Exchange Asymmetries in Productive Assets:
-Tools, Fertilizer or Cash?

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Motivation

- Factor markets in developing countries are characterized by high transaction costs and imperfect information
- Binswanger and Rosenzweig (1986++)
- The parvasiveness of this is questioned
- With infrastructure development & IT technology reducing information costs
- Does it eliminate **exchange asymmetries**?
- Does it pave the way for different policies?
- More cash-oriented, less commodity-oriented?

- **What is the relevance of Prospect Theory?**
  - **Endowment effects/loss aversion**

Exchange Asymmetries: Of relevance for:
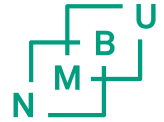
- Development/AID policies:
  - Commodity versus cash transfers
    - Food-for-work vs. Cash-for-work
  - Design of input subsidy programs
  - Efficiency benefits from reduction of transaction costs
  - Targeting efficiency
  - Crowding out effects
  - Fungibility concerns
  - Relevance of nudging and commitment devices

Concepts

- Exchange asymmetries are associated with
    - «Endowment effects» (Thaler 1980 ++)
    - «Status quo-bias» (Samuelson & Zeckhauser1988)
    - "WTA-WTP gap" (e.g. review by Horowitz & McConnell 2002; Plott & Zeiler 2005)
    - Transaction costs/information asymmetries

Recently, the prospect theory explanation of the phenomenon has been critically examined and questioned (Plott & Zeiler 2005; 2007; Brown 2005; Knetsch & Wong 2009; Morewedge et al. 2009)
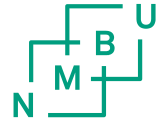
Objective

- Investigate whether exchange asymmetries in rural factor markets prevail due to behavioral explanations after removal of transaction costs, liquidity constraints and information asymmetries

- Specifically: Investigate the extent of exchange asymmetries and their explanations for two types of productive assets versus cash among poor rural households through a field experiment

Novelty of paper

- Investigate preference-related exchange asymmetries in productive assets
  - Nature of productive assets and their markets
    - Durable asset versus short-term input
    - Thin markets
  - Trade experience
  - Importance of loss aversion for asymmetries
  - Functional form of demand and supply shadow price distributions
- Insights of potential high relevance for development policy
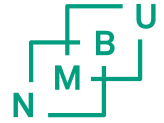
Literature review/theory 1

- **Endowment effects theory**
  - Thaler (1980)
    - People may demand much more to give something up than they would be willing to pay to acquire it
  - Kahnemann & Tversky (1984) attributed this asymmetry to *loss aversion*
  - Samuelson and Zeckhauser (1988) called the same (?) phenomenon *status quo bias*
  - Plott & Zeiler (2005, 2007) advanced and tested several alternative explanations to endowment effects theory:
    - Artifacts explained by weaknesses in experimental design(?)

Literature review/theory 2

- Trade experience

  - List (2003; 2004) found that exchange asymmetries varied across subject pools - due to variation in experience? Professional traders know their preferences better, inexperienced traders may hesitate to trade (keep their good) due to their more limited experience

  - Harbaugh, Krause & Vesterlund (2001) used simple exchange experiments on children without finding any effect of exchange experience

- Characteristics of the good

  - List (2003, 2004) distinguished between unique goods and everyday consumables

Literature review/theory 3

- Plott & Zeiler (2007) alternative theories for exchange asymmetries;
  - *Other-regarding preferences*
    - Reluctance to trade goods received as gifts
  - *Experimenters' influence*
  - *Cascade theory*
    - Public revelation may cause group influences
  - *Small differences in transaction costs*
    - Make a difference when respondents are nearly indifferent regarding their choice of commodities

Hypotheses

- 1) Loss aversion contributes to higher exchange asymmetry (endowment effect theory)

- 2) Experience reduces exchange asymmetries and should be lower for men than for women, as men traditionally make agricultural decisions and are therefore more experienced (gender, age and education may matter for experience)

- 3) Nature of commodity. Find a greater exchange asymmetry for tool (durable good, less frequently traded) than for fertilizer (thin or seasonal markets)

Field Experiment

- Incentive-compatible binary choice approach with a transparent random allocation of productive asset or cash

- Randomize both the type of productive asset (tool versus fertilizer) and the amount of cash (40 EB-140 EB) that respondents are offered

