

A Field Test of Adaptive Nonresponse Follow-Up Procedures in an Establishment Survey

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BACKGROUND



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Background

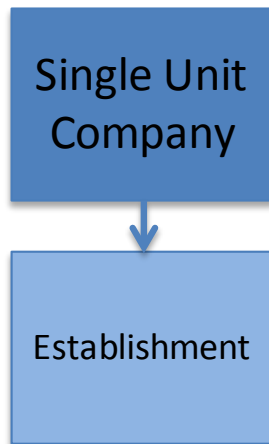
- 2017 Economic Census is conducting a series of embedded field experiments on data collection features
 - Ongoing annual business surveys
 - Adaptive nonresponse follow-up (NRFU) as one potential collection strategy
- NRFU protocols considered
 - Targeted allocation
 - Nonrespondent subsampling

Economic Census

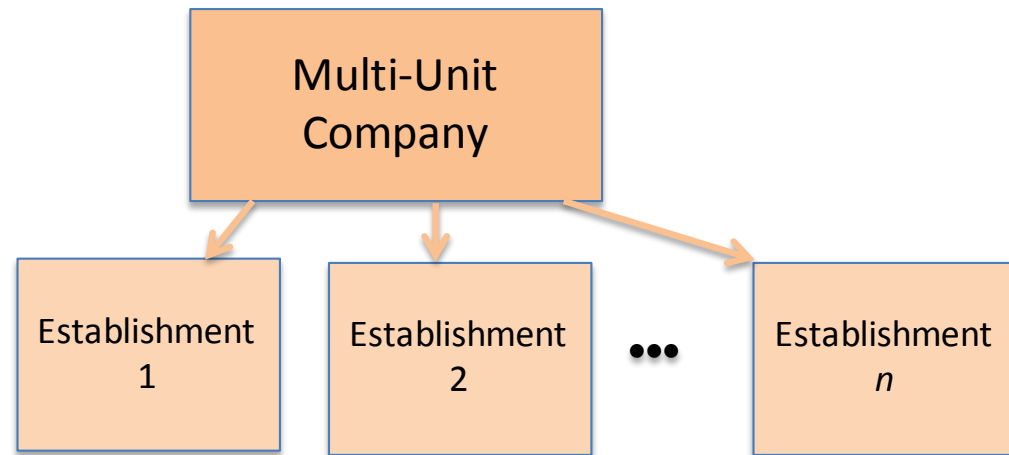
- Conducted every five years
- Covers eighteen non-farm sectors
- Surveys over 4 million **establishments**
- Produces industry and geographic estimates
- Provides data for sampling frames
- (Starting in 2017) Electronic collection
 - Mail-out for initial contact

Business Organization Structures (Simplified)

Single Unit (SU)



Multi Unit (MU)



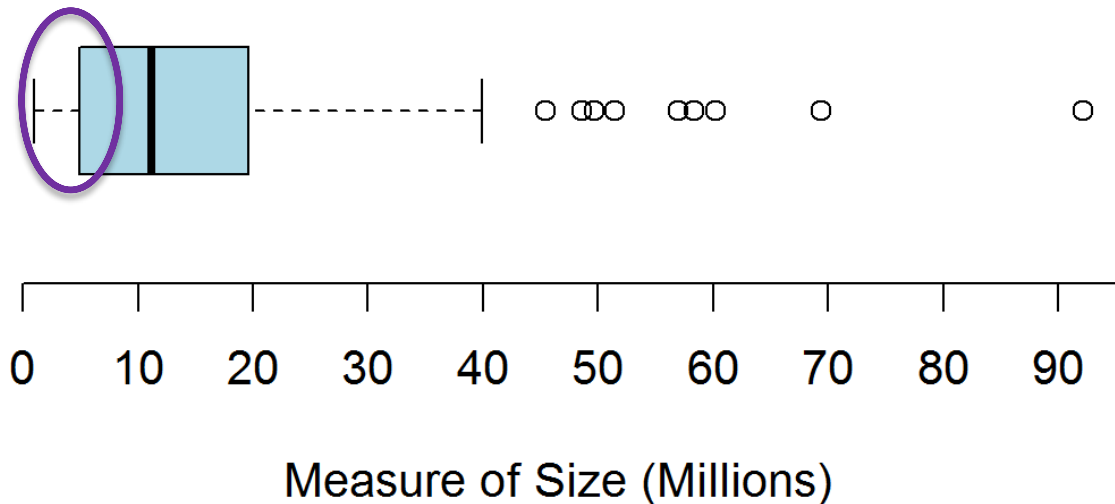
- One primary industry

- Can operate in more than one industry

“Hard to Reach”

Small Single Unit Establishments

- Contribute small proportion of tabulated totals
- Cognitive and bookkeeping factors
- Generally last priority for follow-up (inexpensive)



Annual Survey of Manufactures (ASM)

- Alternative to Economic Census in off-census years (manufacturing sector)
 - Similar electronic questionnaire
 - Similar editing/imputation procedures
- Different sampling design
 - Census – Stratified SRS-WOR
 - ASM – Stratified PPS-WOR

Research Projects

Sample Design

1. 2013 and 2014
 - Optimized allocation approaches
 - Simulation study (ASM)
2. 2016
 - Improved optimized allocation approaches
 - Simulation study (ASM)

