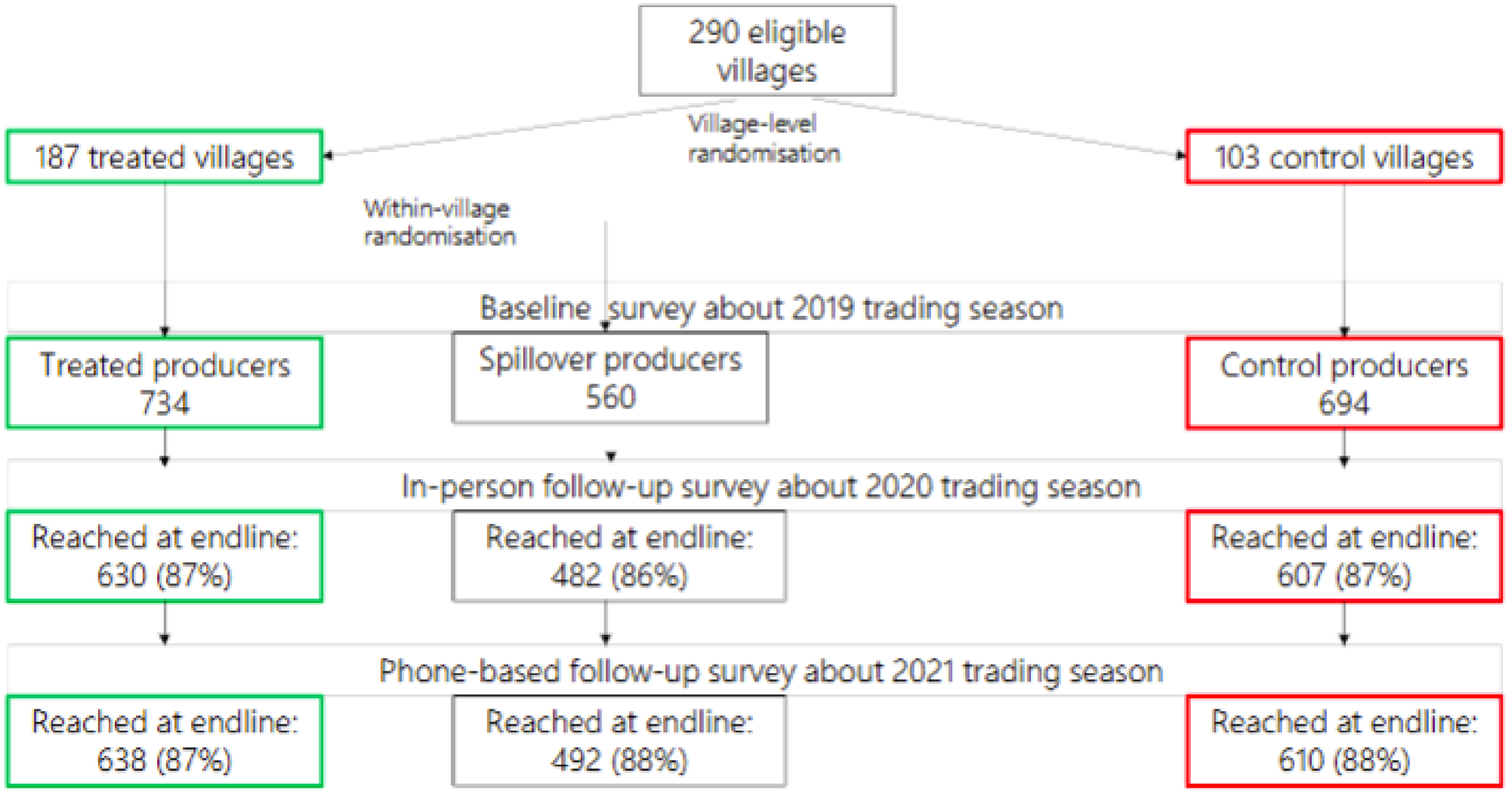
KoBoToolbox



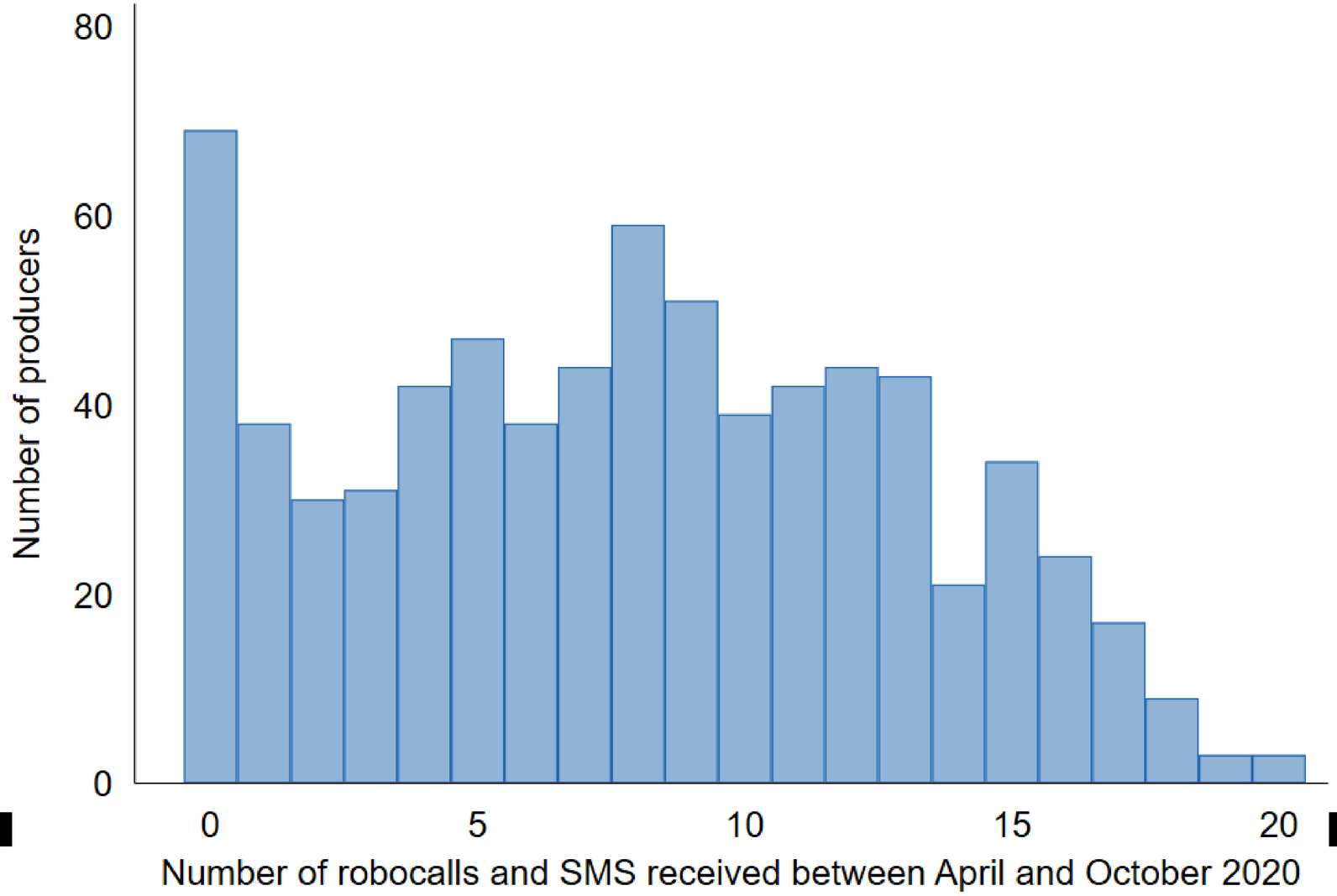
Selecting and training **field teams** – coordinators and enumerators

