NOT YOUR AVERAGE JOB:
MEASURING FARM LABOR IN TANZANIA

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Introduction

- In low-income countries, a large share of people rely on small-holder farming

- Farming practices are labor intensive and primarily dependent on own labor

- Labour is a key asset for the poor

- Its measurement underlies

  – Key stylized facts: unemployment & underemployment, agricultural productivity gap,

  – A lot research in development economics: agricultural HH models, intra-household allocation, child labor, agricultural productivity, entry into off-farm, structural transformation, urbanization….

Role of Surveys

- Labour measurement happens primarily through surveys

- Little guidance on best-practice

- Little knowledge on reliability of current data

- Most evidence on reliability of labour data comes from the US (Bound e.a. 2001)

- Unlikely to be relevant for developing world

Components of labour aggregate

- The accuracy of labor measurement depends on the accurate recall of many components, including:
  - A complete listing of all plots farmed
  - A complete listing of all workers
  - Weeks worked
  - Days worked
  - Hours worked

A typical survey instrument (own Farm Labour)

During the last rainy season (do not include the dry season harvest), please list for me the household members that worked on this PLOT performing any activity (land preparation, planting, ridging, weeding, fertilizing and/or harvesting);
ADD A NEW ROW FOR EACH HOUSEHOLD MEMBER WORKING ON PLOT DURING LONG RAINY SEASON 2014

PLOT ID	INDIVIDUAL ID	2	3	4
		How many weeks did [NAME] work?	During those weeks, approximately how many days did [NAME] work per week?	During those days, approximately how many hours did [NAME] work per day?
		Weeks	Days per week	Hours per day
1				
2				
3				

Worries

1. Reliable? Cognitively burdensome:
   - High level of granularity
   - Long recall
   - Asked to calculate averages on the spot
2. Comparable? Survey instruments differ:
   - Respondent (proxy, self)
   - Recall period (yesterday, last season)
   - Phrasing, sequencing, screening
   - Level of granularity (HH, ind, ind-plot, ind-plot-activity)
   - Totals values, typical values or combination
   - etc. etc. etc…

SPOILER ALERT

- Survey experiment amongst small-holder farming households in rural Tanzania
- Traditional labour module: single, end-of-season survey asking about labour in past season (6-9 months back)
- Benchmark: labor information collected in weekly surveys
- Traditional labour modules overstate hours worked per person-plot by a factor of four.
- *ceteris paribus*, that implies understated agricultural labor productivity
- Important finding for debate on agricultural productivity gap (Gollin e.a.) and the sectoral misallocation of labour

OUTLINE

1. Introduction
2. **Insights from social and cognitive psychology**
3. Study Design
4. Local context
5. Results
6. Mechanisms
7. Aggregation and competing forms of bias
8. Conclusion

Social and cognitive psychology

1. Recall period

– Ex. "Did you work on plot X in the past 4 weeks?"

• Forgetting

• Telescoping

– Ex. "How many times have you been angry today?"

vs. Ex. "How many times have you been angry in the past 12 months"

• Recall period influences inferred meaning

Social and cognitive psychology

2. Assumptions about the world

- Undue influence of recent experiences
- Subjective theories - Ross and Conway skills training experiment:
  - respondents reconstruct their past guided by their subjective theories about what the training should have done
  - Sequencing of questions

    'how happy are you with life in general?'

    'how often do you go out on a date?'

- Ex. in low-income survey context: do reports on yields influence reports on labor inputs?