Field Tests

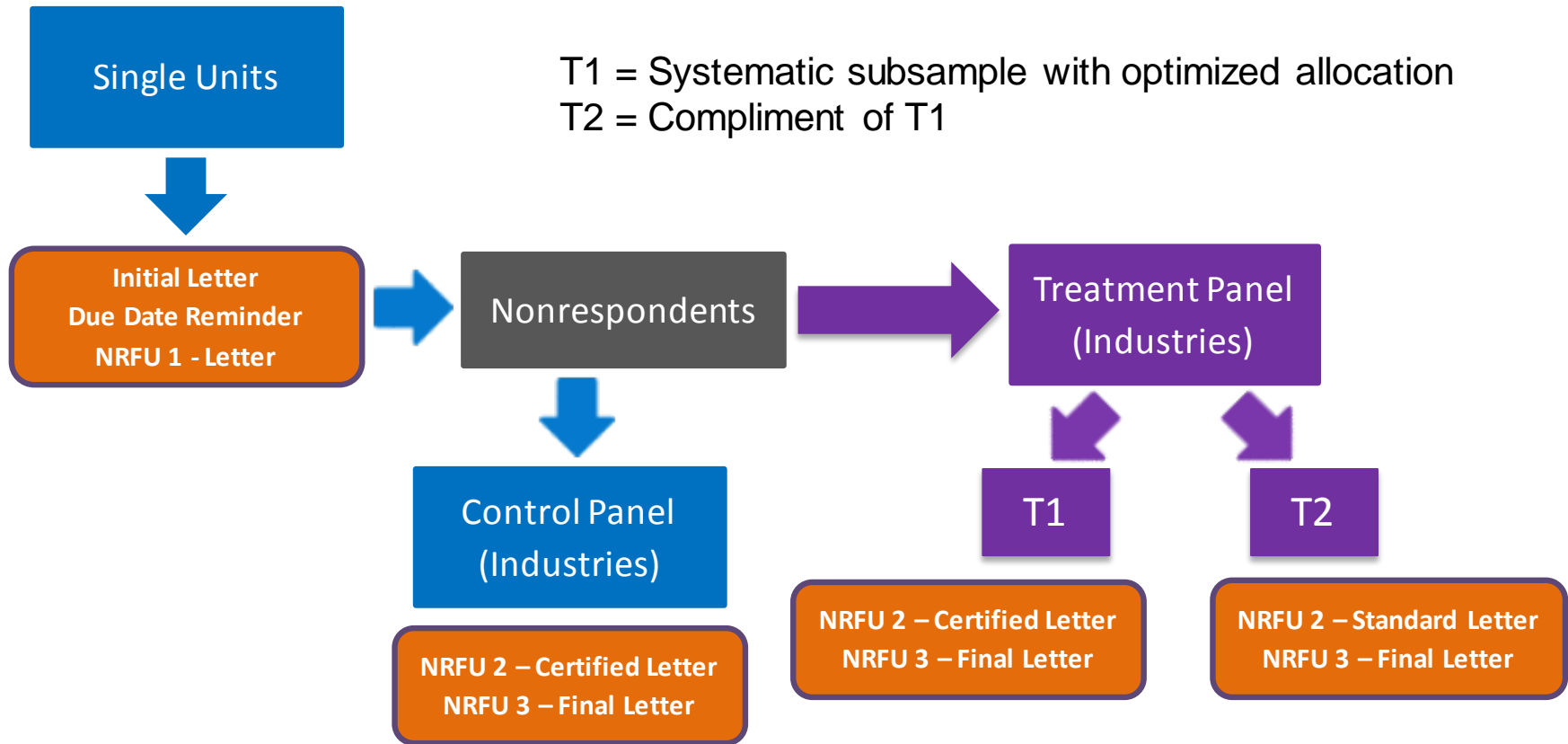
1. 2015 (2014 Collection)
 - ASM Single Unit establishments
 - Three nonresponse follow-up (NRFU) strategies compared
 - Recommendation for certified letter as NRFU
2. 2016 (2015 Collection)
 - ASM Single Unit establishments
 - Same NRFU versus “adaptive” NRFU
 - Analysis presented today