- Respondents decide only whether to keep the productive asset (cash) they have received first through lottery or to exchange it for cash (the productive asset)
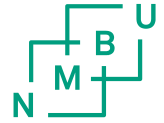
Field Experiment

- Allow us to identify input price response elasticities (shadow price variation in the population)

- Exchange asymmetries
  - are observed as between-subject deviations between input demand and input supply curves, or
  - econometrically by assessing the significance of a dummy variable for whether respondents first received the productive asset or the cash

Sampling

- Households that have been part of a household survey
- Participation in experiment as «payment» for time spent answering survey questions (earned benefit)
- Husbands and wives participated when possible, without knowing the preferences, lottery outcomes or choice of their spouse
- Sample covers 3 ethnic groups in 2 regions in 5 districts in Southern Ethiopia
  - Total sample 600 households & 1050 individual respondents
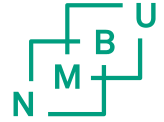
Selection of productive assets
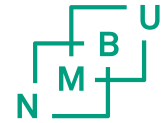
Tools and 6 kg bag of fertilizer have a market value of approximately
100 EB=5 US$

-commodity characteristics

* durable vs. non-durable input

* frequency of purchase, annually versus less frequent

Experimental procedure

- **Player 1 (Head of household)**:_____
- **Commodity preferences:**
- **Choice between** 1= Hoe/plough/fork, 2=6 kg basal fertilizer (DAP), 3=100 EB
- **Husband's choice (Player 1**): Rank 1:_____Rank 2:_____Rank 3:_____
- **Coin toss 1:** Identify whether **Head=Tool** or **Tail=Fertilizer** will be the commodity.
- *Outcome (circle):* 1=Tool, 2=Fertilizer:_____
- **Coin toss 2:** Identify whether the player receives the commodity or a random amount of cash.
- *Outcome (circle):* 1=Head=Commodity, 2=Tail=Random cash amount
- The predetermined (by throwing a die) random amount of cash level **(circle): 40, 60, 80, 100, 120,140 EB**.
- If the player received the commodity, s/he is offered to sell it back for the random amount of cash. If the player received cash, s/he can use the money to buy the commodity.
- **Choice (circle)**: 1=Keep, 2=Exchange
- Player 1 (Husband) is asked to leave the room and come back after the wife has played to identify by a coin toss what the final outcome will be. The wife is asked to come in without communicating with the husband or knowing the outcome for him **(Important!).**
- **Player 2 plays the same way…**
- **Final coin toss (circle): 1**=Head=Player 1, 2=Tail=Player 2
- *Outcome:* 1=Tool, 2=Fertilizer, 3=Cash amount:_____
- The household receives the preferred choice of the winning player and are asked to share it
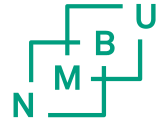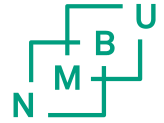
Experimental design

- Test for endowment effect theory, importance of trade experience, & nature of good
  - Separate loss aversion experiment to test endowment effect theory: Loss aversion rank variable
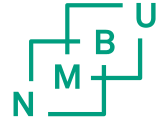
Loss aversion experiment
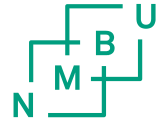
No	Lottery A	Choice	Lottery B	Choice
1	50% of winning 25 EB and 50% of losing 5 EB		50% of winning 30 EB and 50% of losing 20 EB	
2	50% of winning 5 EB and 50% of losing 5 EB		50% of winning 30 EB and 50% of losing 20 EB	
3	50% of winning 1 EB and 50% of losing 5 EB		50% of winning 30 EB and 50% of losing 20 EB	
4	50% of winning 1 EB and 50% of losing 5 EB		50% of winning 30 EB and 50% of losing 16 EB	
5	50% of winning 1 EB and 50% of losing 8 EB		50% of winning 30 EB and 50% of losing 16 EB	
6	50% of winning 1 EB and 50% of losing 8 EB		50% of winning 30 EB and 50% of losing 14 EB	
7	50% of winning 1 EB and 50% of losing 8 EB		50% of winning 30 EB and 50% of losing 11 EB	