Social and cognitive psychology

3. Respondent – survey interactions:

- Social desirability bias

Ex. 25% of non-voters report having voted immediately after an election

- Strategic answers

Ex. Asking about poverty in survey linked to a CCT

Ex. Asking about attitudes after attitudes training

Social and cognitive psychology

4. Respondent strategies
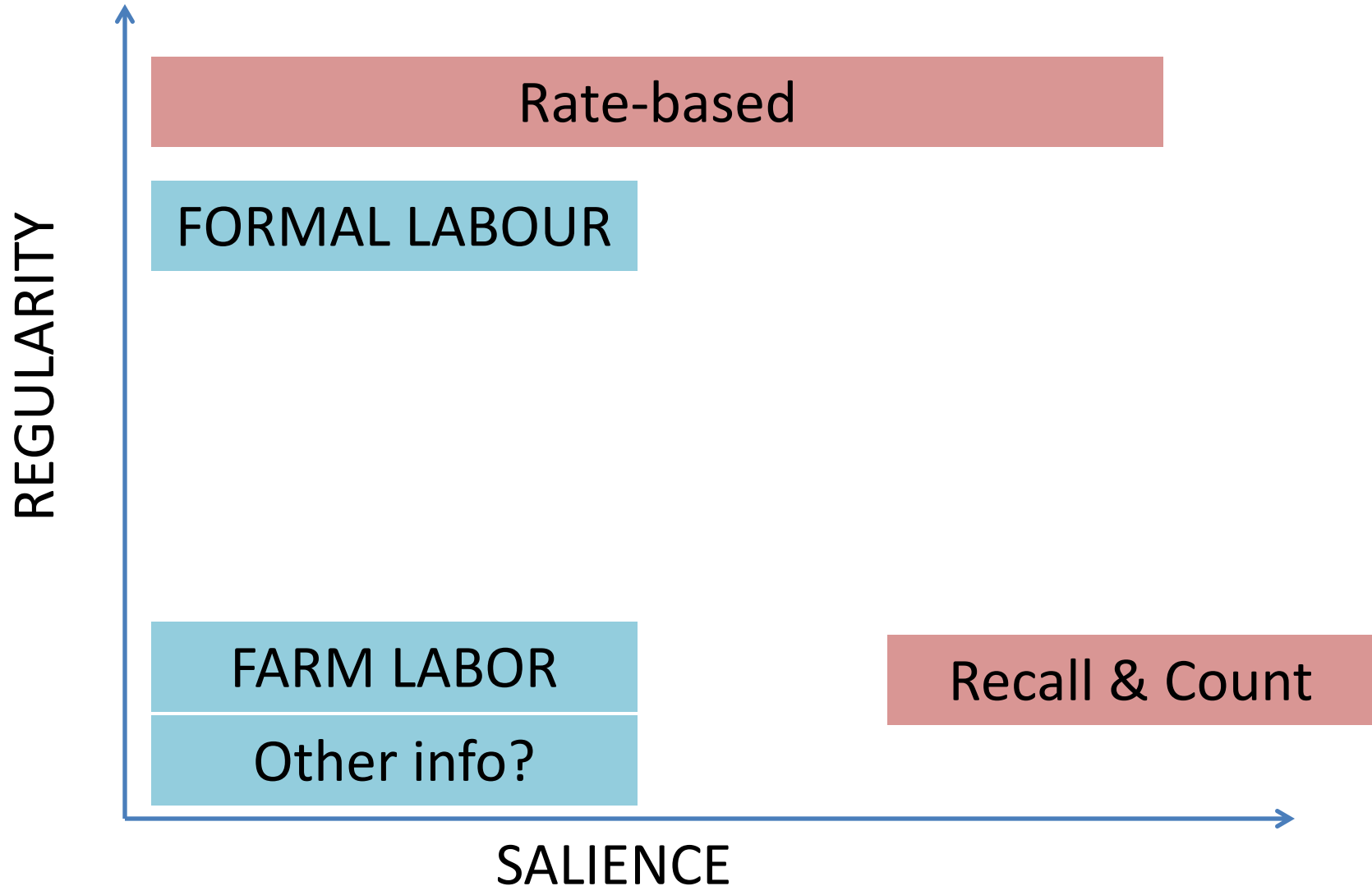
Ex. "how many visits to Africa since January?"

Ex. "how many cups of coffee have you had since January?"

Recall and count for salient and infrequent events.

Rate based estimations for regular events

(possibly with corrections)

Schematically

REGULARITY

SALIENCE

Rate-based

FORMAL LABOUR

FARM LABOR

Other info?

Recall & Count

Arthi, Beegle, De Weerdt, Palacios-Lopez
Measuring Farm Labor

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Design of Study

- 18 communities in rural Mara region, Tanzania
- During and after main agricultural season
- January -September 2014
- Implemented by EDI in Tanzania
- Using CAPI & CATI on *surveybe*

Arthi, Beegle, De Weerdt, Palacios-López
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Mara region, Tanzania

Survey Experiment
"business as usual"

Design	Interview-Type	Number of Households
Recall-ALT	Single end-of-season survey asking about total weeks worked, typical days per week and typical hours per day	212

Survey Experiment
"business as usual"

Design	Interview-Type	Number of Households
Recall-NPS	Single end-of-season survey asking about total days in each of 4 activity & typical hours per day on each activity	218
Recall-ALT	Single end-of-season survey asking about total weeks worked, typical days per week and typical hours per day	212

Survey Experiment "benchmark"

Design	Interview-Type	Number of Households
Weekly-Visit	weekly in-person visits for the duration of the main season (~25 visits)	212
Recall-NPS	Single end-of-season survey asking about total days in each of 4 activity & typical hours per day on each activity	218
Recall-ALT	Single end-of-season survey asking about total weeks worked, typical days per week and typical hours per day	212

Survey Experiment "alternative?"