Piloting the intervention and the survey

Study design and sample

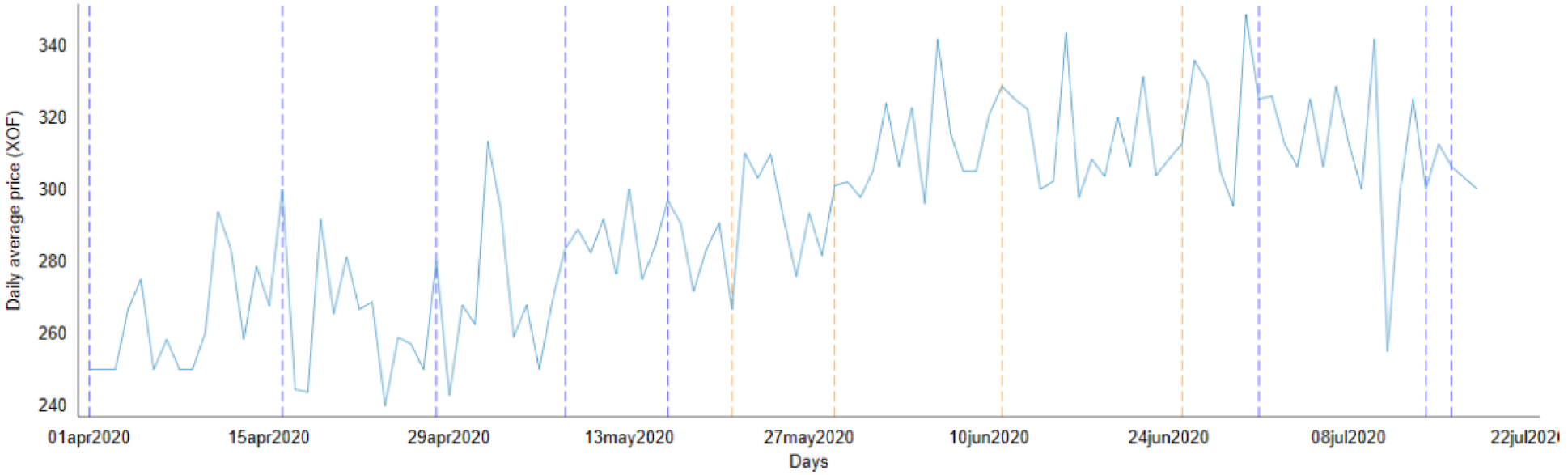


Rolling out and monitoring the intervention



728 treated producers

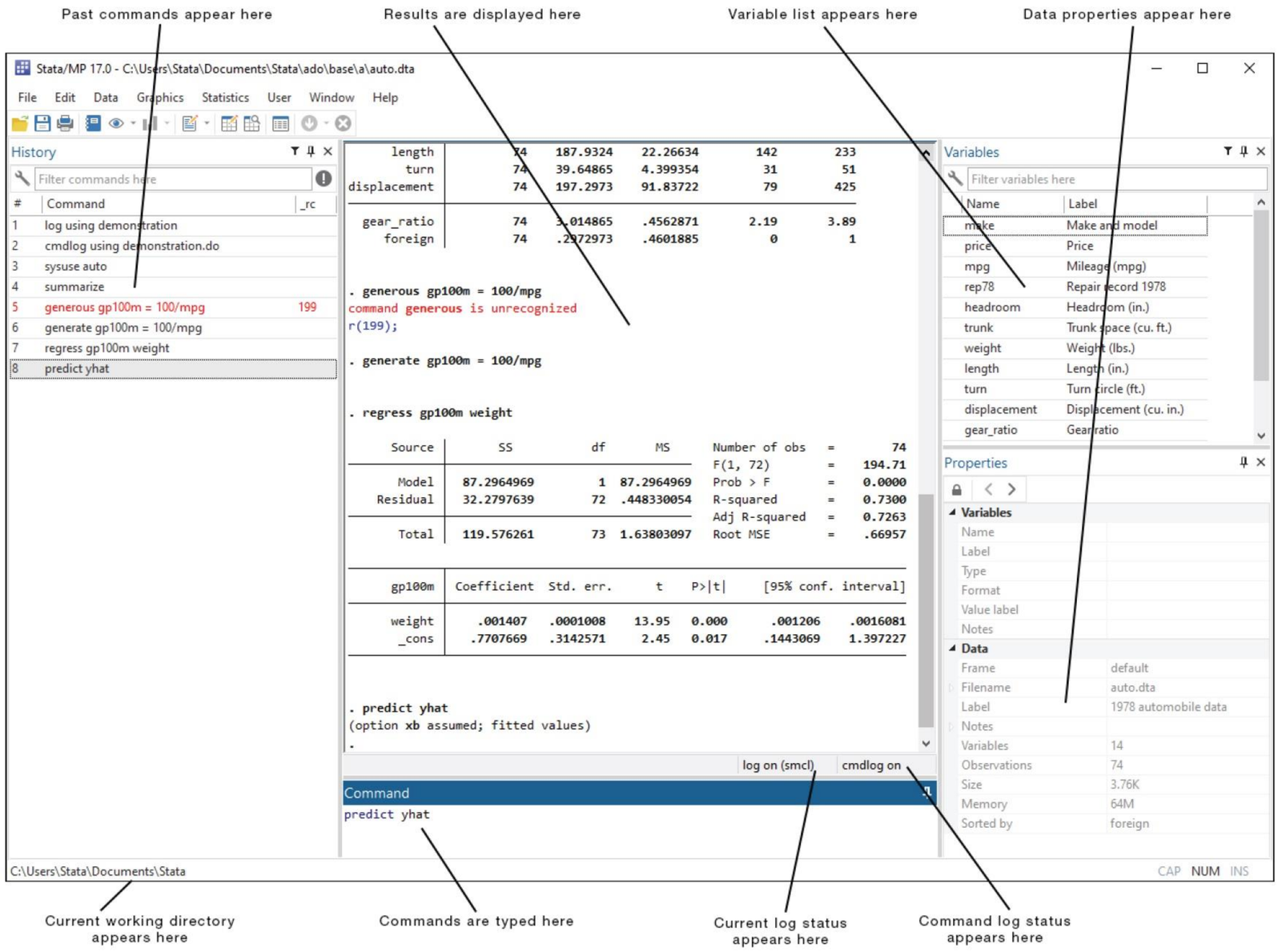
How reliable were the messages?



Bearish message, advising to wait before selling

Bullish message, advising to sell

Data cleaning and analysis



Do-file Editor - myd2.do

File Edit View Language Project Tools

Untitled

```
program weib2
        version 18
        args todo b nf g H
        tempvar t1 t2
        mleval `t1' = `b', eq(1)
        mleval `t1' = `b', eq(2)
        local t "$ML_y1"
        local d "$ML_yd"
        tempvar p M R
        quietly {
                generate double `p' = exp(`t2')
                generate double `M' = (`t'*exp(-`t1'))^`p'
                generate double `R' = ln(`t')-`t1'
        }
        mlsum `lnf' = -`M' + `d'*(`t2'-`t1' + (`p'-1)*`R')
        if (`todo'==0 | `lnf'>=.) {
                // the previous if needs to be code folded closed
        }
        tempname d1 d2
        mlvecsum `lnf' `d1' = `p'*(`M'-`d'), eq(1)
        mlvecsum `lnf' `d2' = `d' - `R'*`p'*(`M'-`d'), eq(2)
        matrix `g' = (`d1',`d2')
        if (`todo'==1 | `lnf'>=.) {
                // the previous if needs to be code folded closed
        }
        tempname d11 d12 d22
        mlmatsum `lnf' `d11' = -`p'^2 * `M', eq(1)
        mlmatsum `lnf' `d12' = `p'*(`M'-`d' + `R'*`p'*`M'), eq(1,2)
        mlmatsum `lnf' `d22' = -`p'*`R'*(`R'*`p'*`M' + `M' - `d'), eq(2)
        matrix `H' = (`d11',`d12' \ `d12',`d22')
end
```