Experimental design

- Attempted to eliminate or minimize other potential reasons for exchange asymmetries:
  - *Transaction cost theory*
    - Placed commodity/cash in front of respondents
    - No out of pocket money needed
    - Single decision: Keep or Exchange
  - *Other-regarding preferences*
    - Earned benefit, not gift
    - Lottery structure
  - *Experimenter influence*
    - Lottery structure
    - No value judgments from experimenters
  - *Cascade theory*
    - Privacy in decisions, no information available about decisions of others

Field experiments, practicalities

Analysis

- Simple OLS (linear probability models)
- Non-parametric regressions (fractional-polynomial prediction plots with 95% confidence intervals)
  - Loss aversion rank: Significance & effect on other parameters
  - A vector of experience-related variables including the sex of the respondent; the age, education, farm experience of the household head; and a dummy for the household head being female
  - Men are usually responsible for agricultural decisions in Ethiopia and may therefore be considered more experienced in factor market trade than women

Overview of experimental outcome
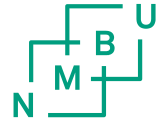
	Initial endowment is commodity	% choose commodity	Initial endowment is cash	% choose commodity
Tool versus Cash	258	**62.8**	302	**35.8**
Fertilizer versus Cash	261	**26.4**	221	**15.8**

Note: Pearson chi2(1) = 40.71, Pr. = 0.000 for tool versus cash experiment.
Pearson chi2(1) = 7.95, Pr. = 0.005 for fertilizer versus cash experiment.

OLS, pooled data

	OLS Model 1	OLS Model 2
Loss aversion rank		0.018***
		(0.01)
Dummy for commodity receiver	0.190****	0.184****
	(0.04)	(0.04)
Dummy for commodity = tool	0.267****	0.263****
	(0.05)	(0.05)
Random cash amount received	-0.004****	-0.004****
	(0.00)	(0.00)
Constant	0.490****	0.448****
	(0.06)	(0.06)
Prob. > chi2	0.000	0.000
R-squared	0.181	0.189
Number of observations	1023	1023

Note: OLS models with cluster-robust standard errors with clustering at the village level. Standard errors in parentheses. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.01%.

Disaggregated OLS-models

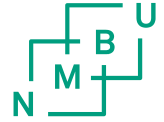|	Disaggregation by commodity		Disaggregation by gender	
	Tool	Fertilizer	Men	Women
Loss aversion rank	0.026**	0.008	0.021***	0.013
	(0.009)	(0.007)	(0.006)	(0.008)
Dummy for commodity receiver	0.256****	0.107**	0.217****	0.157***
	(0.049)	(0.038)	(0.044)	(0.054)
Dummy for commodity = tool			0.304****	0.236***
			(0.048)	(0.064)
Random cash amount received	-0.012***	-0.020****	-0.020****	-0.010*
	(0.004)	(0.004)	(0.003)	(0.005)
Random cash squared / 1000	0.046**	0.090***	0.088****	0.035
	(0.020)	(0.024)	(0.017)	(0.026)
Sex of respondent, 1 = male	0.066	-0.016		
	(0.057)	(0.034)		
Female headed dummy	0.082	-0.003		0.022
	(0.116)	(0.103)		(0.107)
Prob. > chi2	**0.000**	**0.000**	**0.000**	**0.000**
R-squared	0.154	0.155	0.251	0.172
Number of observations	526	426	489	463

Supply and demand, productive assets
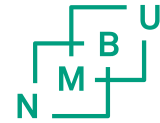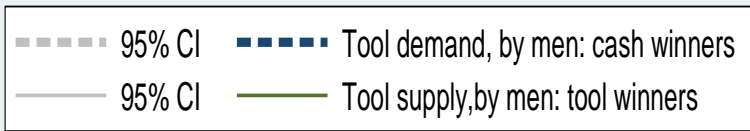