Design	Interview-Type	Number of Households
Weekly-Visit	weekly in-person visits for the duration of the main season (~25 visits)	212
Weekly-Phone	weekly phone interviews for the duration of the main season (~25 calls)	212
Recall-NPS	Single end-of-season survey asking about total days in each of 4 activity & typical hours per day on each activity	218
Recall-ALT	Single end-of-season survey asking about total weeks worked, typical days per week and typical hours per day	212

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Measuring Farm Labor

Benchmark

Errors in recall data are assessed by comparing them to weekly visit, which we believe to be close to the truth, because:

- Day-by-day, plot-by-plot, person-by-person:
  - Based on a recall-and-count of labour instances
  - Not based on inference or rate-based calculations

- Short visits every week
  - Reduced recall period to minimize forgetting
  - Anchoring with previous visit to minimize telescoping

Identification

- Balanced on observables
- No differential attrition
- No differential self-reporting
- Hawthorne effects (+)? Respondent fatigue (-)?
  - No trend of increasing or decreasing labour inputs
  - Little difference face-to-face vs. phone
- Impact of giving mobile phone?
  - 72% HHs already owned a phone
- Intra-cluster randomisation: contamination?
  - Cluster level randomisation could not work with 18 villages
  - Agro-ecological factors controlled for
  - Villages large and diffuse

OUTLINE

Local context: MARA

- Mara region of Tanzania
- 6.4 HH members
- HH cultivates 4.6 plots, 1 acre each
- Plots are 30 minutes away (1 hour commute)
- Main farming season Jan-July
- Primary crops: cassava and maize
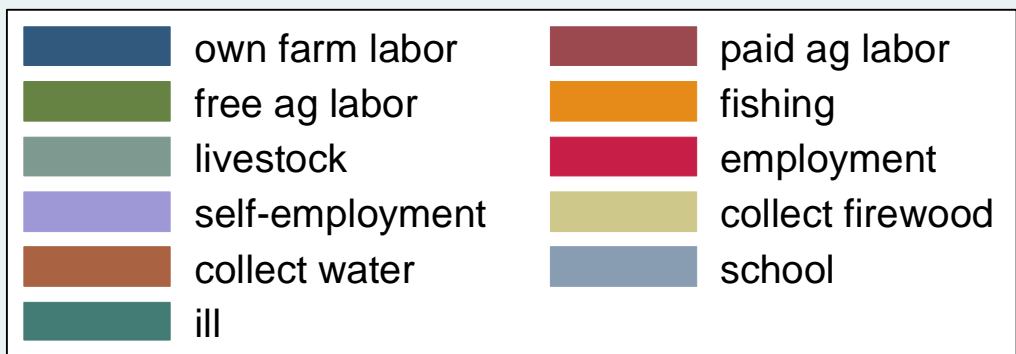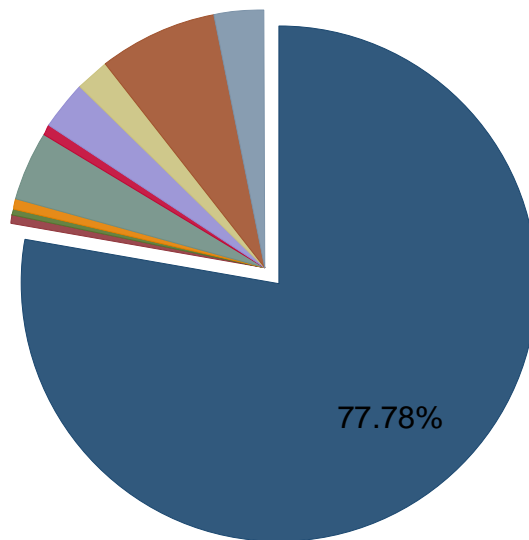- Secondary crops: beans, sweet potato, sorghum