2015 FIELD TEST DESIGN

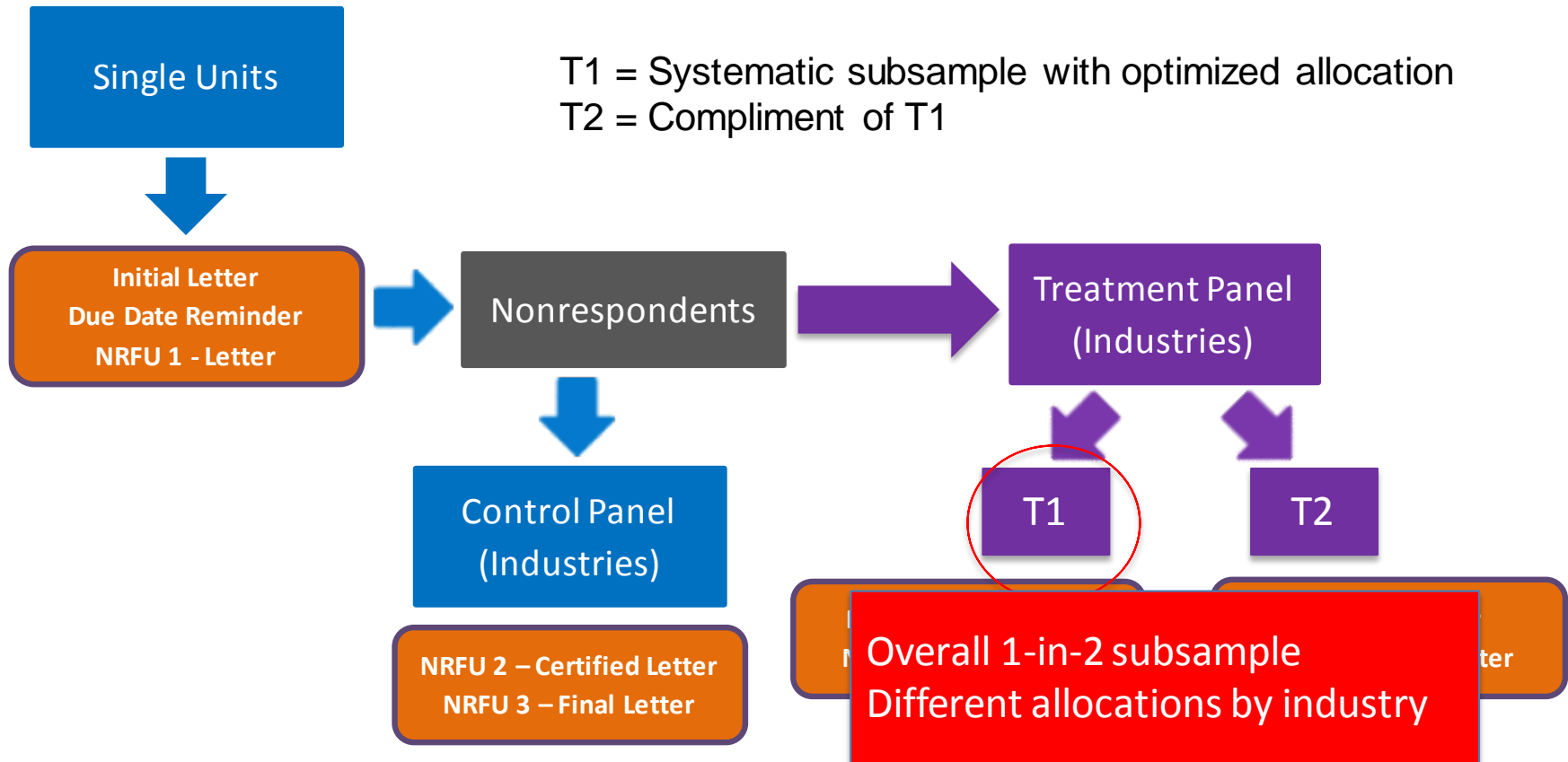


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2015 ASM Field Experiment



2015 ASM Field Experiment



NRFU Treatments (Single Units)

Domain 1	Responders	\$\$ NRFU
Domain 2	Responders	\$\$ NRFU
Domain k	Responders	\$\$ NRFU

Control panel with certified letter (\$\$)

Domain 1	Responders	\$\$ NRFU	\$ NRFU
Domain 2	Responders	\$\$ NRFU	\$ NRFU
Domain k	Responders	\$\$ NRFU	\$ NRFU

Targeted Allocation: Certified letter (\$\$) and standard letter (\$)

Domain 1	Responders	\$\$ NRFU	
Domain 2	Responders	\$\$ NRFU	
Domain k	Responders	\$\$ NRFU	

Nonrespondent Subsampling: Certified letter (\$\$) for probability subsample only

EVALUATION METHODS



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Evaluation Measures

Measure	Description	Range	Level
Proxy Response Rate	Ratio of responding establishments to sampled establishments (unweighted)	0% - 100%	Panel
Quantity Response Rates	Proportion of tabulated item value obtained from reported data (weighted)	0% - 100%	Panel by item
Source of Data Item	Proportion of responding units that retain reported data after processing	0% - 100%	Panel by item
Fraction of Missing Information (FMI)	Measure of effects of potential nonresponse bias on collected items	0 - 1	Panel by item

Fraction of Missing Information (FMI)