m weib2

Line: 2, Col: 1 CAP NUM OVR

Estimation

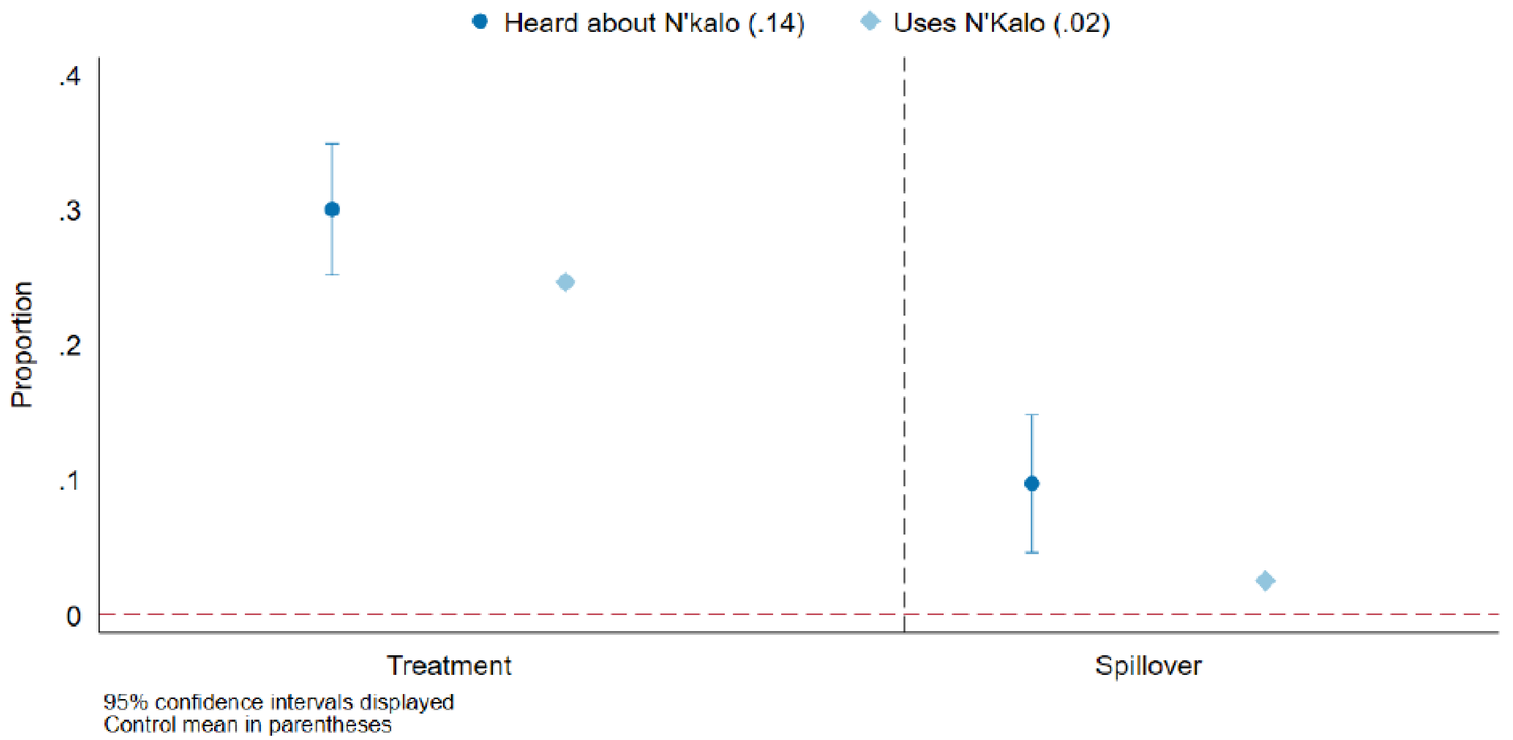
$$y_{iv} = treatment_{iv} \cdot \beta + spillover_{iv} \cdot \delta + y_{oiv} \cdot \gamma + \alpha_v + \epsilon_{iv} \quad (1)$$

- i and v index individuals, and villages, respectively,
- y_{iv} denotes the outcome of interest measured in the follow-up,
- y_{oiv} denotes the outcome of interest measured in the baseline,
- $treatment_{iv}$ denotes individual-level assignment to the treatment group,
- $spillover_{iv}$ denotes individual-level assignment to the spillover group in treated villages,
- α_v denotes the randomisation triplet fixed effect,
- ϵ_{iv} is the unobserved variation in the outcome. Errors are clustered at the village-level, the unit of the first randomisation.

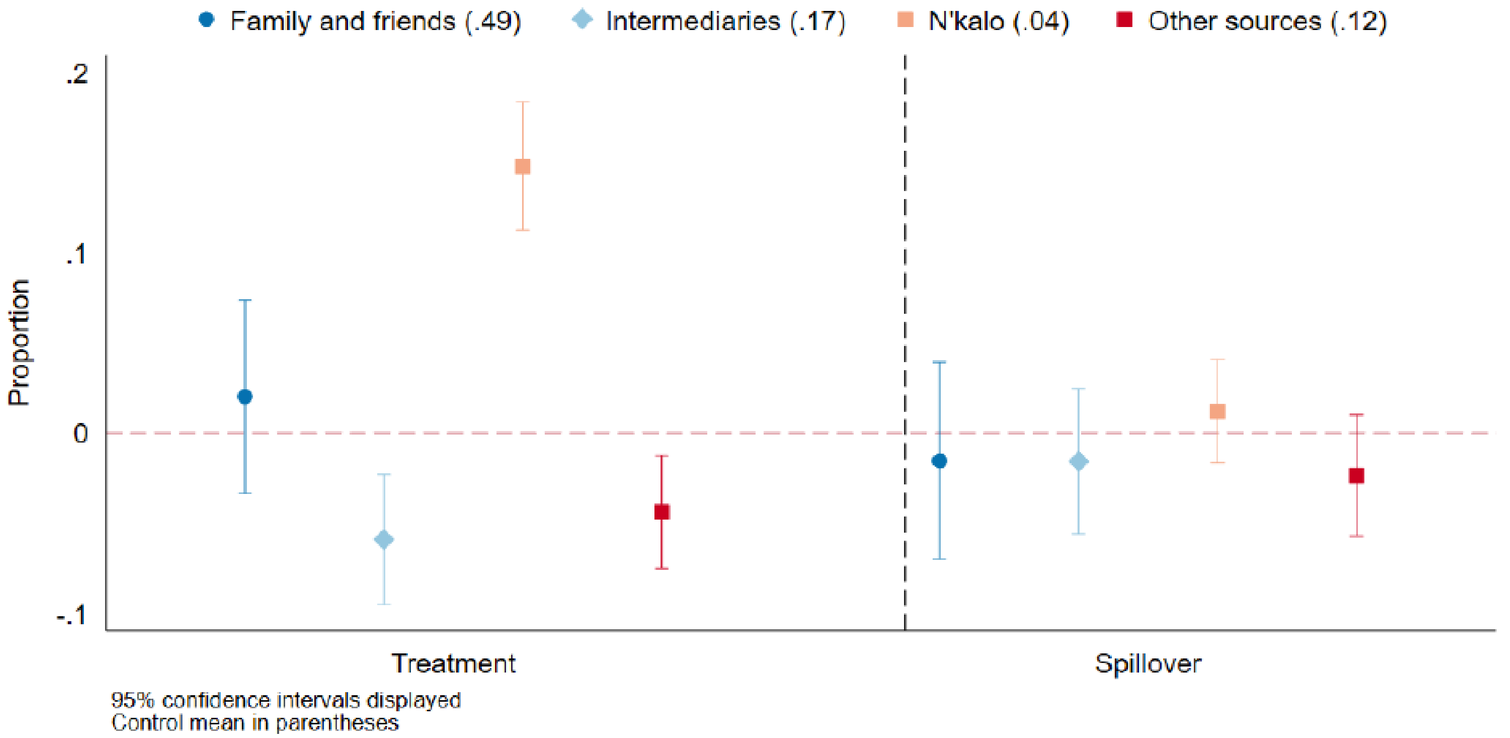
https://www.socialscienceregistry.org/trials/4740