Activities recorded in 25 weekly visits (>10yrs)

	% individuals engaged in the activity at least 1 day	average days worked per week, conditional on being active in the activity*	Hours per day in activity, conditional working that day
Own farm labour	87%	1.90	4.49
Paid ag labor	16%	0.34	4.65
Free ag labor	21%	0.28	4.38
Fishing	10%	1.23	6.38
Livestock work	27%	1.10	5.08
Employment off-farm	11%	1.00	8.39
Business activity	31%	1.43	7.60
Collecting firewood	56%	0.49	2.01
Collecting water	72%	2.75	1.23
Schooling	27%	2.76	7.86
Sick	48%		

* Not conditional on working that week

A day on the field

Any day with some own farm agricultural labor

77.78%

Legend:
- own farm labor
- paid ag labor
- free ag labor
- fishing
- livestock
- employment
- self-employment
- collect firewood
- collect water
- school
- ill

Accounting for 5.8 hours of activities

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Person-plot level results

	REPORTED				CALCULATED
	Total weeks	Total days	Avg. days per working week	Avg. hours per working day	Total hours per person-plot
Revisit					
Phone					
Recall NPS					
Recall ALT					

- Eligible persons are those >10 yrs, reporting any agricultural labour Jan-June (excluding paid agricultural work for others).
- Eligible plots are those on which any eligible individuals worked Jan-June
- Averages are calculated over all eligible person-plot combinations. If an eligible person did not work on eligible plot, then this is counted as a 0 in the average.

Person-plot level results

	REPORTED				CALCULATED
	Total weeks	Total days	Avg. days per working week	Avg. hours per working day	Total hours per person-plot
Revisit	2.52	9.22	3.66	4.14	39.54
Phone					
Recall NPS					
Recall ALT					

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Revisit	2.52	9.22	3.66	4.14	39.54
Phone					
Recall NPS					
Recall ALT	5.74	-	5.19	4.61	146.31

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	Total weeks	Total days	Avg. days per working week	Avg. hours per working day	Total hours per person-plot
Revisit	2.52	9.22	3.66	4.14	39.54
Phone					
Recall NPS	-	25.72	-	4.60	121.30
Recall ALT	5.74	-	5.19	4.61	146.31

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Person-plot level results

	REPORTED				CALCULATED
	Total weeks	Total days	Avg. days per working week	Avg. hours per working day	Total hours per person-plot
Revisit	2.52	9.22	3.66	4.14	39.54
Phone	2.57	10.68	3.68	4.38	48.81
Recall NPS	-	25.72	-	4.60	121.30
Recall ALT	5.74	-	5.19	4.61	146.31

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Mechanisms

- Large upward bias in days worked (roughly tripling the true value)

  - Irregularity of days worked: some agricultural work in 11.04 weeks (out of 26) and on 46.39 days (out of 182)

- Relatively modest upward bias in hours worked (adding 11% to 14% to the true value)

  - Regularity in hours worked conditional on working

Modal number of days/week

Modal days worked	Frequency (%)	Distribution of actual days worked, for a given mode (row %)						
		1	2	3	4	5	6	7
1	24.4							
2	12.1							
3	7.2							
4	6.4							
5	10.3							
6	29.0							
7	10.5							

Notes: mode taken for each member across all working weeks (N=9,508).

Modal number of days/week

Modal days worked	Frequency (%)	Distribution of actual days worked, for a given mode (row %)						
		1	2	3	4	5	6	7
1	24.4	**55.7**	14.9	7.8	6.4	5.6	7.3	2.3
2	12.1	17.9	**41.0**	11.4	8.4	8.2	8.5	4.6
3	7.2	14.7	14.7	**33.8**	11.1	11.8	10.0	3.9
4	6.4	11.8	13.8	12.8	**34.7**	11.2	11.8	3.9
5	10.3	12.2	13.0	13.6	11.3	**34.5**	11.7	3.7
6	29.0	9.1	7.6	9.0	11.0	15.4	**41.8**	6.1
7	10.5	6.2	8.7	8.4	9.5	11.1	15.3	**40.9**

Notes: mode taken for each member across all working weeks (N=9,508).

modal hours/day

Modal days worked	Frequency (%)	Distribution of actual days worked, for a given mode (row %)				
		2	3	4	5	6
2	5.4					
3	12.5					
4	48.3					
5	15.2					
6	18.6					

Notes: mode taken for each member across all working days. N=38,462.

modal hours/day

Modal days worked	Frequency (%)	Distribution of actual days worked, for a given mode (row %)				
		2	3	4	5	6
2	5.4	**48.9**	13.4	21.2	6.6	10.0
3	12.5	11.0	**53.4**	20.5	9.0	6.1
4	48.3	4.5	14.8	**57.0**	13.6	10.2
5	15.2	3.2	10.8	25.9	**46.5**	13.6
6	18.6	3.5	8.9	18.3	16.0	**53.3**

Notes: mode taken for each member across all working days. N=38,462.

