# Credit and Risk: What Have We Learnt from ATAI

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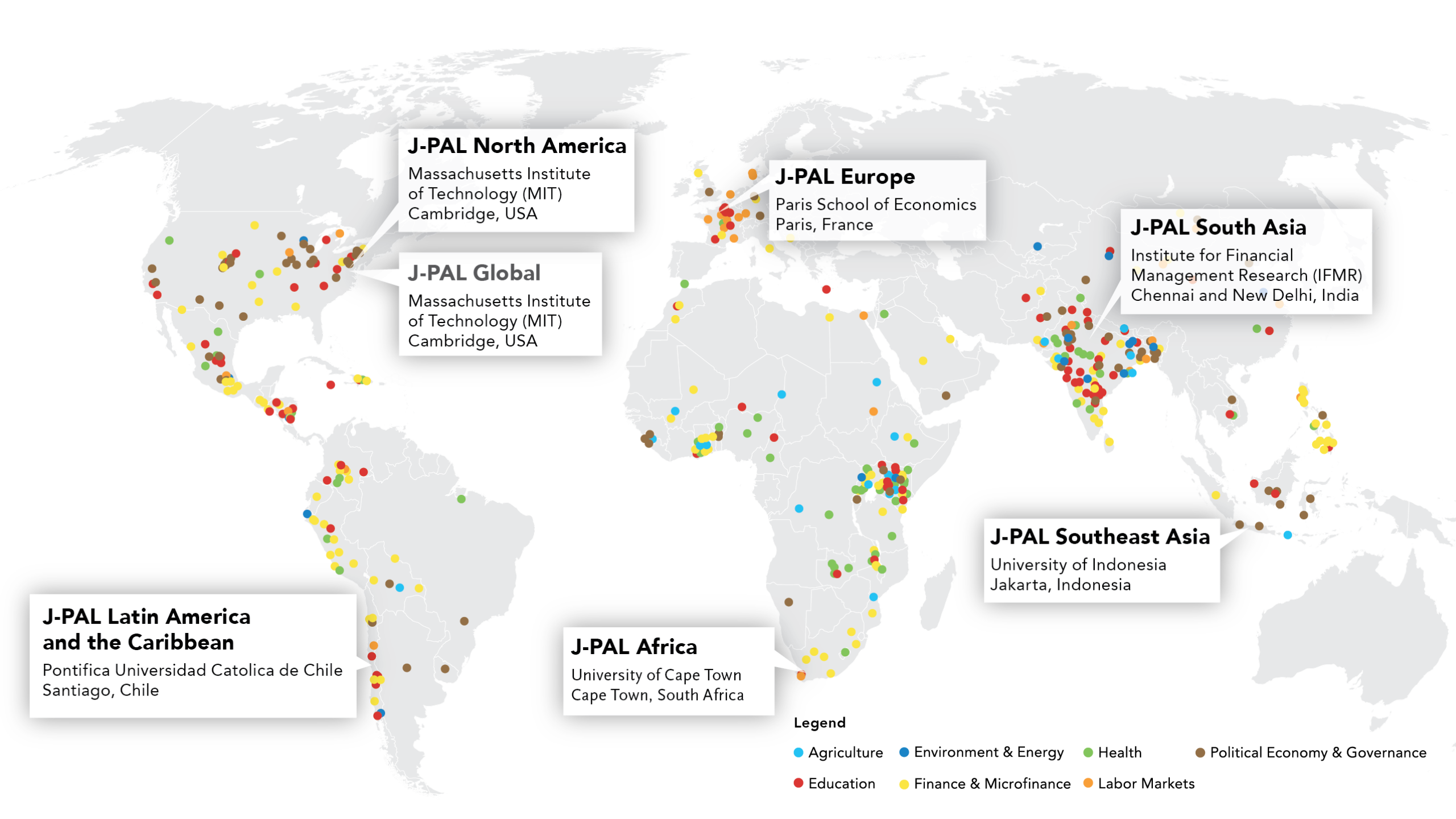
J-PAL | 19 January 2016

# Overview

- **About J-PAL and ATAI**
- Lessons from research on credit
- Lessons from research on risk
- Conclusion


J-PAL North America
Massachusetts Institute of Technology (MIT)
Cambridge, USA
J-PAL Global
Massachusetts Institute of Technology (MIT)
Cambridge, USA
J-PAL Europe
Paris School of Economics
Paris, France
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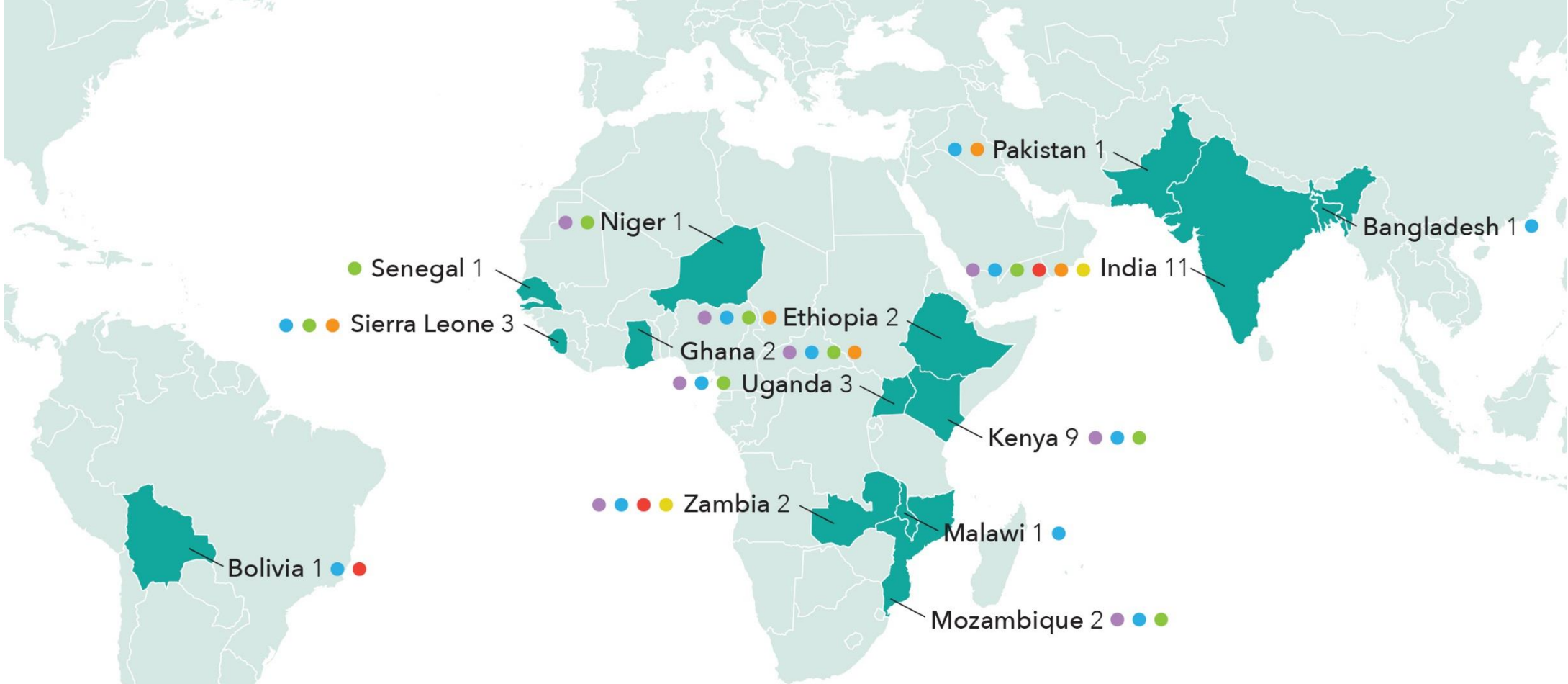
Environment & Energy
Health
Political Economy & Governance
Education
Finance & Microfinance
Labor Markets