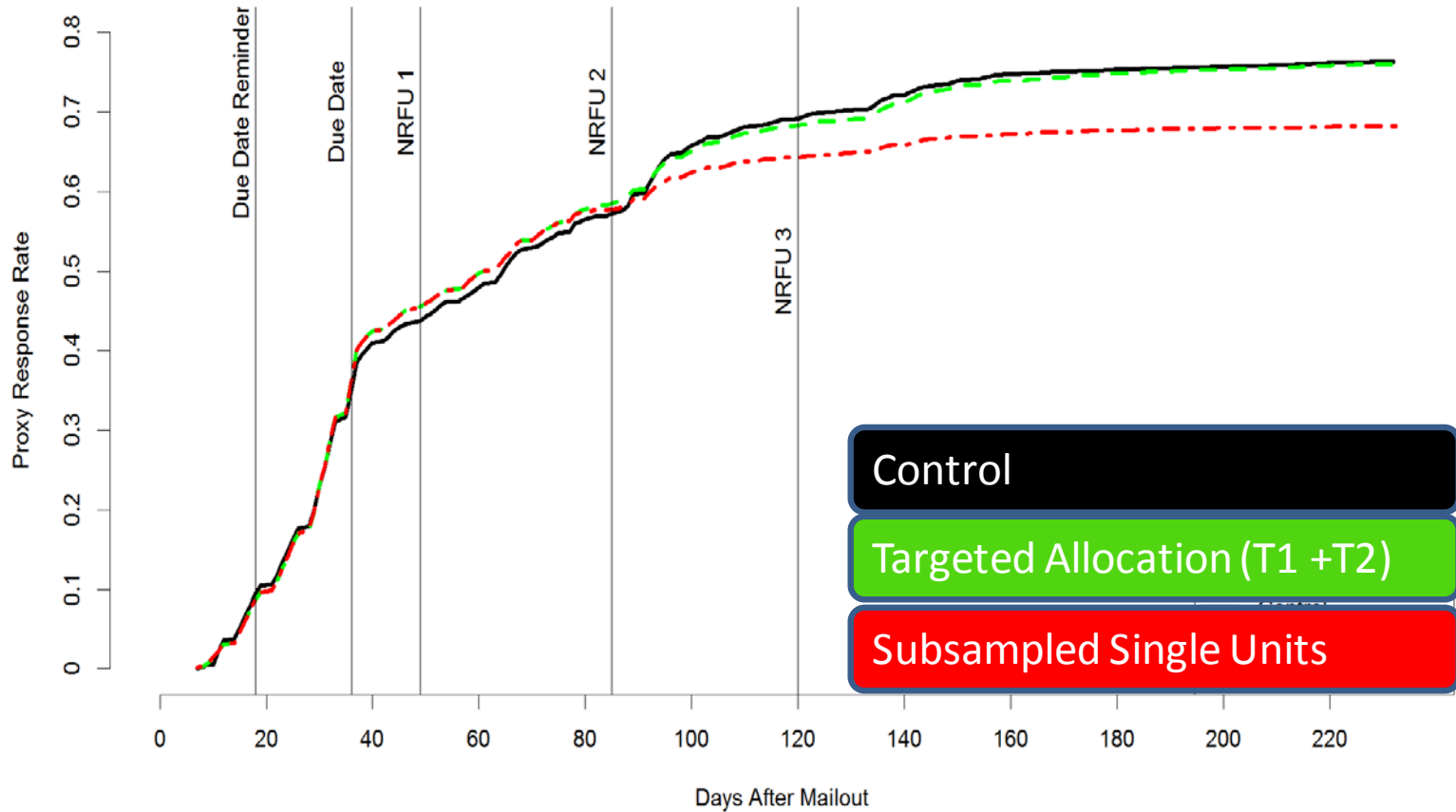
- Multiple Imputation
- Proxy Pattern-Mixture (PPM) Model
 - Gamma PPM Model (Andridge and Thompson 2015)
 - Predicted outcome variable from frame measure of size (Proxy)
 - Obtained different models for respondents and nonrespondents (Pattern-Mixture model)
 - Measured sensitivity by range of response mechanisms
 - MAR = missing at random – “Best Case”
 - NMAR = not missing at random – “Worst Case”