Tool supply and demand

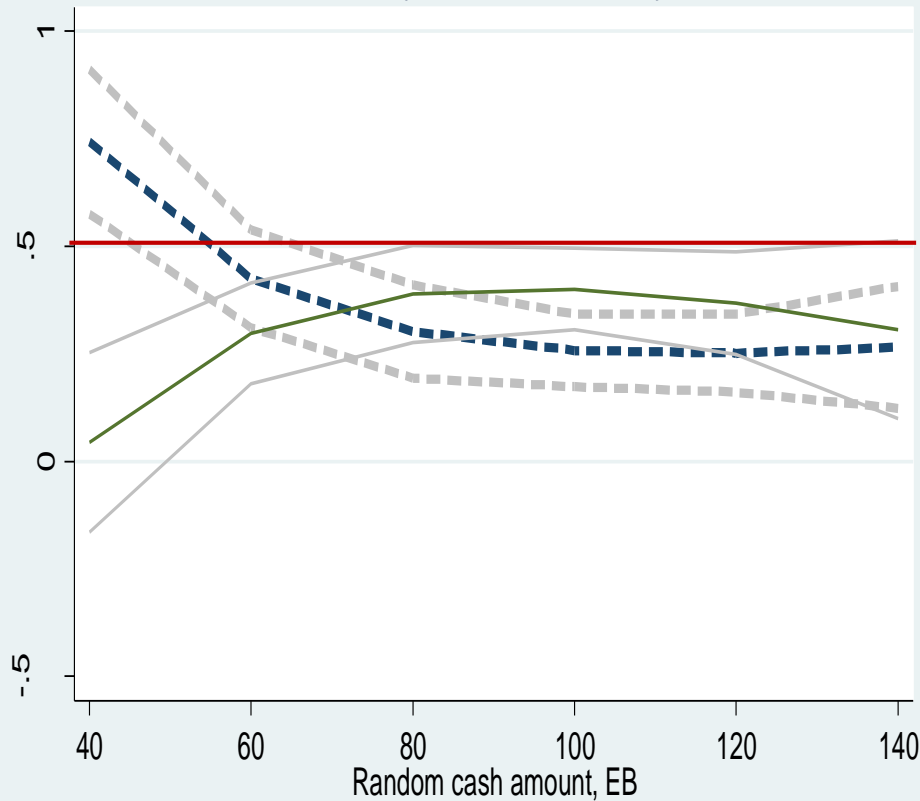Fertilizer supply and demand

x-axis (both panels): Random cash amount, EB

Tool panel legend:
- 95% CI
- Tool demand curve, cash winners
- 95% CI
- Tool supply curve, tool winners