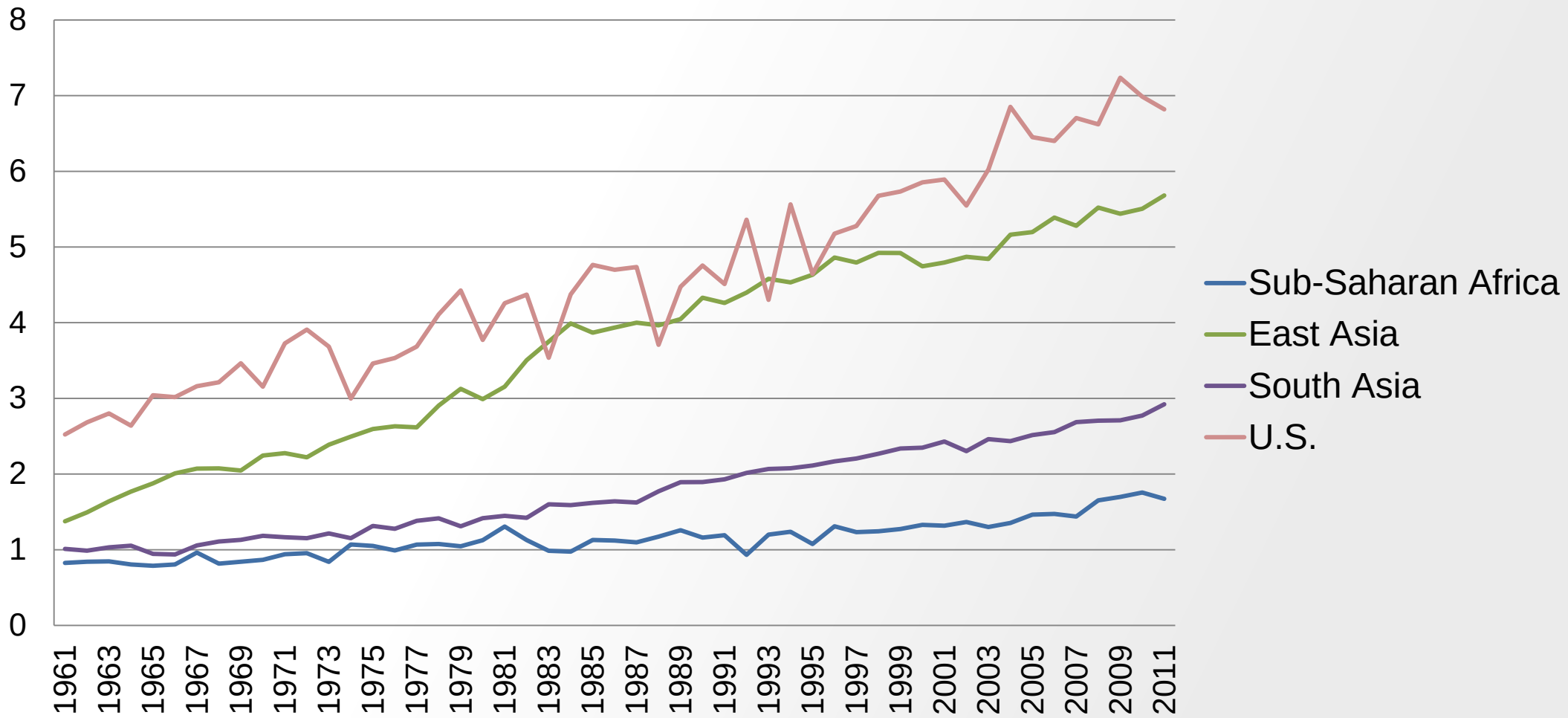



# ATAI Projects

Total: 40

- Credit market constraints 16
- Information inefficiencies 26
- Input & Output Inefficiencies 16
- Externalities 4
- Risk market inefficiencies 9
- Labor inefficiencies 4
- Land inefficiencies 0

# Cereal yields (metric tons/hectare)

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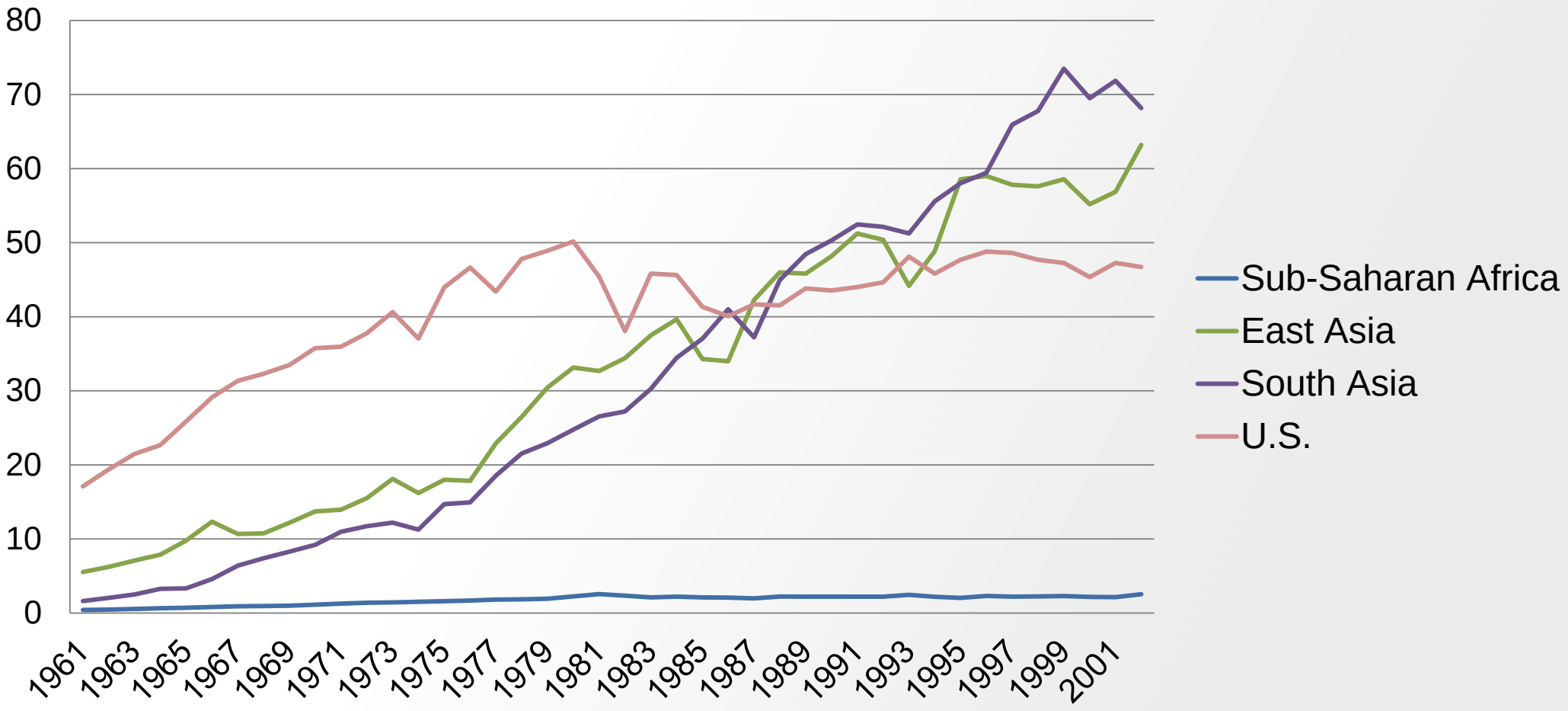
# Fertilizer use (metric tons/hectare)