Results – preliminary (not published yet)

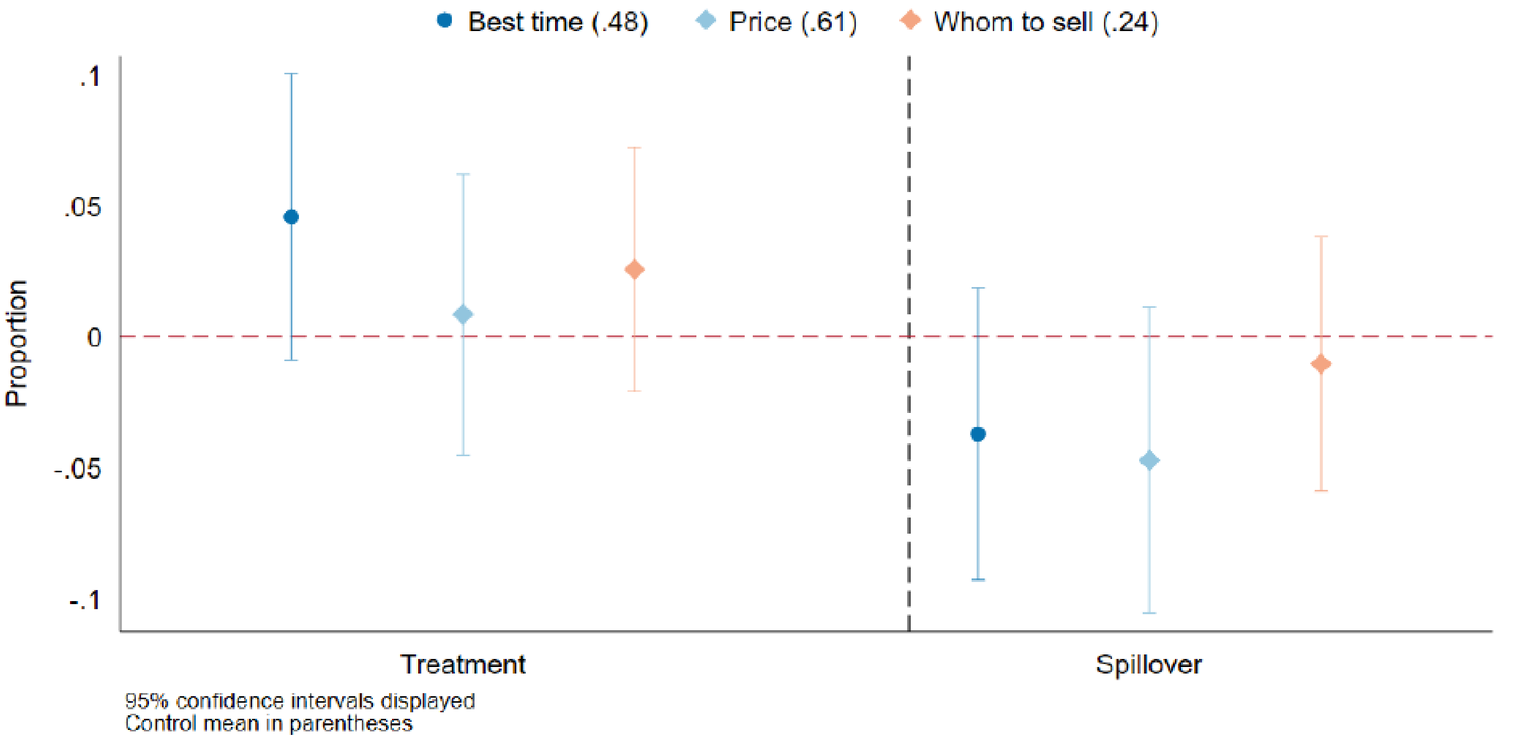
Treated producers engage more with the service



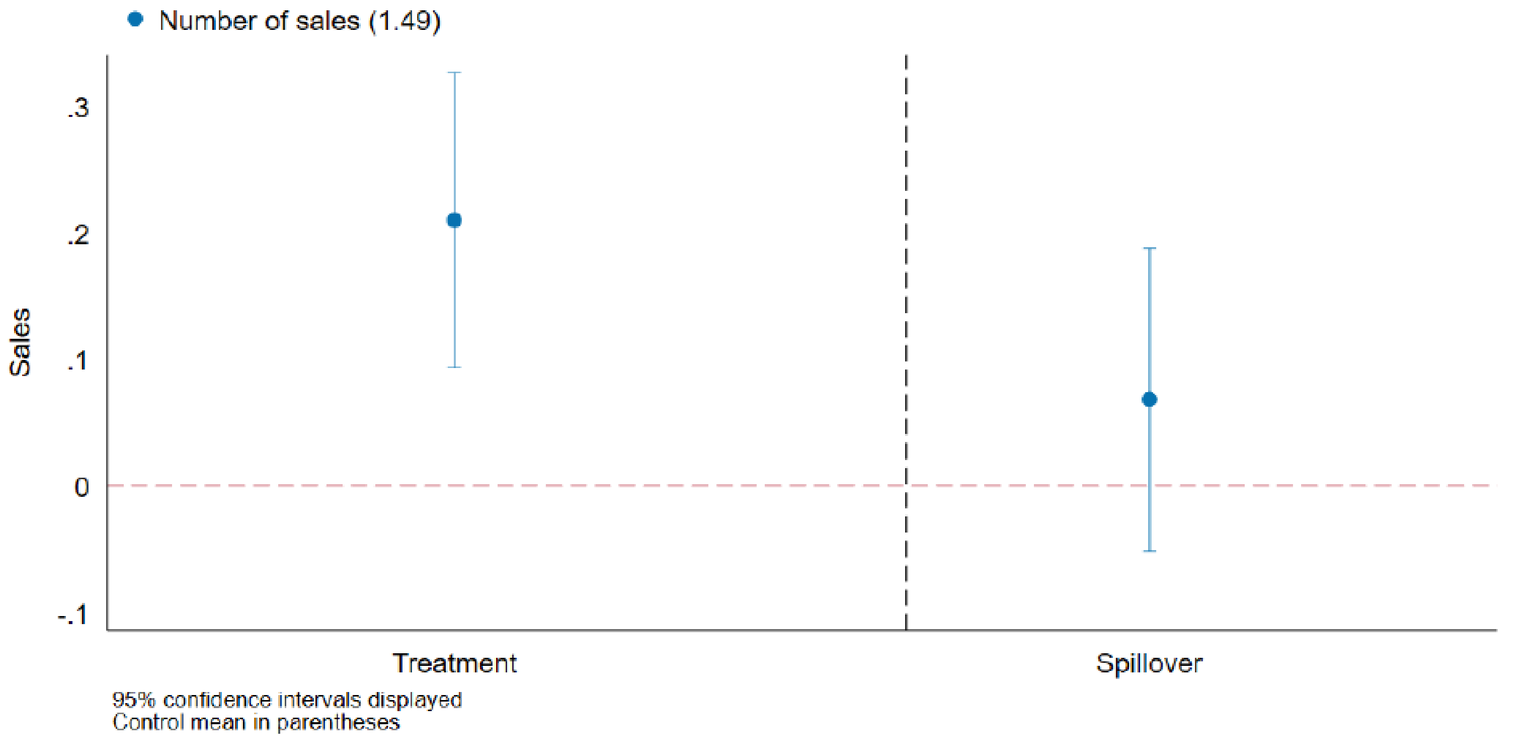
Treated producers follow less the advice of intermediaries or other agents