Fertilizer panel legend:
- 95% CI
- Fertilizer demand curve, cash winners
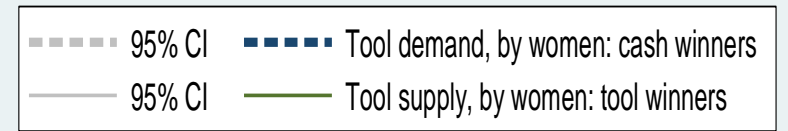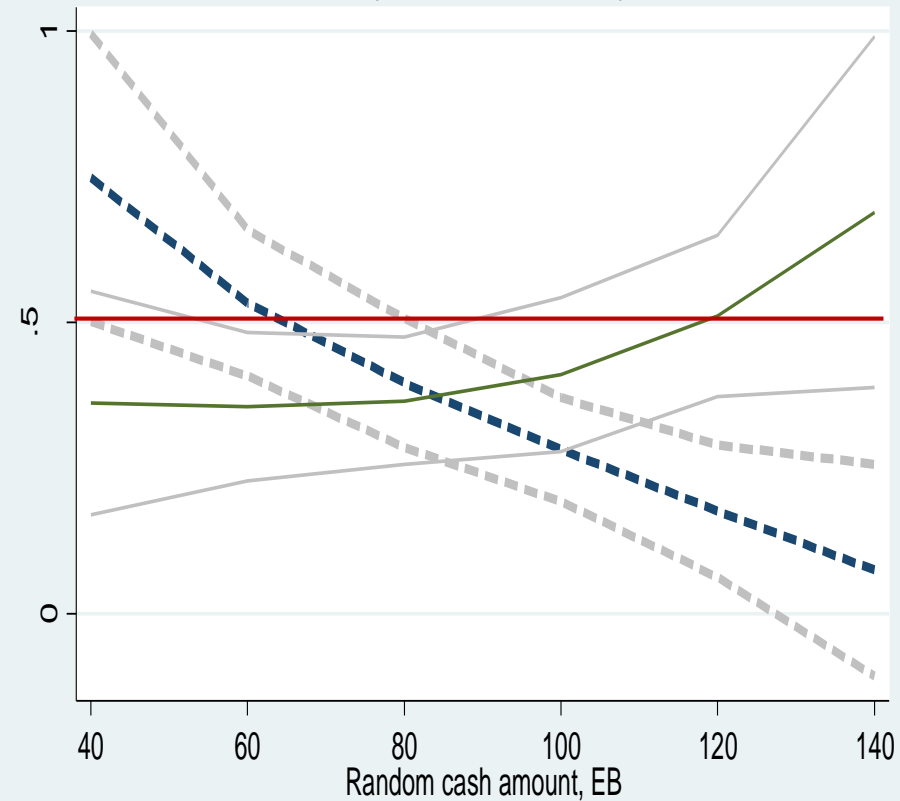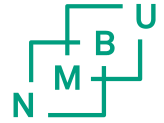- 95% CI
- Fertilizer supply curve, fertilizer winners