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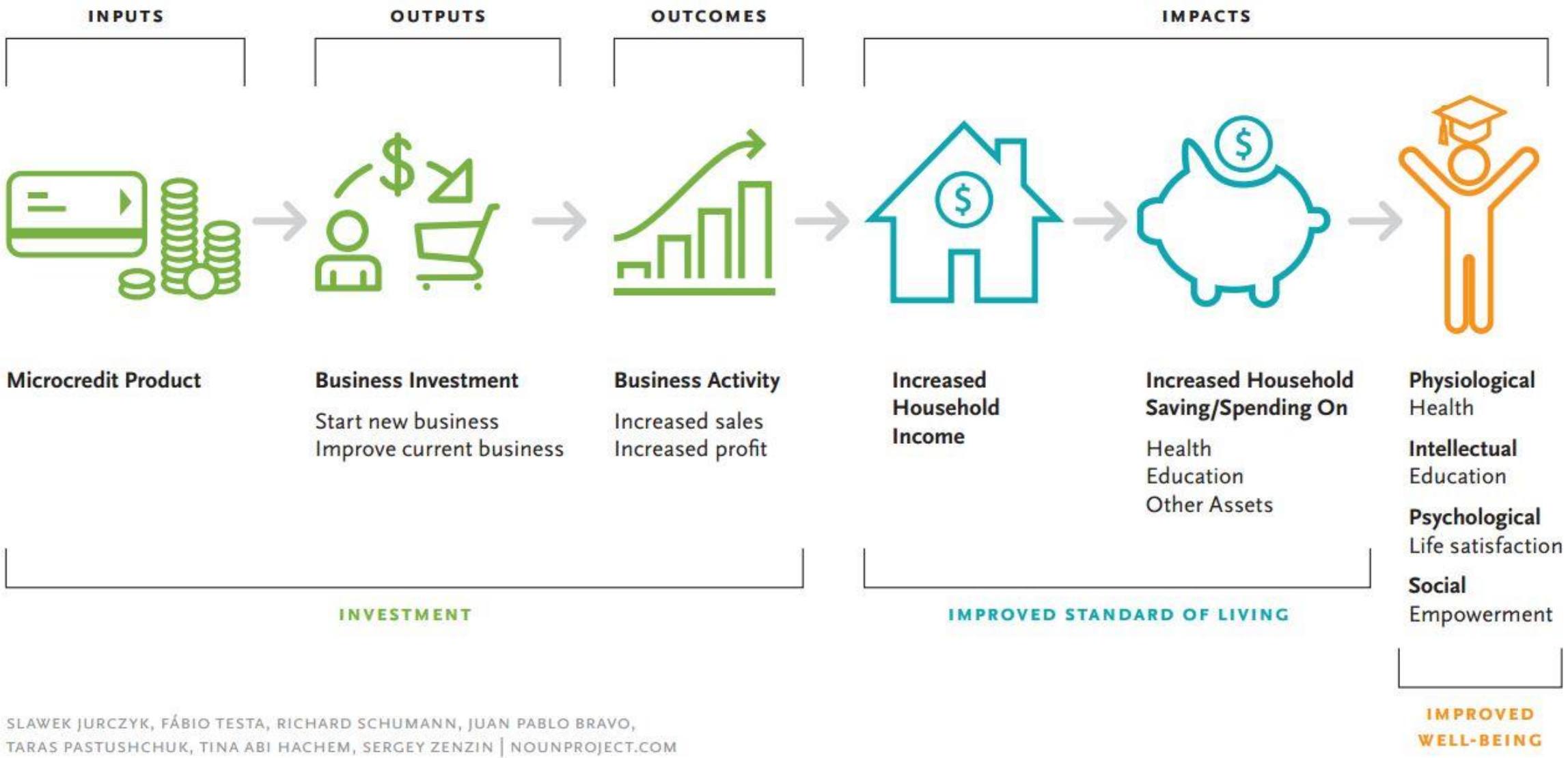
# Inefficiencies constraining technology adoption

1. **Credit markets**
2. **Risk markets**
3. Information
4. Externalities
5. Input and output markets
6. Labor markets
7. Land markets

# The Role of Credit in Agricultural technology Adoption

# Key findings on microcredit

- From 7 RCTs, researchers found
  - Low demand
  - Increase businesses activity for those who had a business
  - No impact on income, social well-being




SLAWEK JURCZYK, FÁBIO TESTA, RICHARD SCHUMANN, JUAN PABLO BRAVO, TARAS PASTUSHCHUK, TINA ABI HACHEM, SERGEY ZENZIN | NOUNPROJECT.COM

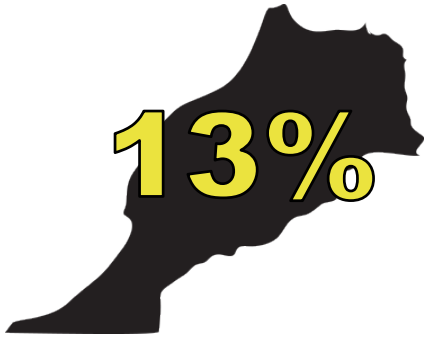
# African credit markets: highly segmented

- MF loans often structured explicitly to prevent use for planting
- Struggled to provide durable commercial sources of input financing
- Yet credit may be critical:
  - ~80% of the population of SSA are farmers
  - Poverty, food insecurity concentrated in agriculture
  - Few viable export markets for manufactured goods
  - Potentially a core barrier to the technology adoption needed to bring the Green Revolution to Africa (Otsuka and Larson 2013)