RESULTS

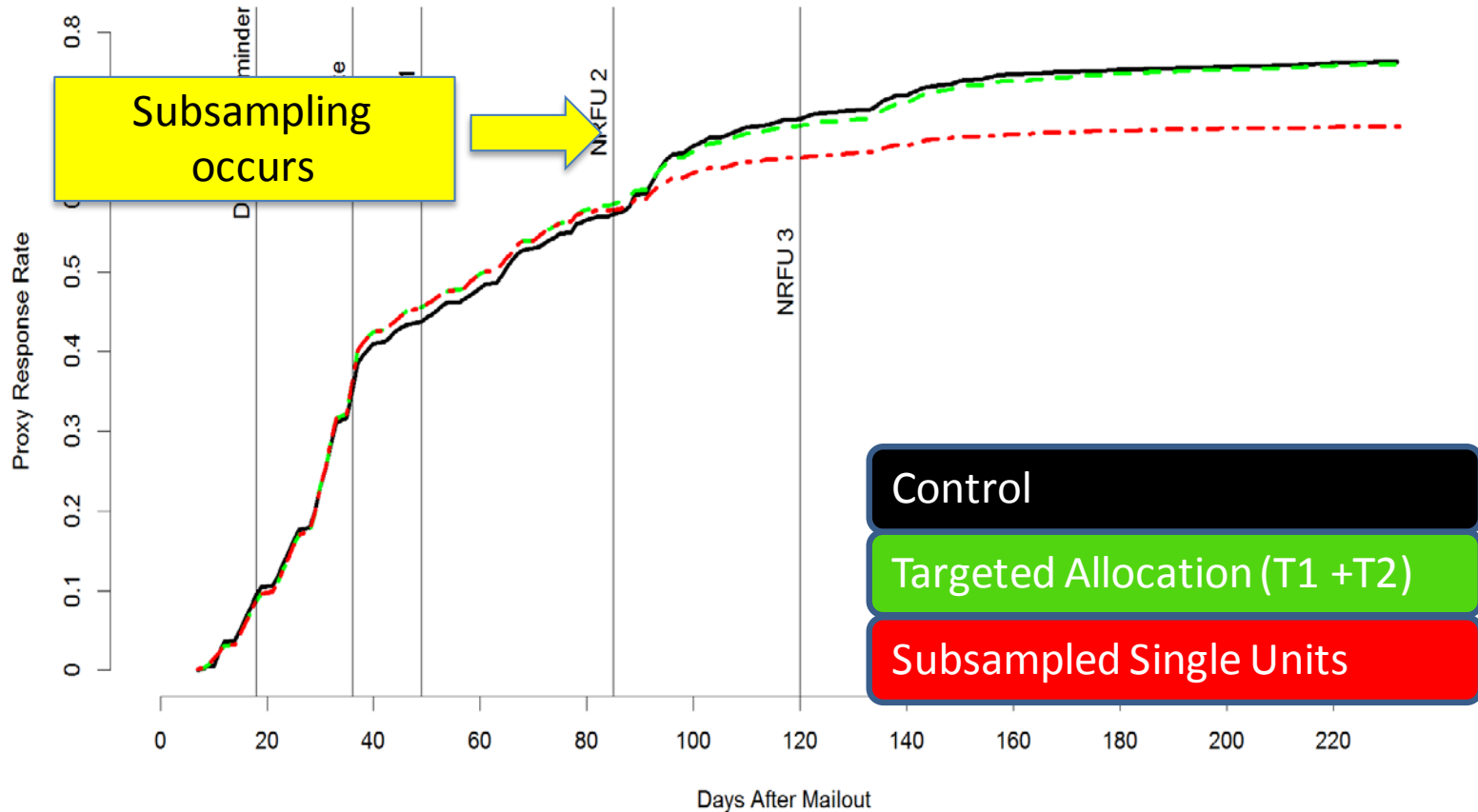


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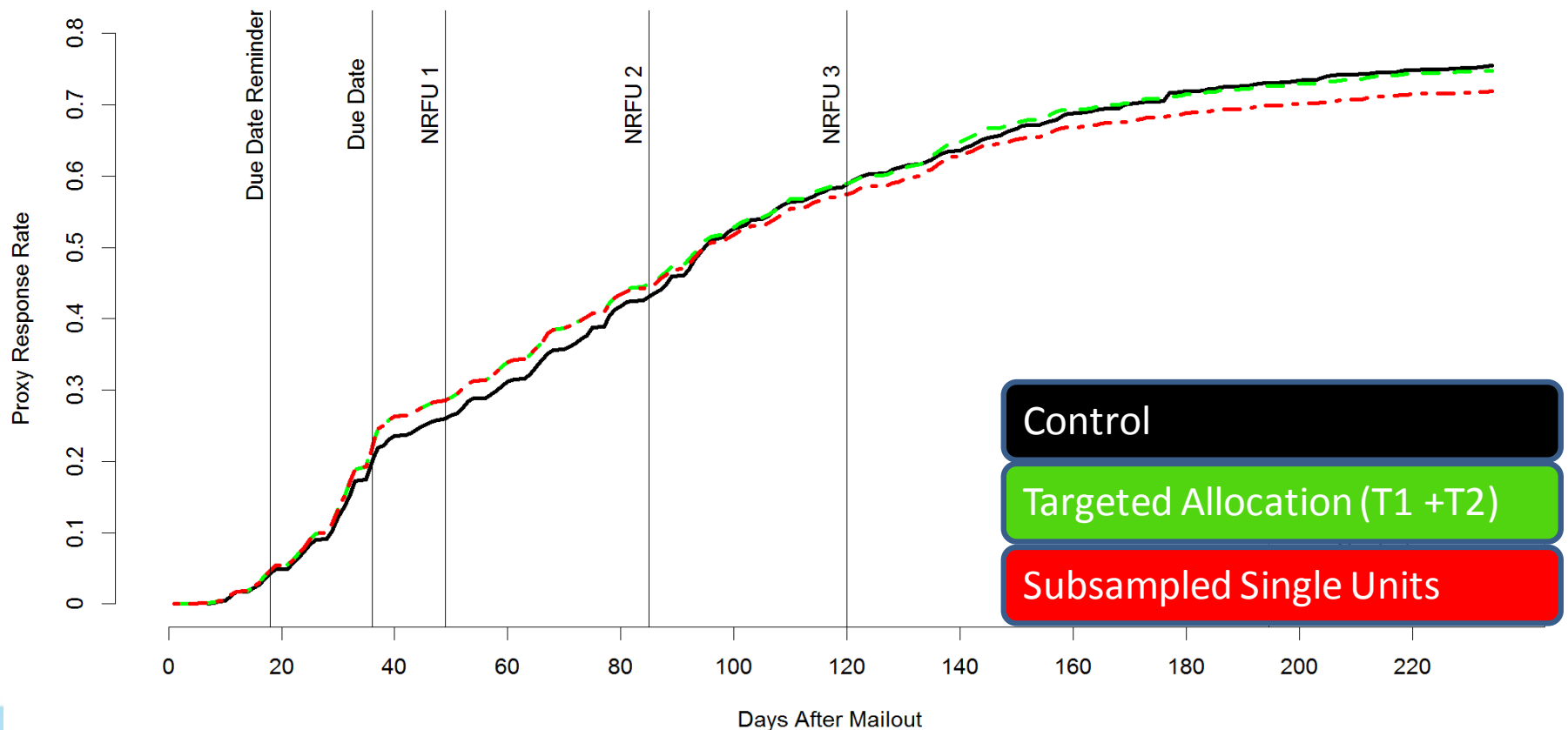
Proxy Response Rate: Single Units