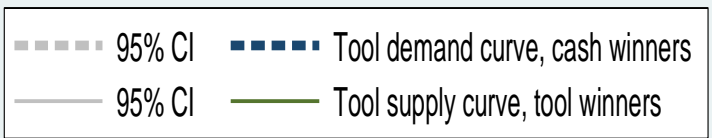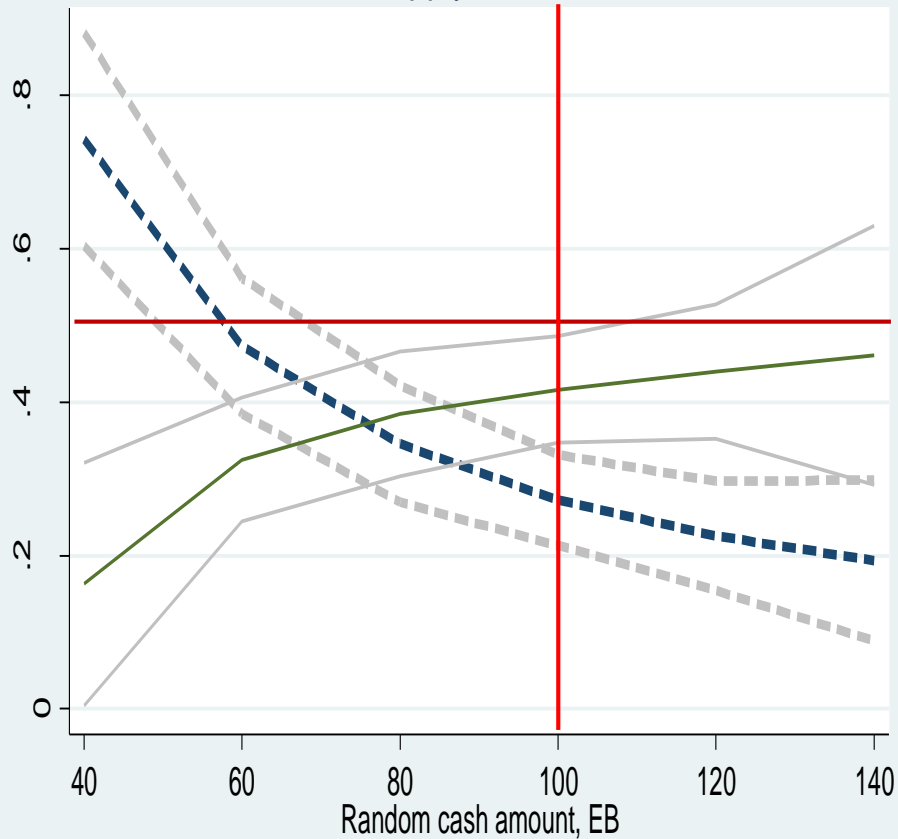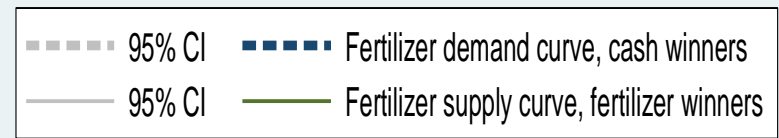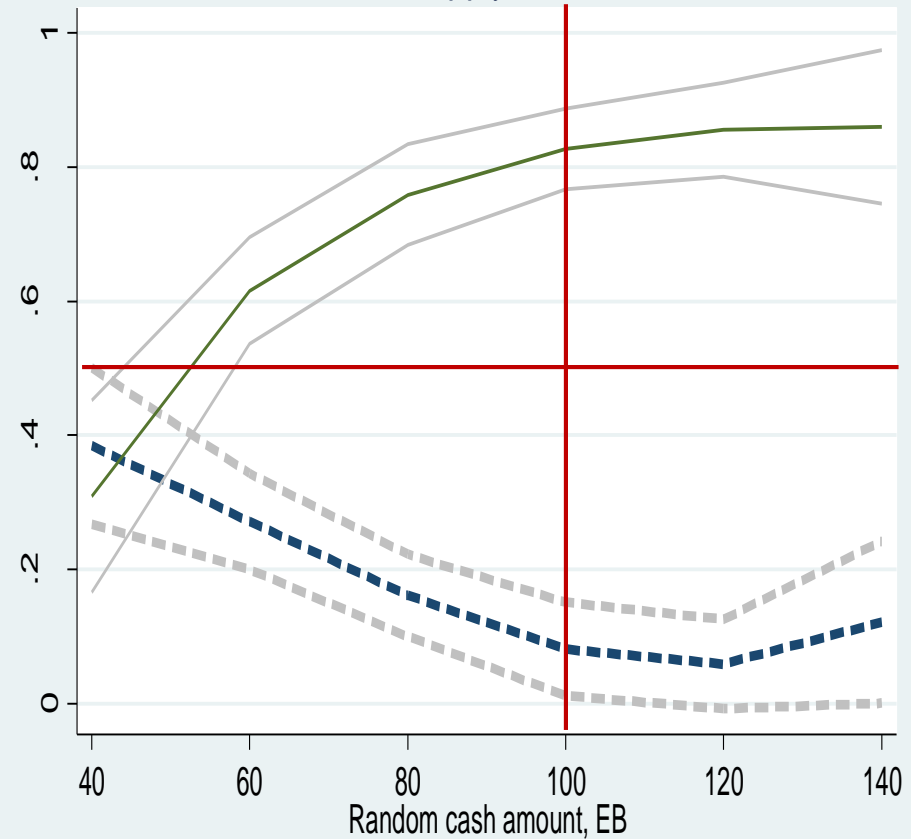
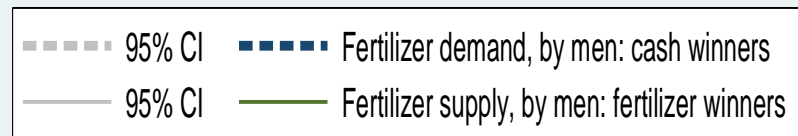# Tool supply and demand by gender
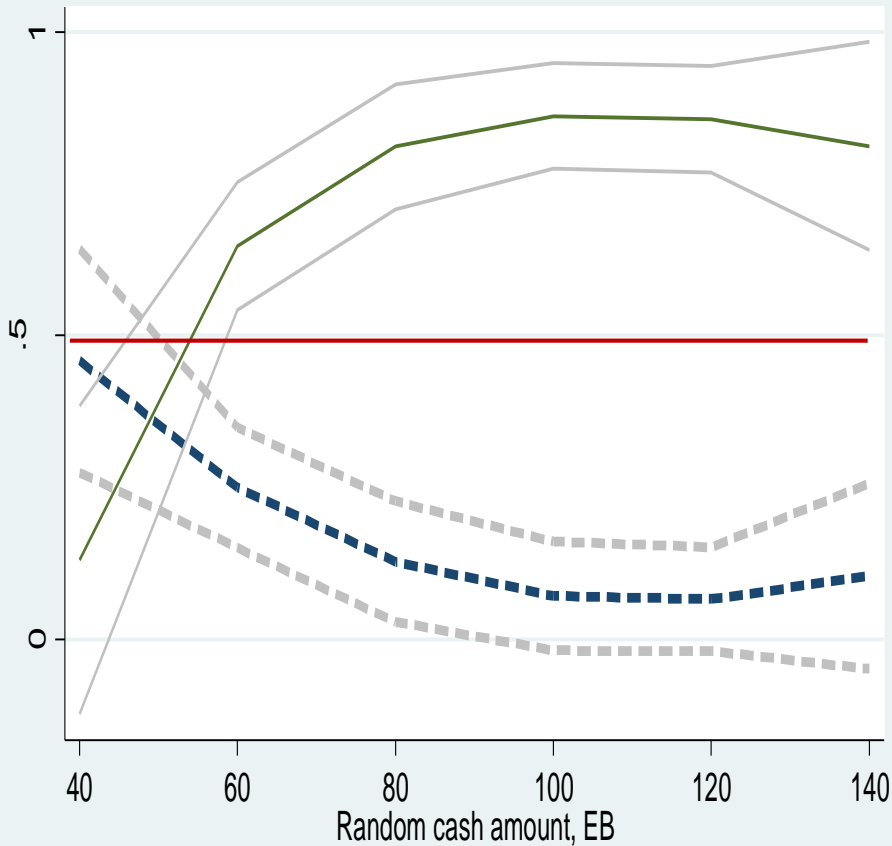