# Hard to push financing to agriculture

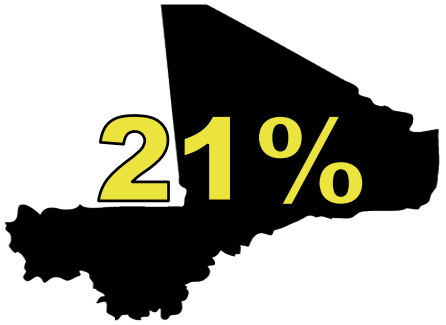
- Lenders dislike agricultural loans because
  - Risks are high due to correlated weather shocks
  - Costs of servicing clients are high, particularly for smallholders
  - Smallholder farmers have no credit histories; land tricky as collateral
- Borrowers appear to have low demand for ag loans
  - Profits in farming may be low absent complementary investments
  - Risks of unavoidable default are high (weather, prices)

# Take-up is low




Morocco: 13%, with no other lenders in the area

Sierra Leone: 25%, 50% lower than bank needed to break even


Mali: 21%, compared to full take-up of cash grants

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Beaman et al. 2014; Casaburi et al 2014; Crepon et al 2015;

# What is special about smallholder credit?

- Must think about risk aversion of borrowers
  - Loss averse
  - Deep fear of losing collateral even if available (Boucher et al 2008)
  - Behavioral issues in consumption, timing, use of credit (Duflo et al 2009)
- Credit is not the only failing market!
  - Returns to investment may simply be lower than interest rate
  - Little evidence that credit to invest in 'business as usual' in ag increases profits (Maitra et al. 2014)
  - Borrowing to invest in new technology almost always increases *income* risk even if technology is risk-reducing

# So how can we make credit work?

- **Flexible collateral** arrangements
- Improved **information** about borrowers
- Account for **seasonal distribution** of farmer income

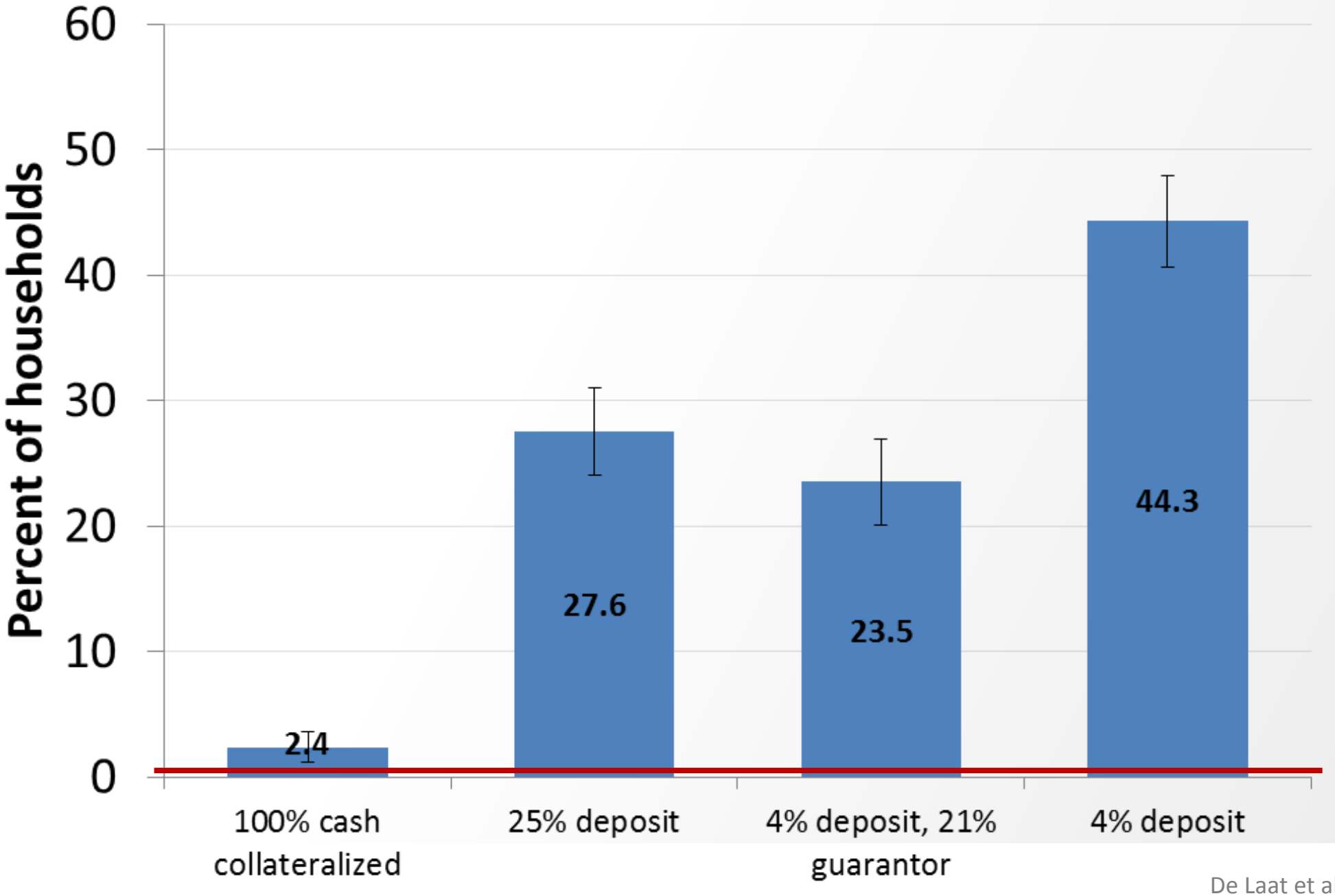
# 1. Flexible collateral

- Land may be an unacceptable form of collateral
  - Banks: titles unclear, seizure under default costly & difficult
  - Farmers: 'risk rationing' may prohibit farmers from being willing even if expected profits positive
- However, many large agriculture investments can be self-collateralizing (leasing)
- Important role for Asset Registries that support leasing
- 'Inventory as collateral'; crops can be used to collateralize harvest-time loans (Pender 2008, Basu and Wong 2012; Burke 2014; Casaburi et al. 2014); Warehouse Receipts

# Rainwater harvesting tanks in Kenya

- Variation in loan offers
  - Standard: 100% secured
  - 25% deposit, tank as collateral
  - 4% deposit, 21% pledge from guarantor, tank as collateral
  - 4% deposit, tank as collateral

De Laat et al. forthcoming




One default in all groups

De Laat et al. forthcoming

# Rainwater harvesting tanks in Kenya

- Changes in time use
  - Girls spent less time fetching water
  - Boys spent less time tending livestock
  - Girls' **school enrollment** increased by 4% from base of 95%
- Testing concept in Rwanda

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De Laat et al. forthcoming

# 2. Improving information

- Credit bureaus are the transformative institution when lender info is poor, competition high (McIntosh & Wydick 2006)
- Functioning credit bureaus allow borrowers to substitute ‘reputational collateral’ for physical collateral (de Janvry et al. 2010)
- Alternate technologies such as fingerprinting borrowers (Gine et al. 2011)