Mechanisms

- Assuming respondents do not use recall and count strategies, how might they average?
  - Based on recent experiences, such as the last week, or the harvest period?
  - Based on peak labour periods (salience)?
  - Not taking account of weeks not worked? Assuming they worked every week?
  - Granularity? E.g. erroneously report total person hours at the person-plot level (x 4.6 estimate)
- Exercise: take slice of weekly data and scale (necessary, but not sufficient condition)

Scaling exercises (person level)

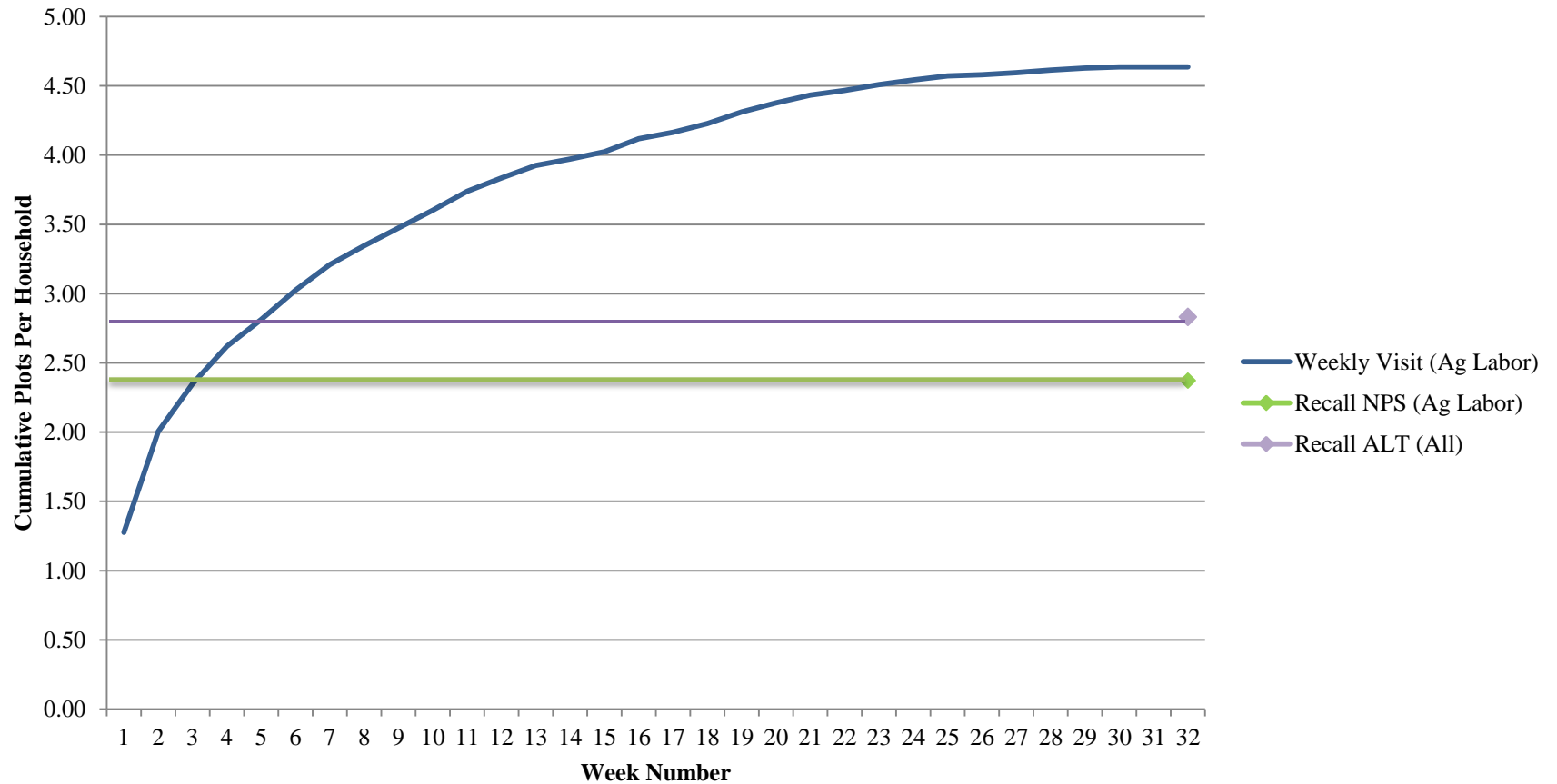|	Weekly Visit	Weekly Phone	Recall NPS	Recall ALT
Report from survey (no scaling)	201	228	314	390
Scaled up hours in busiest week	940			
Scale up hours in most recent week	393			
Scaled up hours in average harvest week	432			
Scaled up hours in average working week	411			