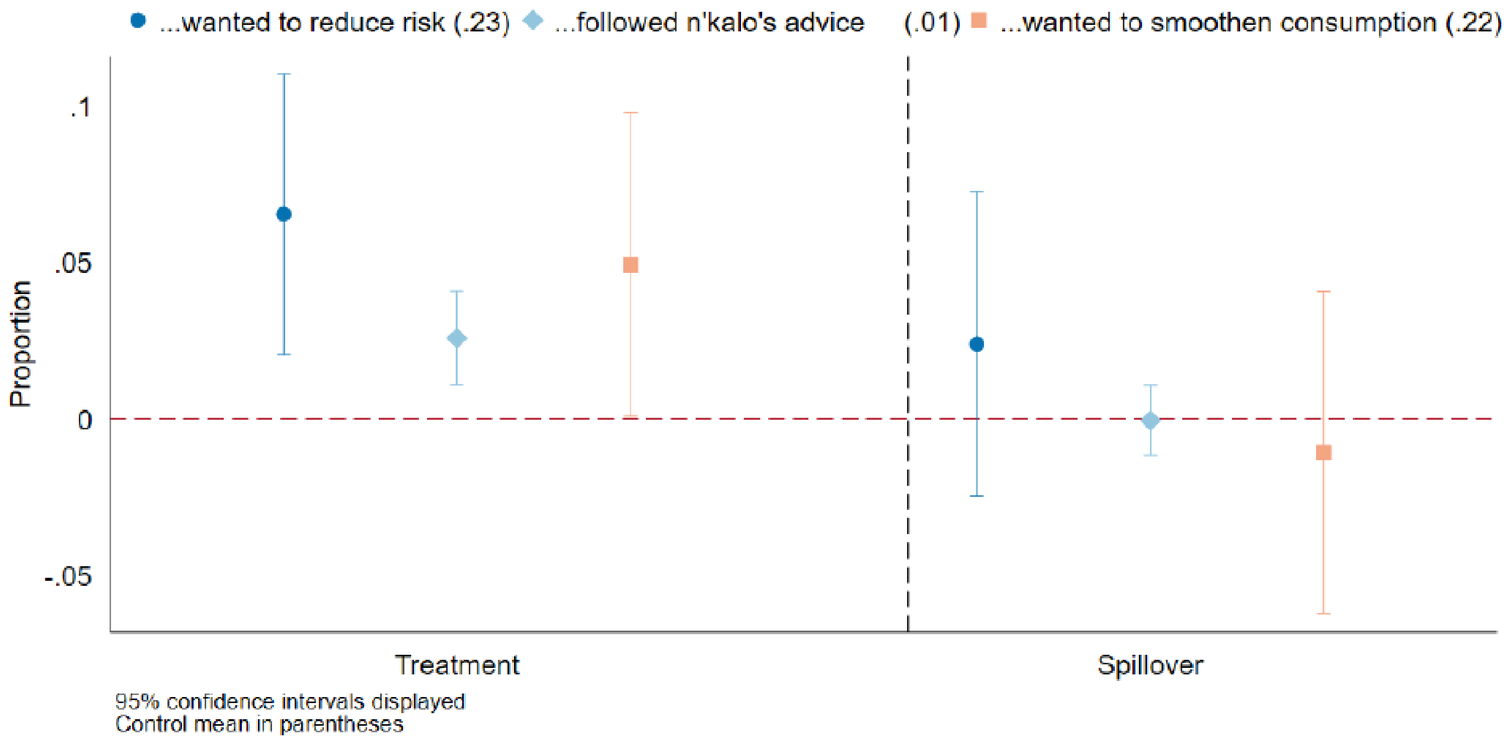
Treated producers seek advice on the best time to sell