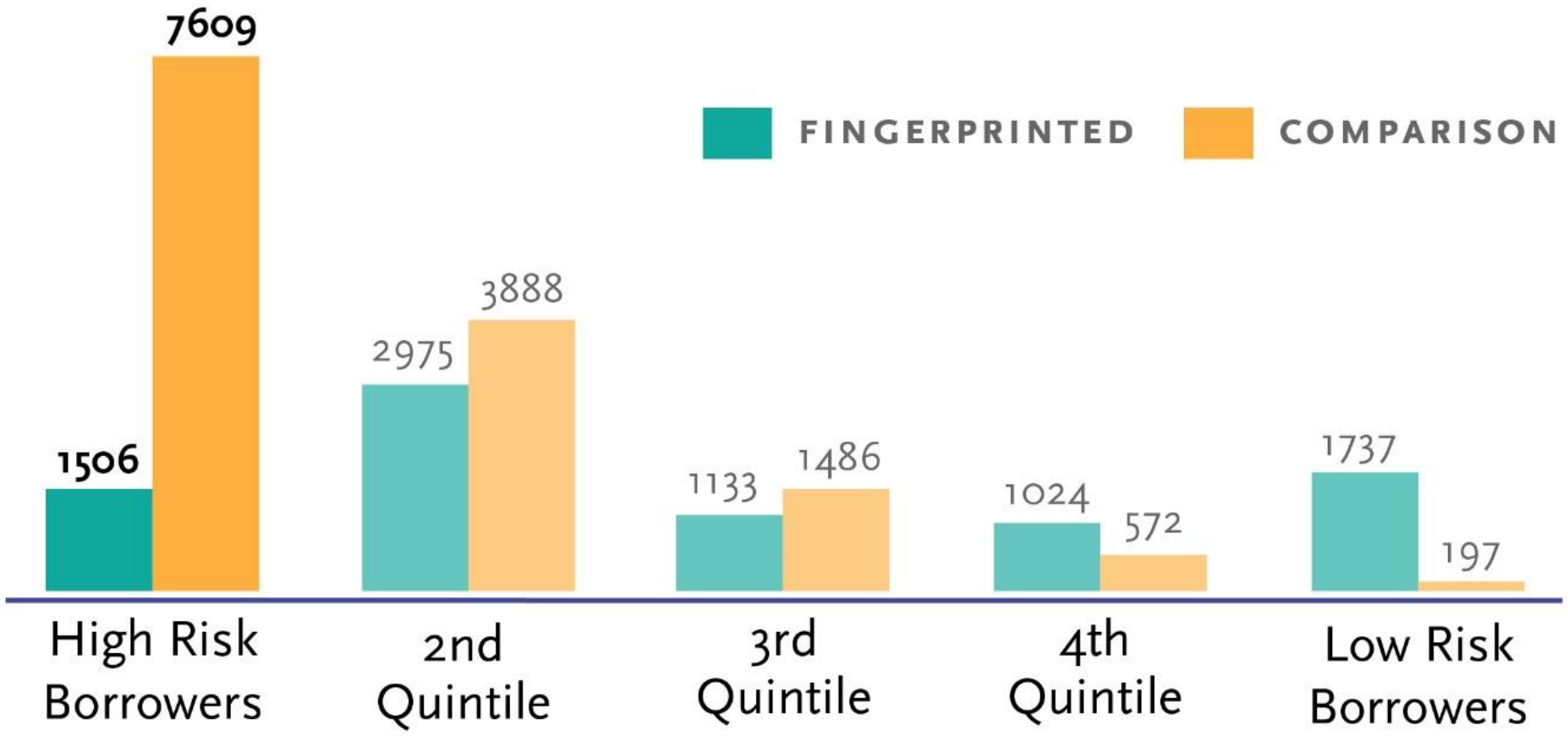
# Fingerprinting borrowers in Malawi

- Lack of information makes banks unwilling to lend
  - Cannot credibly threaten to cut off future credit
- Treatment group **fingerprinted** during application process
  - Biometric identification cannot be lost, forgotten, stolen