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Aggregating over plots and hours

	Weekly Visit	Weekly Phone	Recall NPS	Recall ALT
A. Per person-plot				
Hours	39.54	48.81***	121.30***	146.31***
Days	9.22	10.68***	25.72***	29.80***
B. Per person (sum over plots)				
Hours	201.02	228.25***	313.51***	389.46***
Days	46.39	49.57*	66.49***	79.32***
C. Per plot (sum over persons)				
Days	183.02	223.09***	363.89***	452.42***
Hours	42.23	48.45***	77.17***	92.14***
D. Per household (sum over person-plots)				
Hours	848.64	977.59*	865.10	1104.06**
Days	195.83	212.31	183.47	224.85

Cumulative no. of plots

Cumulative Plots per Household by Week

	Weekly Visit	Weekly Phone	Recall NPS	Recall ALT
Mean plot size (ha)	0.39	0.41	0.36	0.36
	(0.38)	(0.41)	(0.32)	(0.35)
Proportion owned	0.68	0.69	0.83***	0.82***
Mean distance from residence (minutes)	31.57	33.73	31.22	29.53
Distance (proportions):				
(0, 30] minutes	0.66	0.60***	0.74***	0.75***
(30, 60] minutes	0.23	0.27**	0.15***	0.16***
(60, 90] minutes	0.06	0.07	0.03**	0.03**
(90, 120] minutes	0.02	0.03*	0.06***	0.04**
(120, 240] minutes	0.03	0.03	0.03	0.02