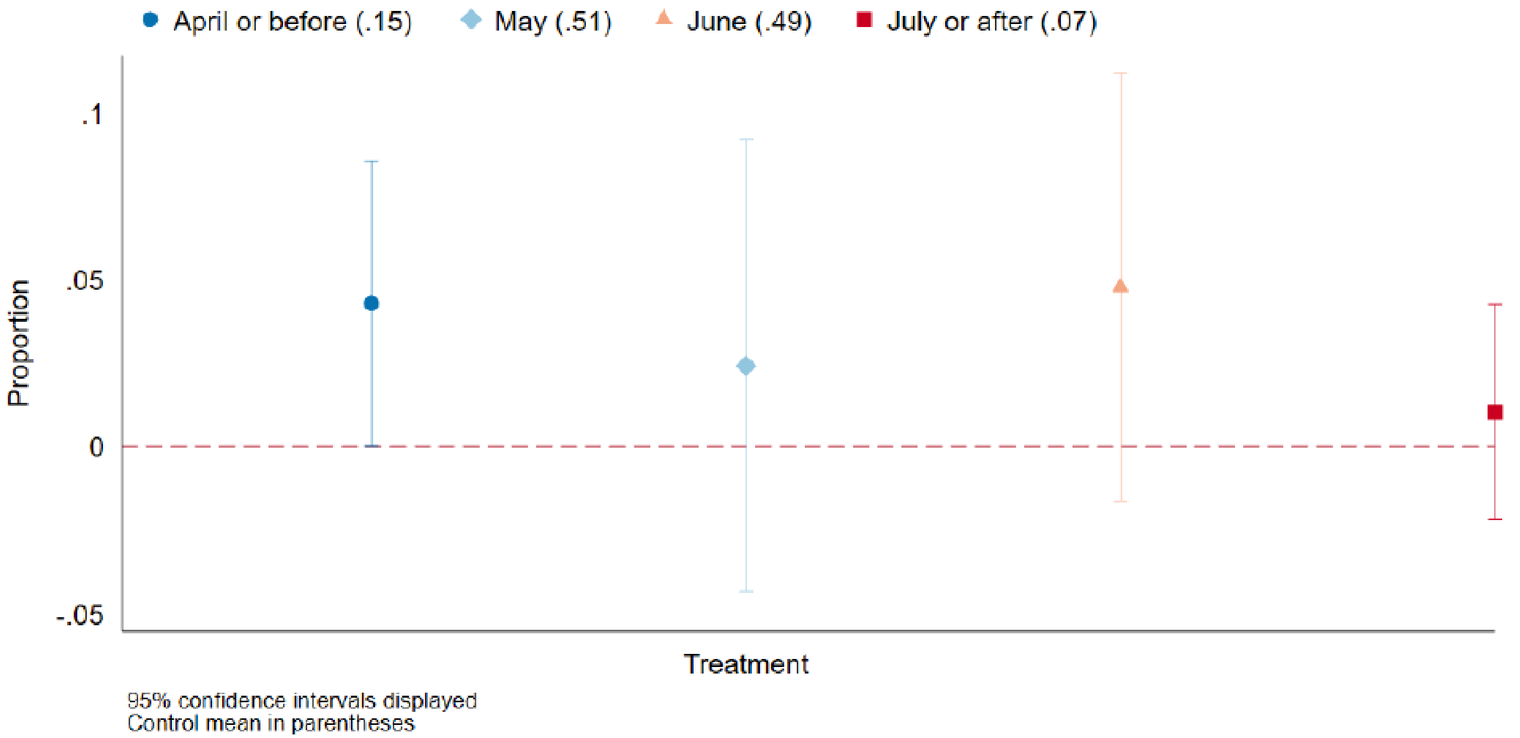
Treated producers sell more frequently



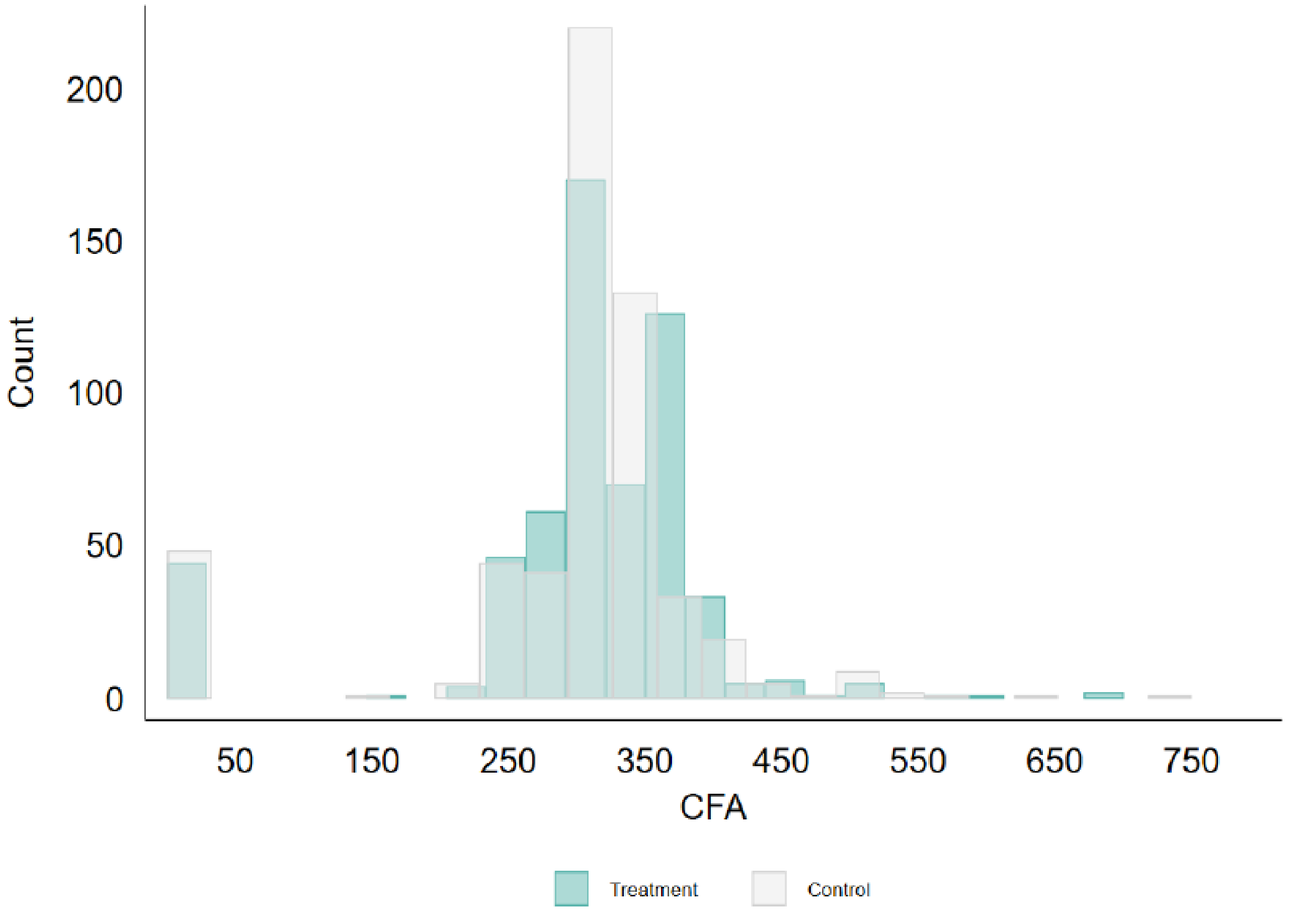
Producers sold more than once because they...