Gine, Goldberg, and Yang 2011

UNPAID BALANCE (MWK) 2 MONTHS AFTER LOAN WAS DUE

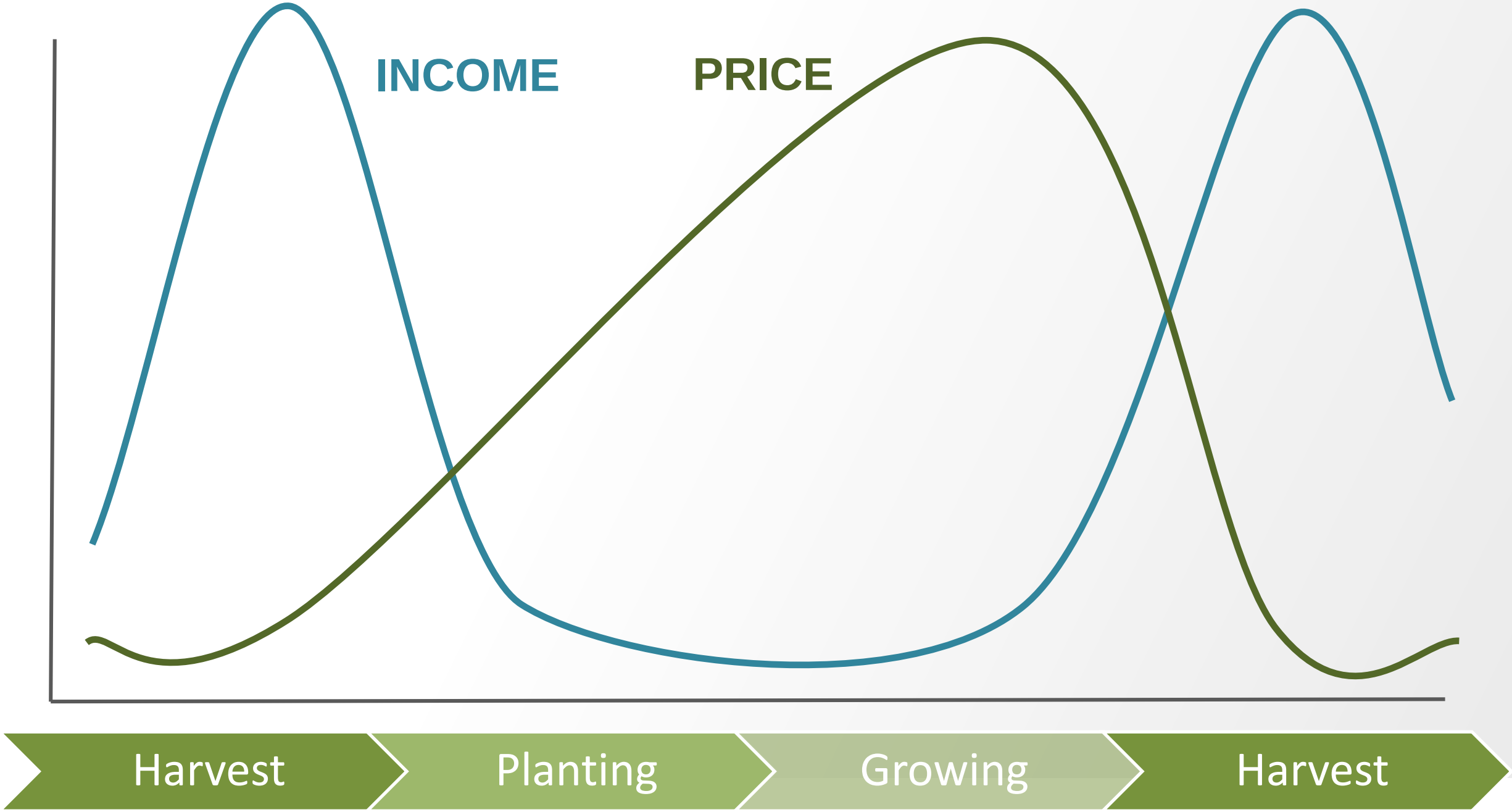
*STATISTICALLY SIGNIFICANT DIFFERENCES ARE BOLD*

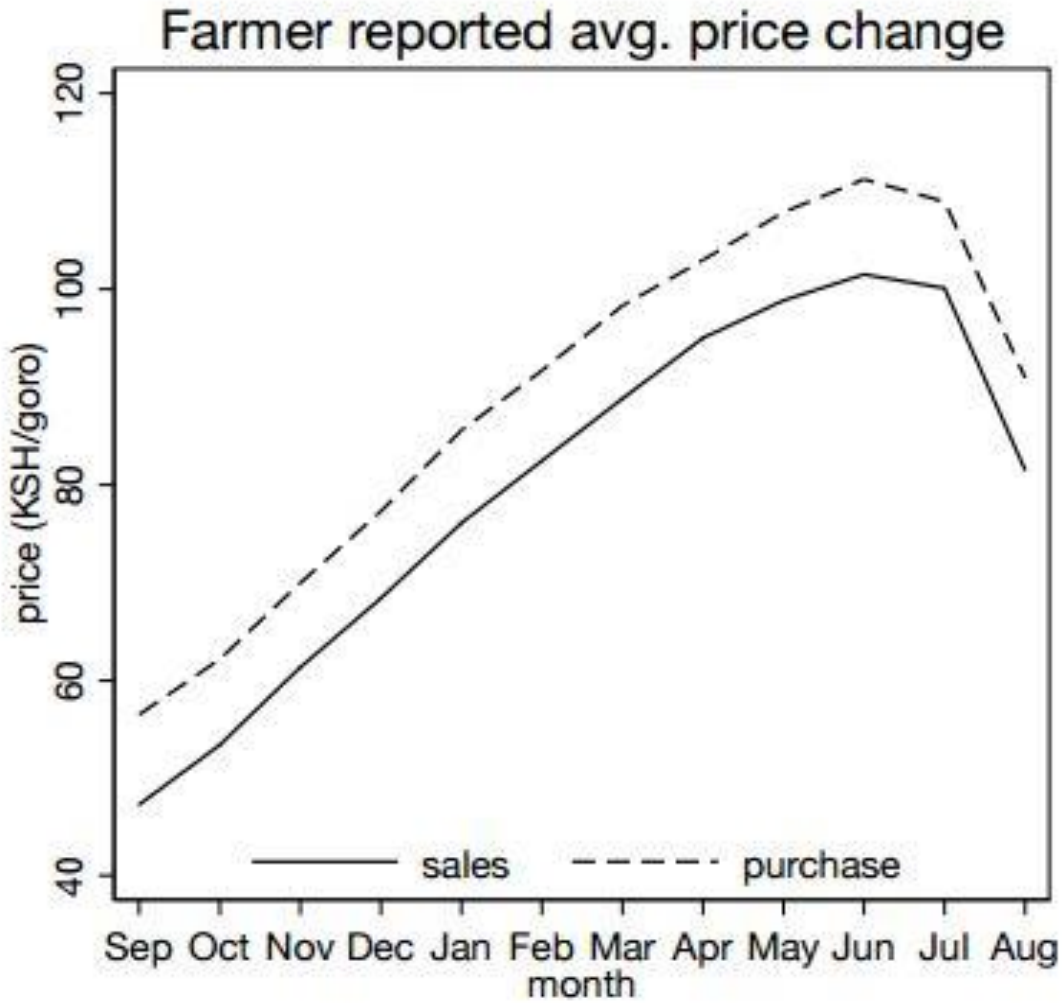



Gine, Goldberg, and Yang 2011

# 3. Accounting for seasonal variation in income

- Intra-seasonal price fluctuations in many grain markets over 100%
- Long-cycle ag lending is risky and forces farmers to sell at the worst time to repay loans
- Short-term loans so farmers store & sell when prices are higher?
  - Short-term loans feature less interest, (maybe) less risk
  - General equilibrium benefits: flatten price contours for everyone
  - Arbitrage rule: price shouldn't change faster than interest rate + wastage rate
- Complementary intervention to post-harvest storage improvements


INCOME
PRICE
Harvest
Planting
Growing
Harvest




Source: Burke 2014, from western Kenya

Burke 2014

# Harvest-time loans in Kenya

- Loans allowed farmers to:
  - Buy/keep maize at low prices
  - Store while prices rose
  - Sell later at higher prices
- Temporal arbitrage increased profits
  - Concentrated in areas where fewer farmers offered loans (sign of spillover effects)

# Inconclusive evidence on profits

- Mali
  - Cash grants **increased** farm profits
- Morocco
  - Agriculture income increased, other sources decreased
- Kenya
  - Temporal arbitrage **increased profits**
- Sierra Leone
  - **No effect** on profits

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Beaman et al 2014; Crepon et al 2015; Burke 2014; Casaburi et al 2014

# Maybe credit is not the binding constraint... what about risk?

# How does risk constrain adoption?

- Agriculture is an inherently risky activity
  - Weather and disease risks are **aggregate**, affect all farmers in an area
- Farmers may lose large portion of harvest to extreme weather event
- No great ways to mitigate or insure risks
  - Higher-value crops may also be more sensitive to weather
- Exacerbated by **risk aversion** and **ambiguity aversion**
  - Behavioral issues, lack information, trust, etc.

# Credit vs risk

- Two-armed trial distributes cash for input purchases versus free WII
- Provide theoretical justification for why WII might work better:
  To the extent that risk is the operative constraint for investment, WII can 'unlock' farmers' own capital by giving them the confidence to invest in inputs
- Cash amounts an order of magnitude larger than WII premium subsidies
- But, behavior change from WII subsidies are an order of magnitude larger
- When households released from risk constraints they find investment capital
- Hence, credit not binding!