Tool supply and demand, by men
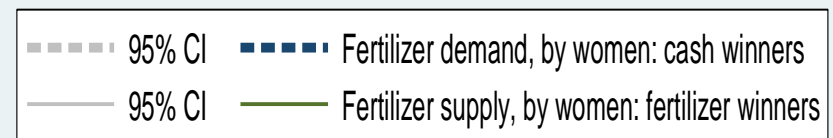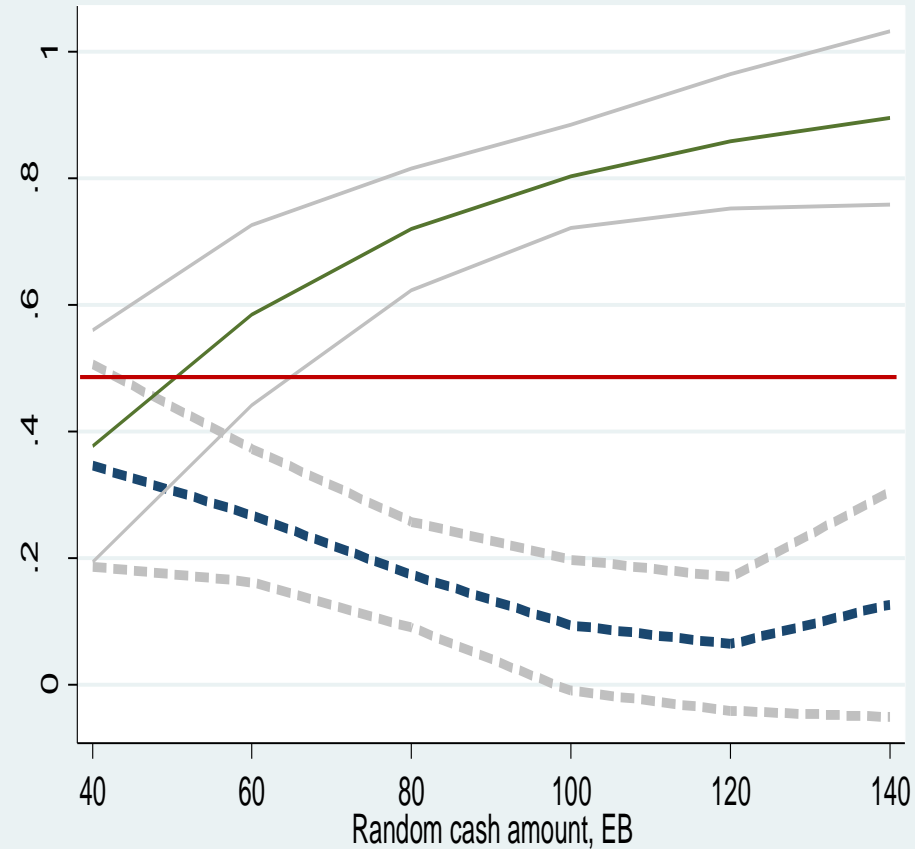
Tool supply and demand, by women
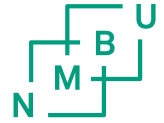
Fertilizer supply and demand by gender

Fertilizer supply and demand, by men

Fertilizer supply and demand, by women

Summing up/Conclusions

- Substantial exchange asymmetries were found, especially for the more popular tool (durable asset)
- Loss aversion was found to play a significant but small role
- The experience of the respondents did not reduce the exchange asymmetries; rather the opposite was found as the men revealed greater exchange asymmetries than did the women
- Policy implications:
    - Exchange asymmetries remain, commodity-oriented policies may remain important
    - Too much focus on fertilizer in the past?
- More studies needed to assess the robustness/external validity.