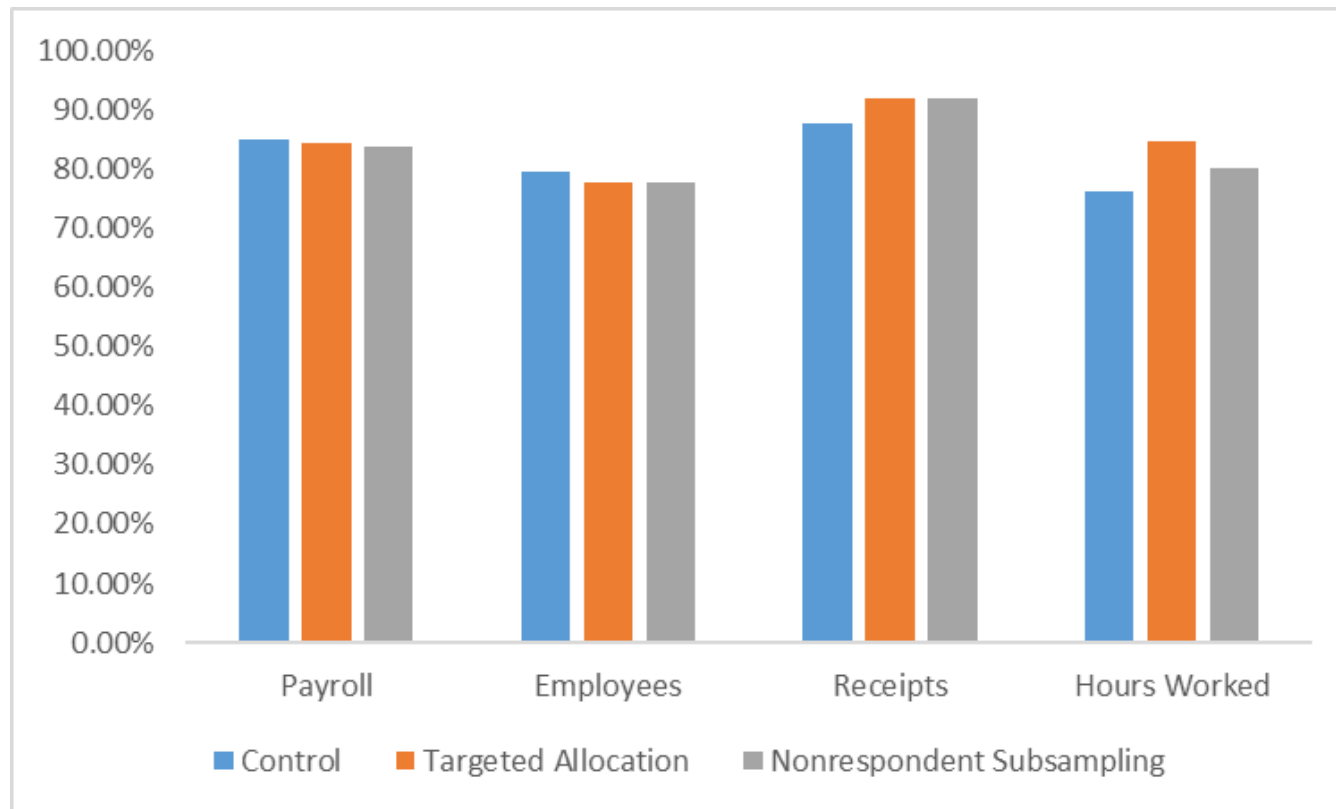
Proxy Response Rate: Single Units



Proxy Response Rate: All Units

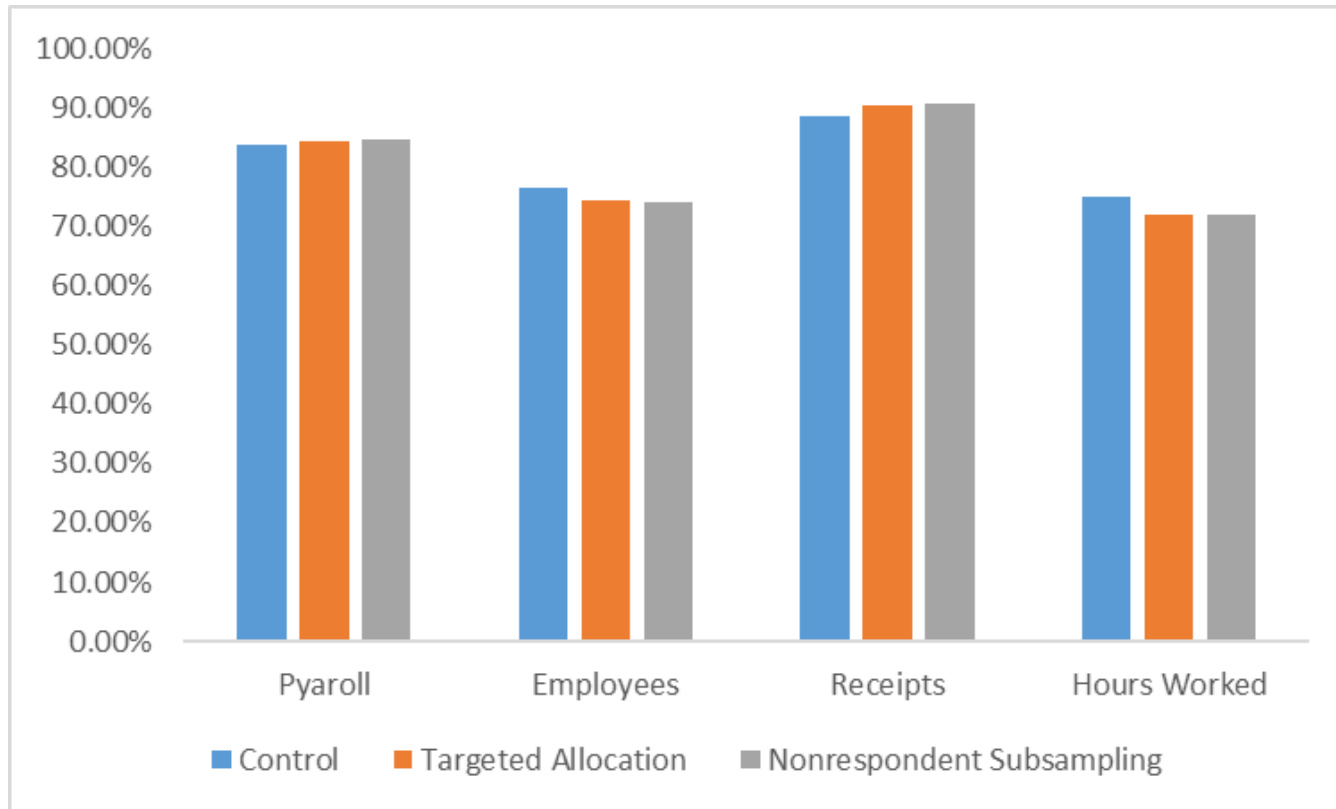