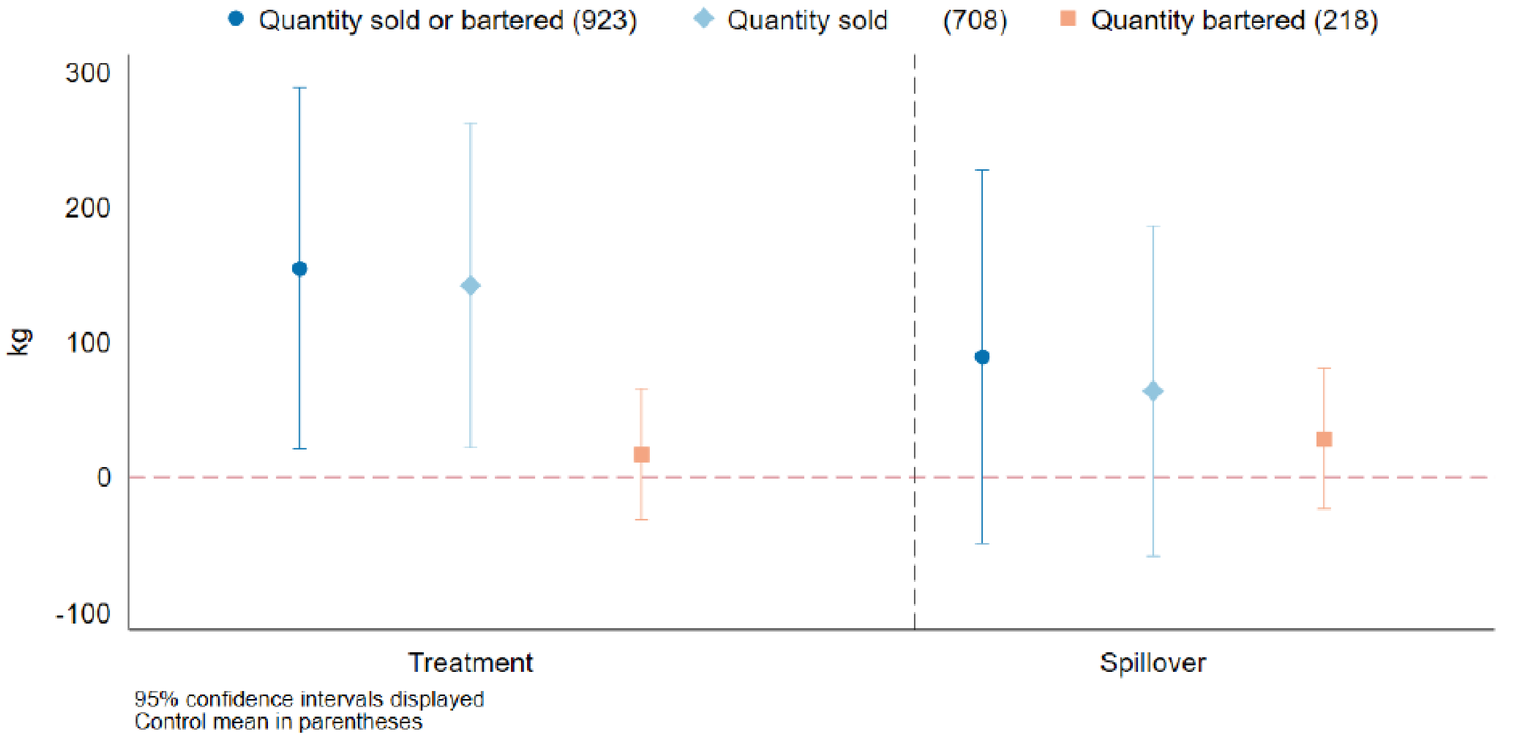
Treated producers start selling earlier



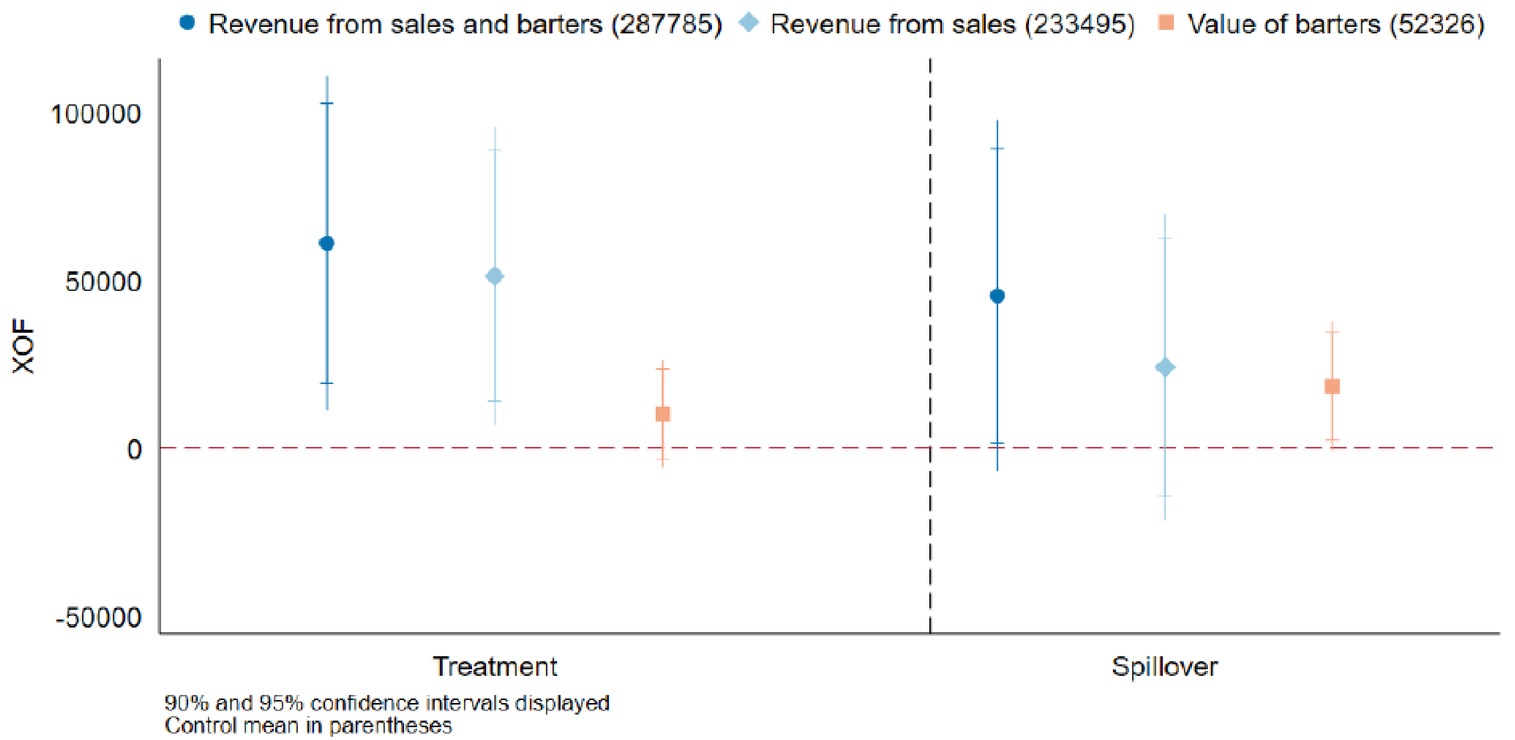
However, prices are not significantly higher for treated producers



But by selling more...

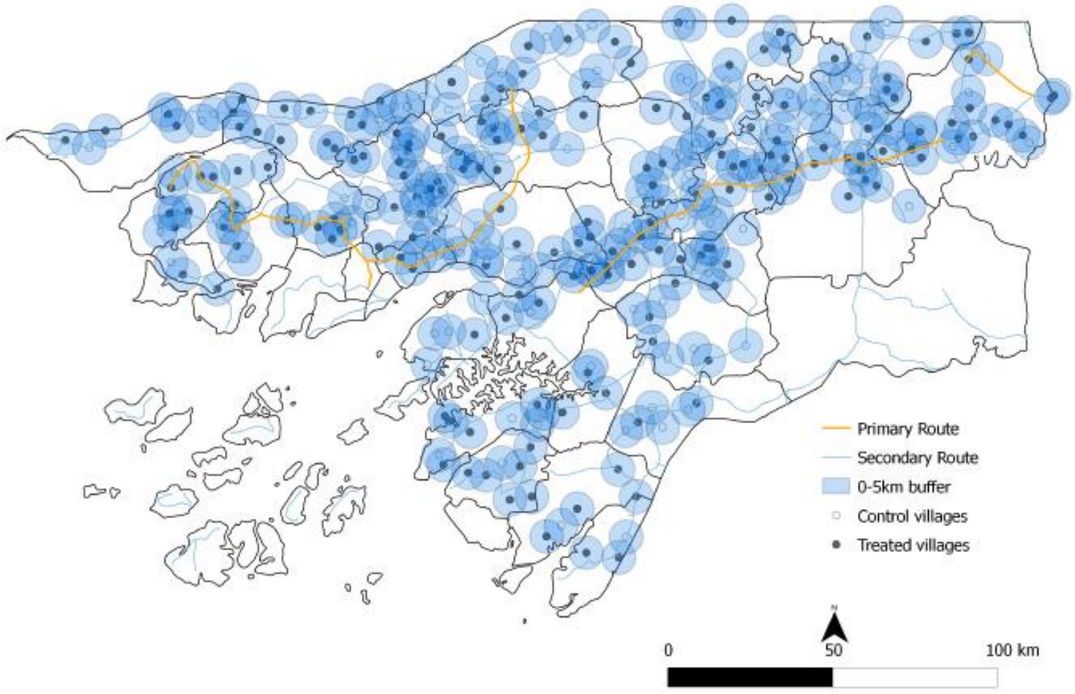


..treated producers make more revenue (+21%)



Identifying spillovers across villages

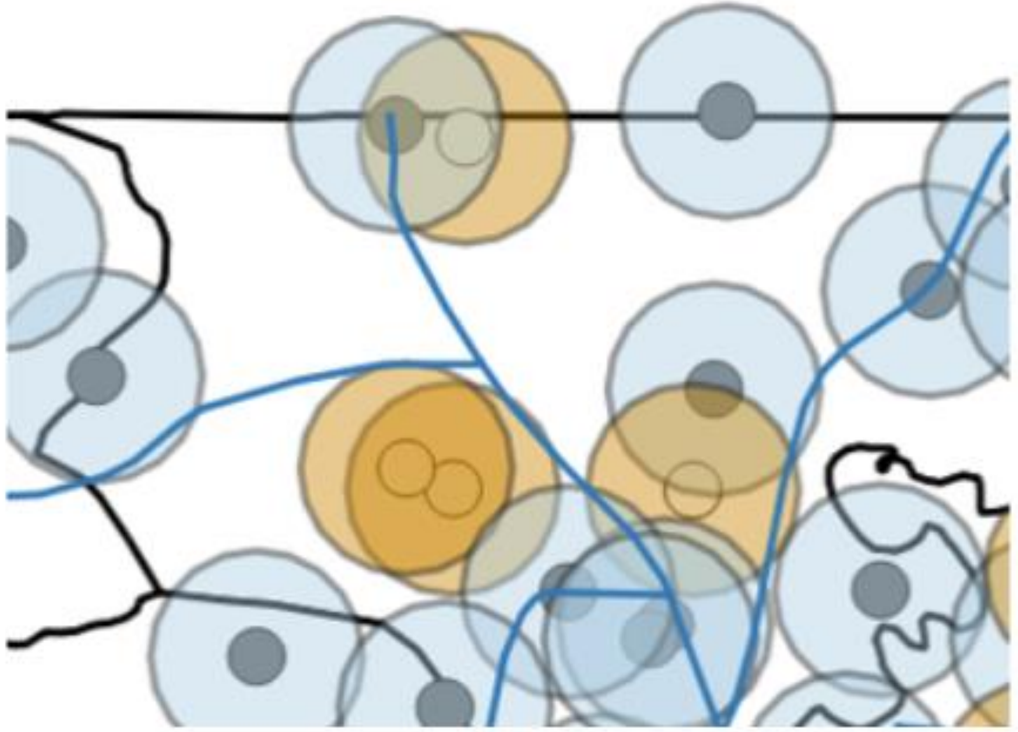
We identify between-village spillovers in the style of Miguel and Kremer (2004) and Egger et al. (forthcoming).