Workers per HH per week

Cumulative Workers per Household by Week
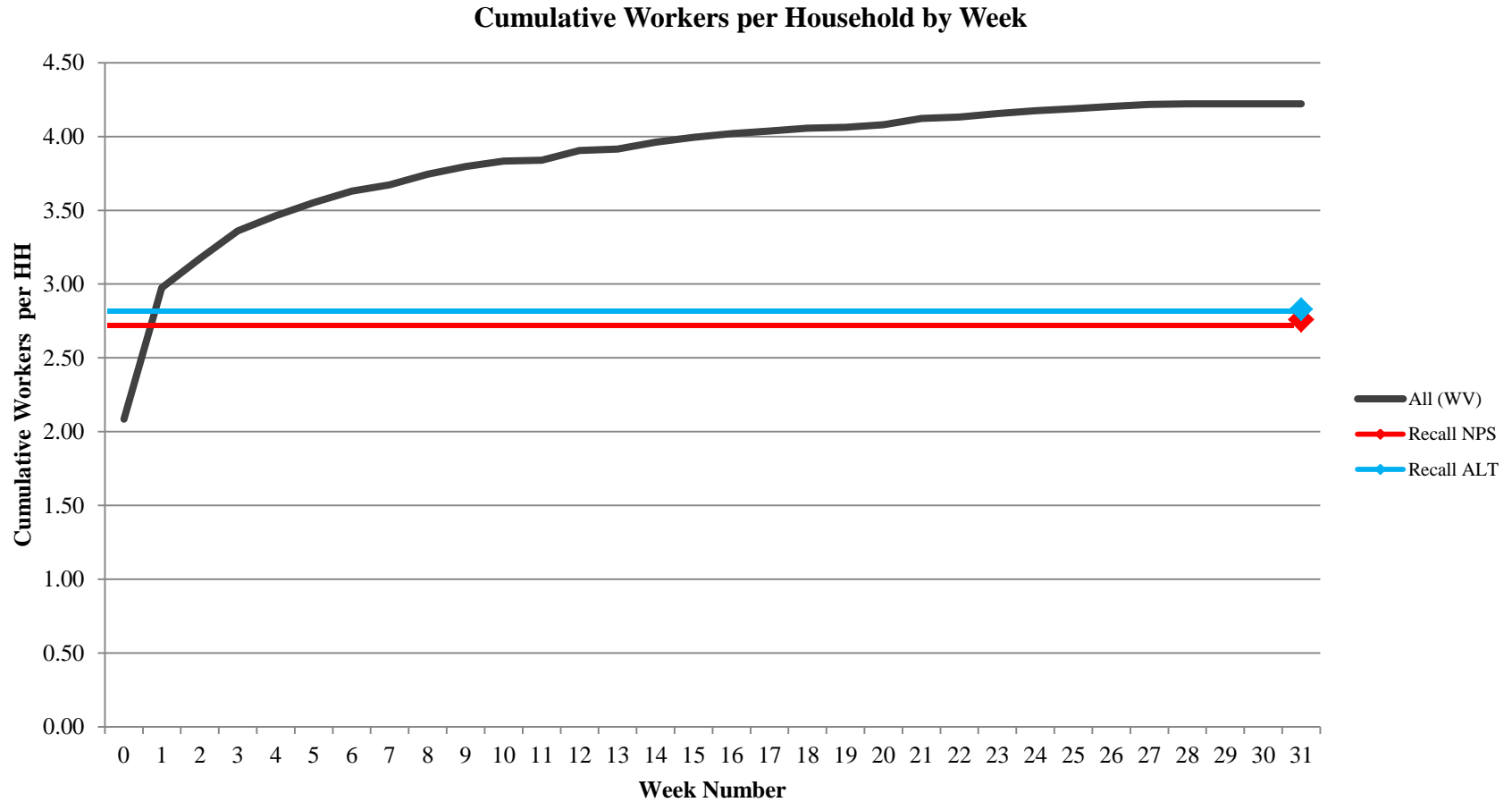
Person characteristics

	Weekly Visit	Weekly Phone	Recall NPS	Recall ALT
Proportion adults (ages 20 and up)	0.60	0.65**	0.74***	0.73***
Proportion children (ages 10-19)	0.40	0.35**	0.26***	0.27***
Proportion men	0.47	0.49	0.49	0.52**
Proportion women	0.53	0.51	0.51	0.48**
Proportion stated occupation farmer	0.78	0.78	0.82	0.83**
Proportion working <10 days (pp)	0.56	0.50***	0.13***	0.22***
Proportion working <20 days (pp)	0.78	0.76*	0.38***	0.44***
Proportion working <30 days (pp)	0.87	0.87	0.61***	0.57***
Proportion working <10 days (p)	0.19	0.16	0.06***	0.09***
Proportion working <20 days (p)	0.35	0.30**	0.16***	0.22***
Proportion working <30 days (p)	0.46	0.41**	0.29***	0.32***

(p) = per person; (pp) = per person-plot

Can three wrongs make a right?