Quantity Response Rates Single Units (Treatment Eligible)



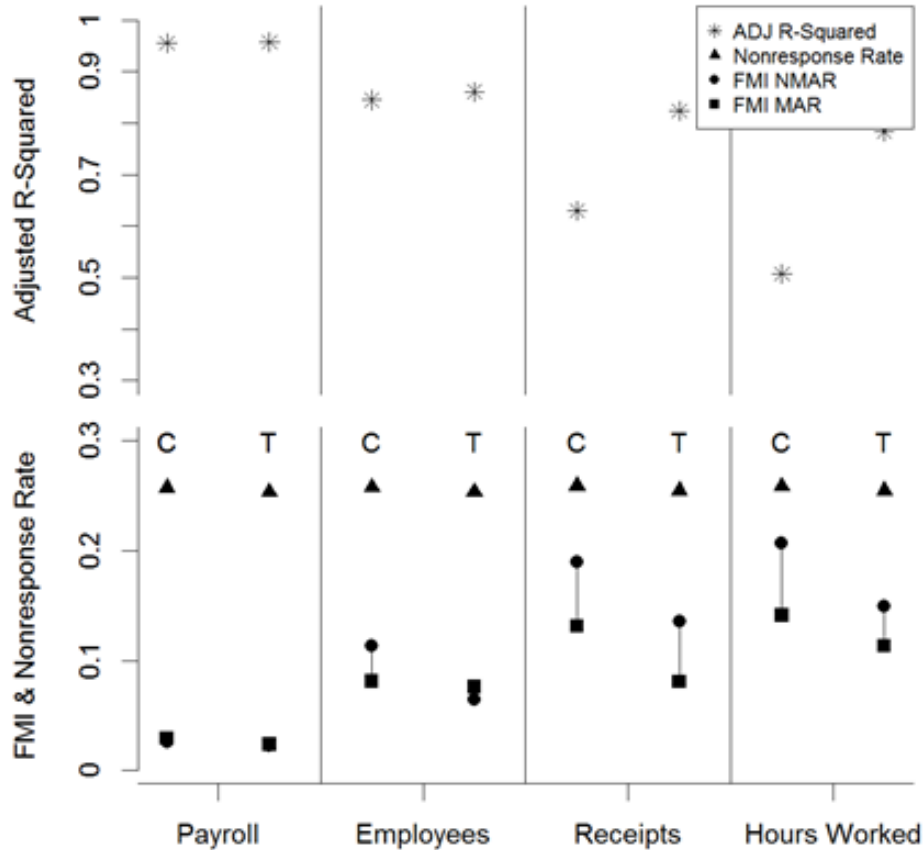
Source of Data Item

Single Units (Treatment Eligible)