Karlan et al 2013

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# Four solutions to risk

1. Financial instruments:  Weather Index Insurance (WII)
2. Technology that structurally decreases risks
   - Risk-mitigating crops, irrigation
3. Credit products with (explicit or implicit) limited liability in case of weather shocks
4. Public sector safety nets

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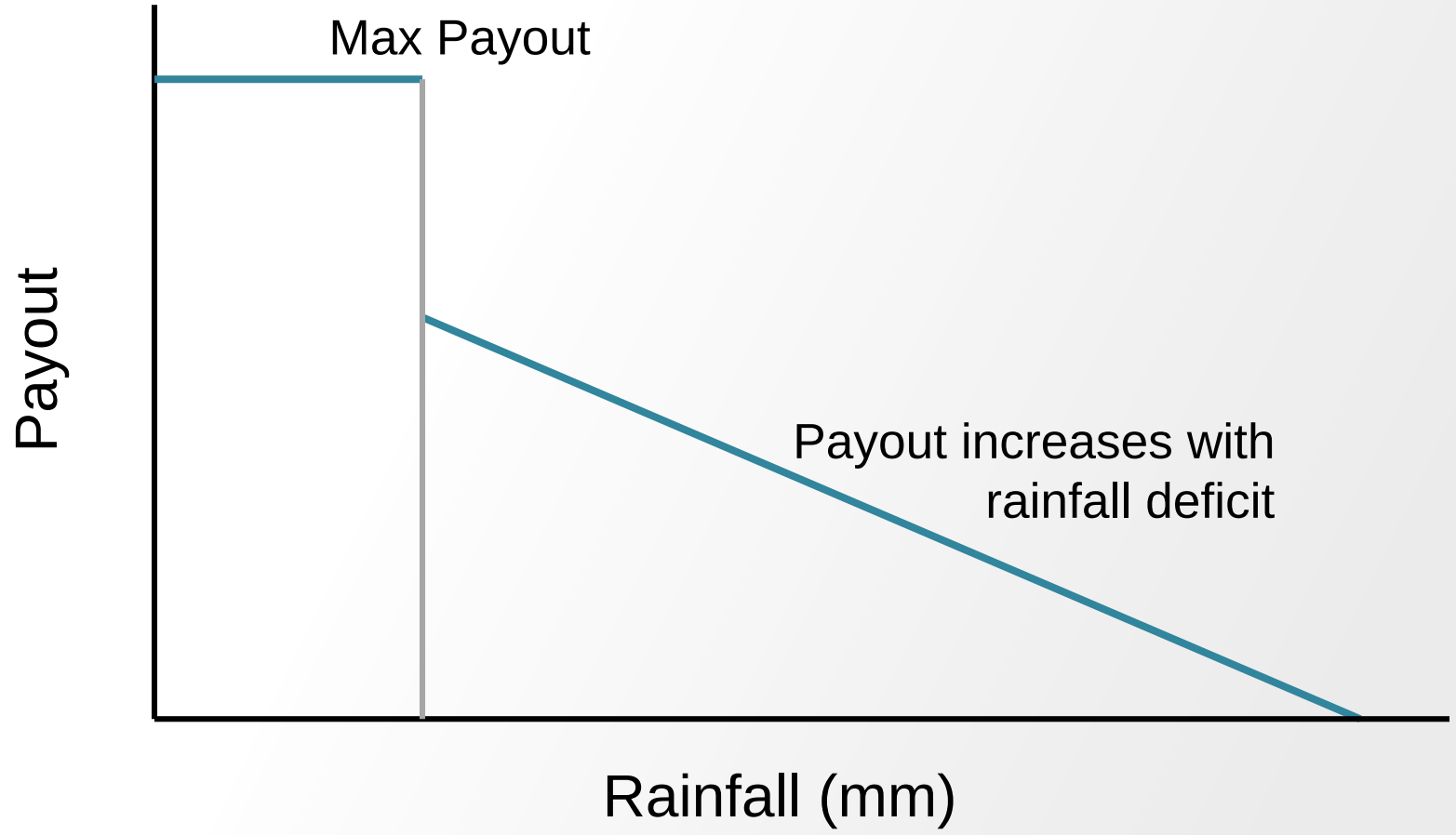
# 1. Weather index insurance

# Protect farmers through formal insurance

- Agricultural insurance to hedge risk ubiquitous in developed countries (typically heavily subsidized)
  - Large number of small farmers, poor regulatory environments make most traditional products **ill-suited** to smallholders
- Weather index insurance as innovation to insure smallholders
  - Payouts made on observable variable (e.g. rainfall)
  - Avoids: lengthy claims process, adverse selection, moral hazard
  - Possible to write a large number of small policies at reasonable cost

# Stylized index insurance payout schedule

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# Arguments for the use of an index

- Avoids all moral hazard (problematic in small-area yield insurance)
- No adverse selection
  - Attributes of individual farmer do not affect contract terms
- Even in data-poor environments, have high-frequency rainfall data
  - Possible to install automated rainfall stations quite inexpensively, but re-insurers require long (~30 year) histories of data to be willing to write contracts

# However, there is basis risk

- No index perfectly correlated with yields even if data from the field
- WII typically based on rainfall stations that are distant from fields
  - Combination of these two: 'basis risk' (Barnett, Barrett, and Skees, 2008)
  - WII is ***partial insurance***, much more ambiguous relationship to demand (Gollier & Pratt, 1996)
  - Demand for incomplete insurance may be non-monotonic in risk aversion (Clarke 2011)

# A decade of WII experimentation

- 9 RCTs conducted in a various contexts (India, Ethiopia, Ghana, Malawi)
- When given subsidized insurance, farmers took greater production risks
  - In Andhra Pradesh, farmers who received insurance were 6pp more likely to plant **cash crops** (Cole et al. 2014)
  - In Ghana, farmers increased the share of land under maize, **fertilizer use** (Karlan et al. 2013)
  - In China, insurance for sows causes farmers to move into a risky but highly profitable crop (Cai et al. 2014)
  - In China, farmers given tobacco insurance increase production by 20% (Cai 2012)

# However, demand for WII is low

- Take-up 6-18% at market prices
  - Those who purchase insure small portion of land
- But (very) **large subsidies** increased demand
  - India: over 60% of farmers purchased insurance with 75% discount
- Few examples of commercial weather index insurance
  - Most insurers receive large subsidies or technical assistance
  - Subsidized, compulsory Weather Based Crop Insurance Scheme in India