	Weekly Visit	Weekly Phone	Recall NPS	Recall ALT
A. Per person-plot				
Hours	39.54	48.81***	121.30***	146.31***
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6. Mechanisms
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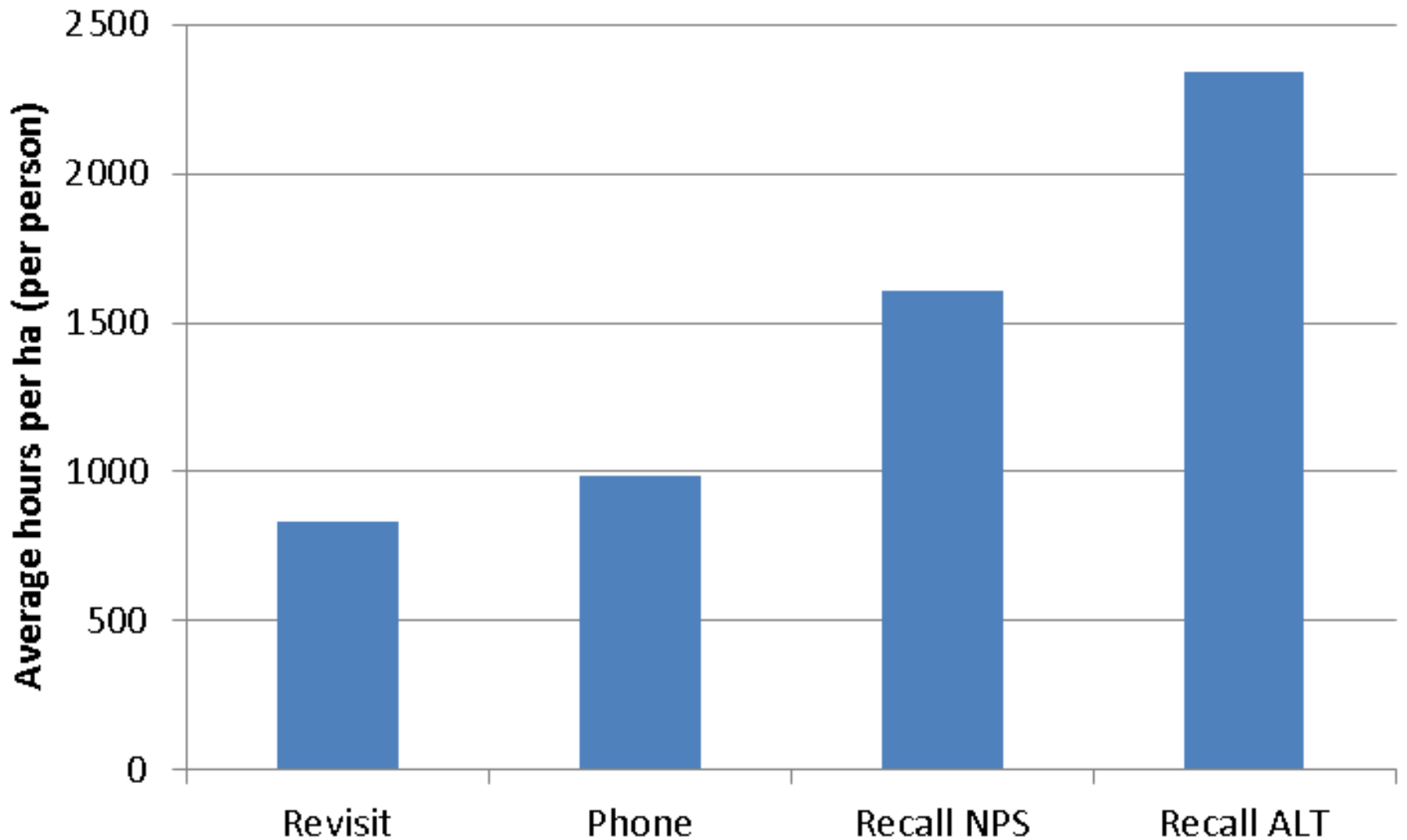8. **Conclusion**

CONCLUSIONS 1

- labor recall modules exaggerate estimates of the total days and hours worked by individuals on plots.

- Likely due to the irregularity of such work

- recall can even distort information on the number of plots and the number of people who work on the farm

- Various forms of bias compete with each other

- Phone surveys perform well technically, but are they cost-effective?

High frequency phone surveys: cost

Table 11: Per household interviewing costs as a percentage of the baseline survey cost

		Weekly Visit	Weekly Phone
Cost per Household US$	1 visit	14%	6%
Cost increase relative to the cost of an LSMS-type survey	10 visits	139%	54%
	20 visits	277%	108%
	25 visits	346%	135%
	30 visits	416%	162%

Exaggerated hours per ha

CONCLUSIONS 2

- Misallocation of labour across sectors (Gollin e.a. 2015)

- If we exaggerate labour inputs then, *ceteris paribus*, we underestimate productivity of people...

- Raises question for future research: why do people not work more?
  - Demand for leisure?
  - Market imperfections?
  - Is our concept of farm labour too narrow?

Thank you!

Sources of Discrepancy

- ## Which plots are being forgotten?
  - Exclusion of late-added and early-dropped plots does not appear to account for the gap in hours, nor the gap in total household plots
  - Plot characteristics do not predict likelihood of exclusion from recall reports
    - Distribution of plots reported by plot characteristics (e.g. proximity to home, ownership status, crops) similar across recall and weekly plots

- ## Who is being forgotten?
  - Exclusion of household members who do not report work , household members who report infrequent or highly variable work, and household members who are non-farmers does not appear to account for the gap in hours, nor the gap in total household workers