Quasi-random exposure to exogenous treatment

Details

Control village (orange) center-left has no treated villages (blue) within 5km.



Between-village spillovers: prices and quantity sold

	(1) Price	(2) Price	(3) Quantity sold	(4) Quantity sold
Treatment	2.16	7.09*	140.62**	94.17
	(3.37)	(4.08)	(61.25)	(69.35)
Spillover	2.49	6.92*	62.28	51.32
	(3.27)	(4.01)	(61.29)	(75.81)
Treated producers within 0-5km	**2.03***	**3.96*****	-4.21	-17.45
	(1.20)	(1.41)	(16.17)	(27.88)
Villages within 0-5km	-6.22	-6.11	25.32	24.86
	(4.72)	(4.62)	(55.92)	(55.50)
Treatment*Treated producers within 0-5km		-2.90**		27.39
		(1.36)		(28.32)
Spillover*Treated producers within 0-5km		-2.59*		6.93
		(1.42)		(29.63)
# Obs.	1587	1587	1622	1622
P-value: Treat = Spillover	.918	.966	.143	.534
P-value (Interaction): Treat = Spillover		.742		.41
Control group mean	295.71	295.71	708.21	708.21
Control group st. dev.	104.26	104.26	855.14	855.14

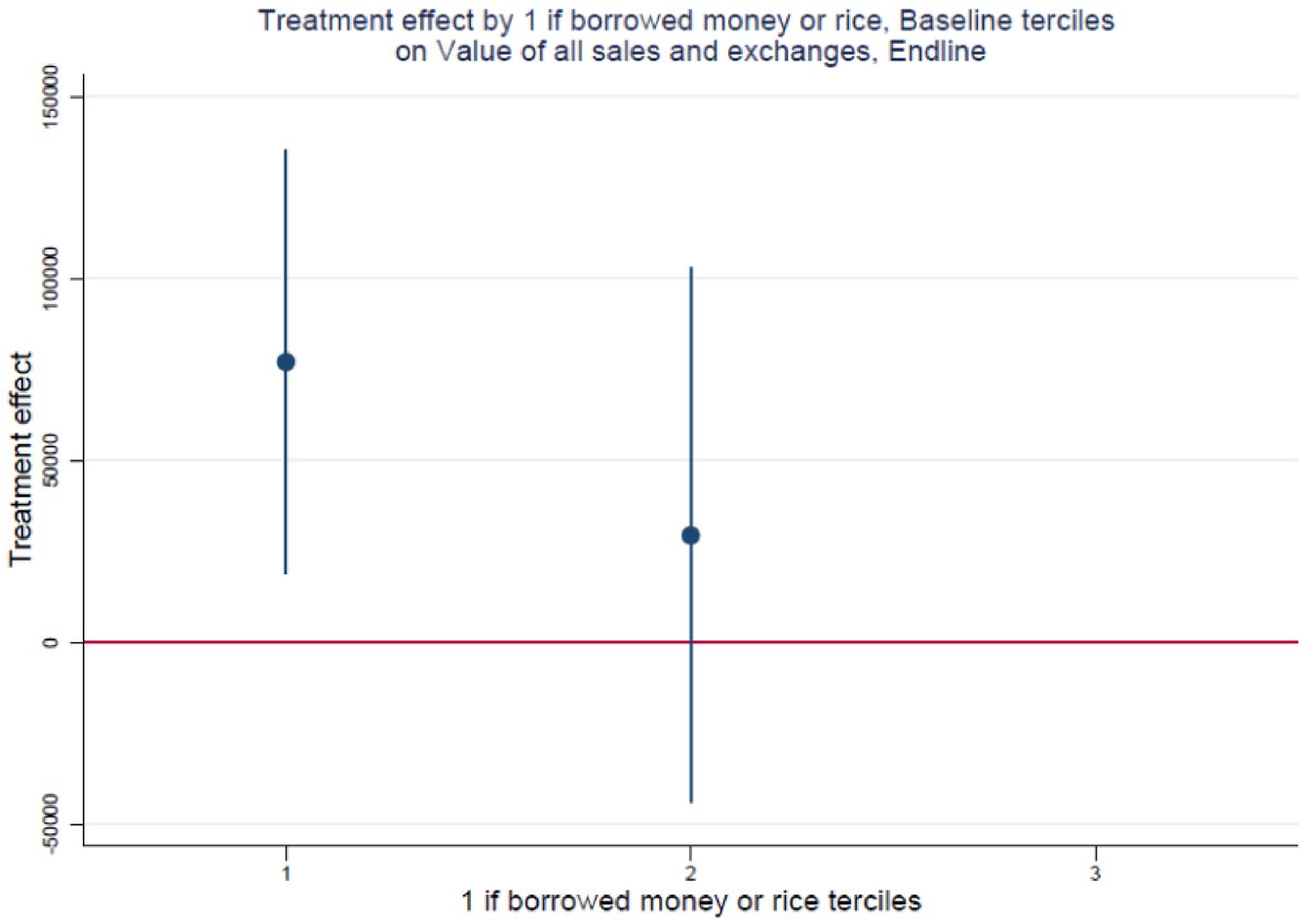
Notes: OLS estimates of between-village effects, controlling for exogenous spatial treatment intensity. Each column represents a separate regression. The first three rows represent coefficients on household-level indicators for treatment assignment. The fourth row reports estimates of the effect of every additional treated producer within a radius of 0-5km of the observation. The radius of 0-5km was selected after running a series of nested models as in Egger et al. (forthcoming), selecting the model that minimised the Bayesian Information Criterion across all models. Outcome variables are listed across columns. The unit of observation is the producer. Regressions control for randomisation tripled fixed effects and baseline value of the outcomes. Conley (1999) standard errors are in parentheses, accounting for spatial correlation within a 5km radius. Stars on the coefficient estimates reflect unadjusted *p*-values. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level. Bottom rows displays the mean, standard deviation for the control group, and total number of observations.

Heterogeneous effects and total revenue

The impact of the service on **total revenue** (and quantity sold) is large and significant for those producers who:

- Live close to a regional capital, or to a main road.
- Have no storage limitations.
- Had not borrowed money or rice before the cashew season.

Increase in total revenue without credit frictions



Summary of results

Producers that are given access to market information change the timing and frequency of sales, as they sell when they prefer to, potentially smoothing consumption and the risk of price volatility.

No direct effect on average farmgate prices.

- We identify **between-villages spillovers** across-villages, which show that the service **increased average prices**.

Treated producers sold a larger amount and obtained a **higher revenue**.

- The service resulted in a **clear increase in** quantity sold and **total revenue for those less-constrained producers**.

Scaling-up and resulting policy

- During the 2021 season the service was made available to everyone in the country for about 0.3 euros per month, while the treated group continued to have access to it for free.
- The average increase in revenue for treated producers in 2021 was even larger.
- The service was operational over four cashew seasons, reaching a peak of 3.000 subscribers – without any marketing.
- A follow-up project was financed by PEP, consisting of:

  - An improve version of the service, with a team of market analysts based in the country, talking weekly on the phone to an information agent per village, who worked as an intermediary between the analysts and the community.

  - An initiative to institutionalize impact evaluation within the government, setting up a unit and a team dedicated to evaluating projects

Thanks for your attention and contributions!