Gaurav et al 2011; Karlan et al 2013; Mobarak & Rosenzweig 2012

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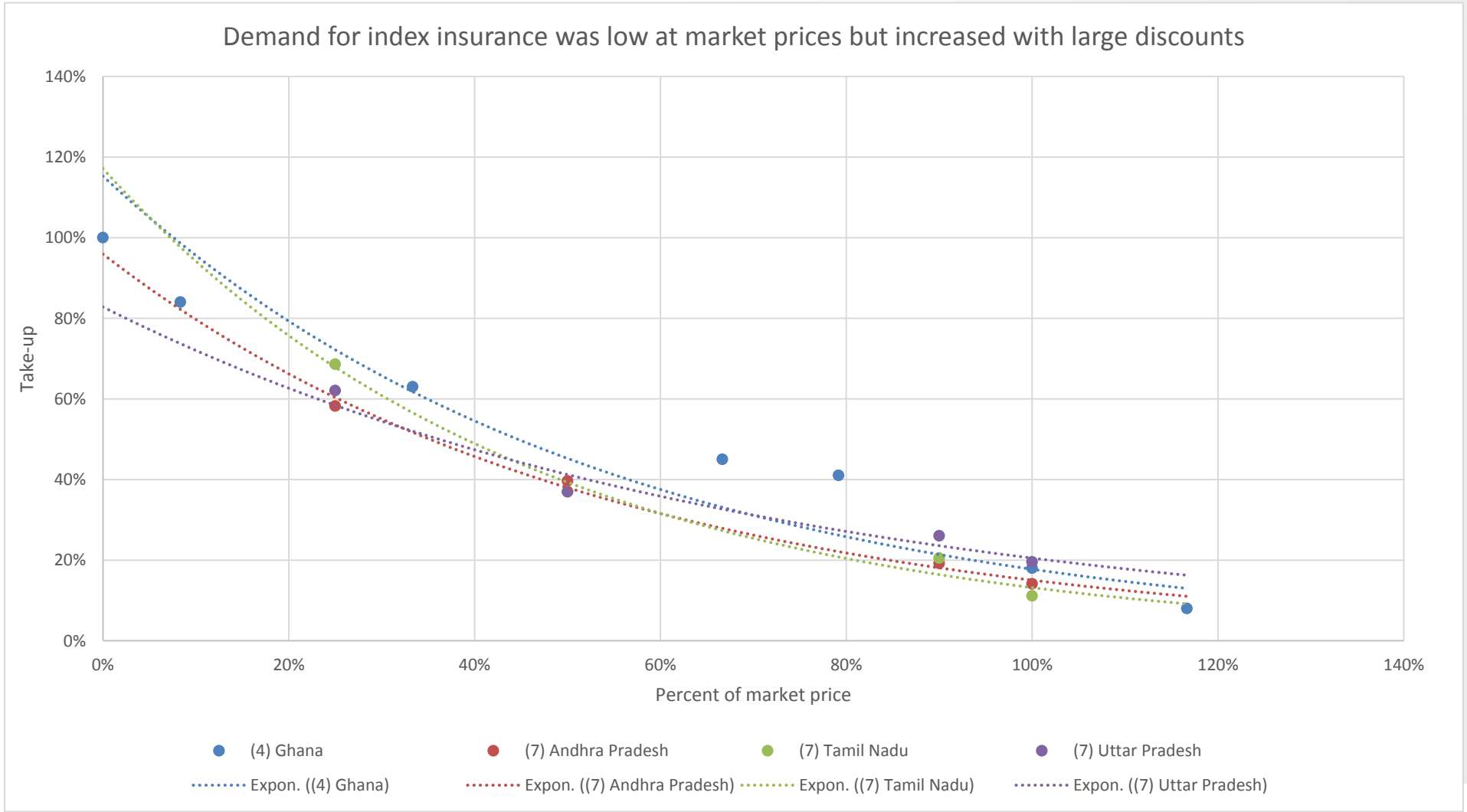
# How to improve demand…

- Marketing & Training?
  - India: relatively low take-up with flyer and video marketing techniques
  - India: financial literacy training had **small effect**
  - China: longer promotion session increased take up from 35% to 50% (Cai et al. 2015)
- Recency bias: demand increases after payouts (credibility?)
- Group based WII: only if basis risk is idiosyncratic + informal insurance
  - Dercon et al. (2013): *iddirs* in Ethiopia
  - Mobarak & Rosenzweig (2012): geographically dispersed *jatis* more likely to take up WII
  - McIntosh et al. (2015): in Guatemala, farmers understand and are willing to pay for risk pooling benefits of group insurance; dislike the group leader conducting loss adjustment

Cole et al 2013; Gaurav et al 2011; Cole et al 2014

# Pricing: demand increases w/ subsidies



# Dynamic effects of subsidies

- Dynamic effect of subsidies pronounced only when payouts occur
  - Interest in designing 'optimal' subsidies to reach adoption target (de Janvry et al. 2015)
  - No evidence that temporary subsidies will 'kick-start' a private market
- Subsidized insurance has large effects on farmer behavior, but the market won't work without subsidies
- Is there a welfare case to be made for perpetual subsidies to WII?
- Downside: substantial shift into risky production -> agricultural system as a whole more sensitive to rainfall -> landless laborers (most vulnerable) see *higher* wage sensitivity to rainfall

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# Cash vs. premiums

- Current debate in social protection about UCTs versus various types CCTs
- Distributing free insurance premiums a very specific type of CCT: *'If your crops fail, we will provide you with a cash transfer'*
- The underlying logic for this is that the release of risk constraints allow farmers to move toward pure profit maximization as farming decision-makers
- Links WII to social protection

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# 2. Risk-reducing technology

# Farmers given Swarna-Sub1 invested more

- Farmers given Swarna-Sub1 had higher yields in 2011 floods
- Farmers **invested more** in their farms
  - Cultivated more land; applied more fertilizer
  - Switched to more effective, but higher-labor techniques
- Scale-up would benefit **marginalized populations** the most, as they are more likely to hold flood-prone land
  - IRRI distributed stress-tolerant seeds to >10 million farmers

Dar et al 2015

# 3. Interlinking WII with credit

- Why not address both constraints simultaneously?
  - India: massive National Agricultural Insurance Scheme, covers 13.6 million farmers
  - Mandatory, heavily subsidized, requires 100% of the agricultural lending portfolio be covered by insurance
- In practice, no evidence that interlinking works well.
  - Giné and Yang (2009): in Malawi that demand for loans that bundle insurance with credit is lower than demand for standalone credit!
  - Banerjee, Duflo, and Hornbeck (2014): microcredit demand falls when interlinked with insurance
  - McIntosh et al. (2015): in Ethiopia, demand for both standalone and interlinked loans is low
  - Ahmed et al: uptake of interlinked loans in Ethiopia ~ 2%

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# Can we insure the lenders instead?

- Meso-level products can be offered to ag lenders
  - India's National Agricultural Insurance Scheme
  - Client is sophisticated
  - Don't need to insure entire portfolio, lowers costs
  - Can be effective if credit markets are supply constrained
  - Should borrowers be informed of nature of insurance? Should lenders attempt to collect loans even if paid out by insurance?
    - Lender-driven solutions not effective if risk rationing main constraint

# 4. Public Safety Nets and WII

- Public-private partnerships for Risk Layering (Carter 2011)
- Public-sector programs crowd out demand for WII (Duru 2015)
  - However, if private sector WII isn't viable, not a major downside
- Would expose governments to huge weather-related risk
  - Governments should use reinsurance themselves
  - Transfer huge and unexpected liabilities into a predictable flow of costs for public sector
- WII may be a way to provide safety nets without problems of clientelistic demands & soft budget constraints
  - Hard to achieve this in practice

# Conclusions on WII

- No evidence that the products tested to date can scale to be commercially viable, private sector solutions to agricultural risk
- However, still clear that risk is a major constraint for smallholder farmers
  - Especially weather risk
- Low demand for weather index insurance as commercial product
  - Price, distrust, lack of financial literacy, basis risk

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# Conclusions on WII: where to from here

1. Embrace subsidized WII: can create multiplier effects; can act as a social safety net program; may be an important part of reducing vulnerability to climate change
2. Risk-protecting ag technology: invest in producing, distributing improved seed technology; irrigation
3. Can WII be rescued w/ better design? Better indexes; group contracts
4. Pursue meso-level insurance: for both banks and governments

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# Conclusions: credit and risk

- Though credit likely key, may not be the binding constraint
  - African markets too risky, too low-return to be viable without additional investment (infrastructure, information systems)
  - Complementary institutions critical: credit bureaus/registries, weather monitoring systems
  - Promising interventions: use new collateral, information, timing
- Risk is a dominant issue: insurance and credit likely need to be grown hand-in-hand