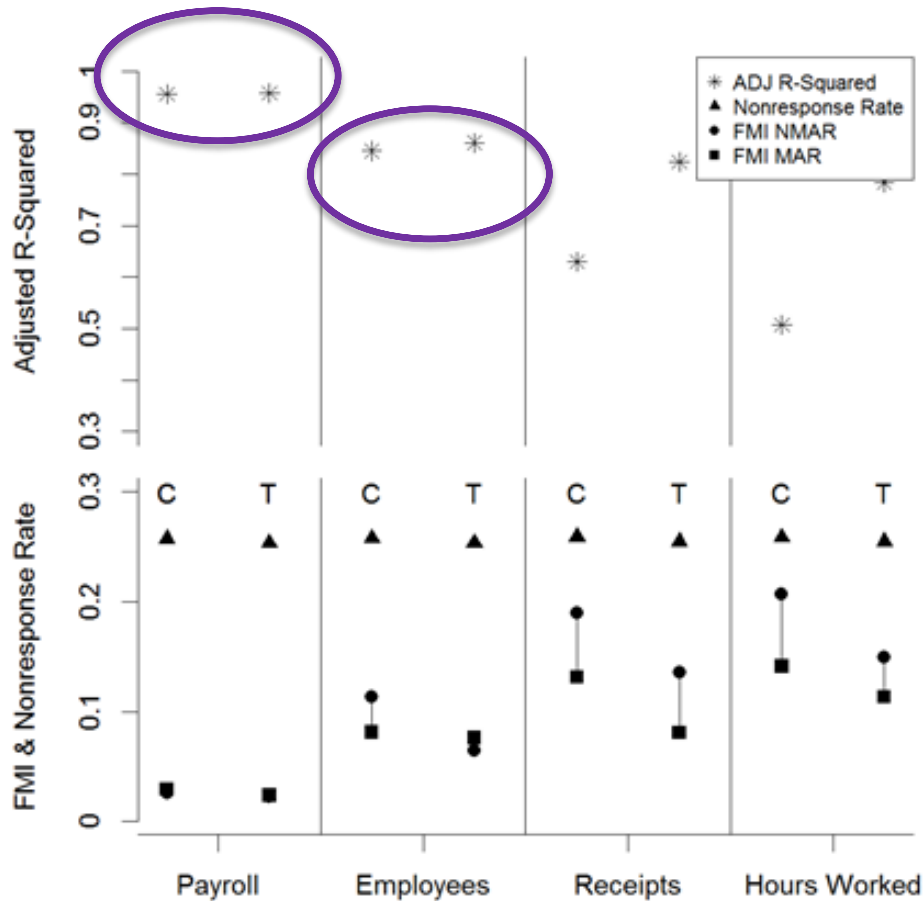
FMI Results – Single Units Targeted Allocation (T)

Strength of Proxy



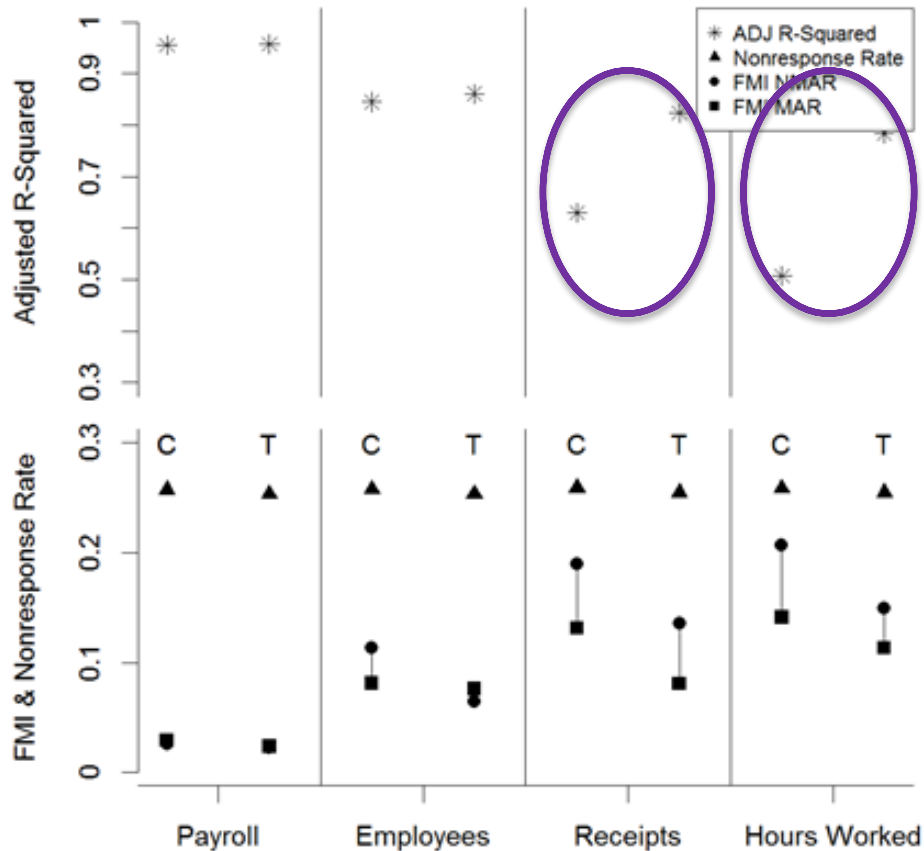
FMI Results – Single Units Targeted Allocation (T)

Strength of Proxy – About the Same in Both Panels

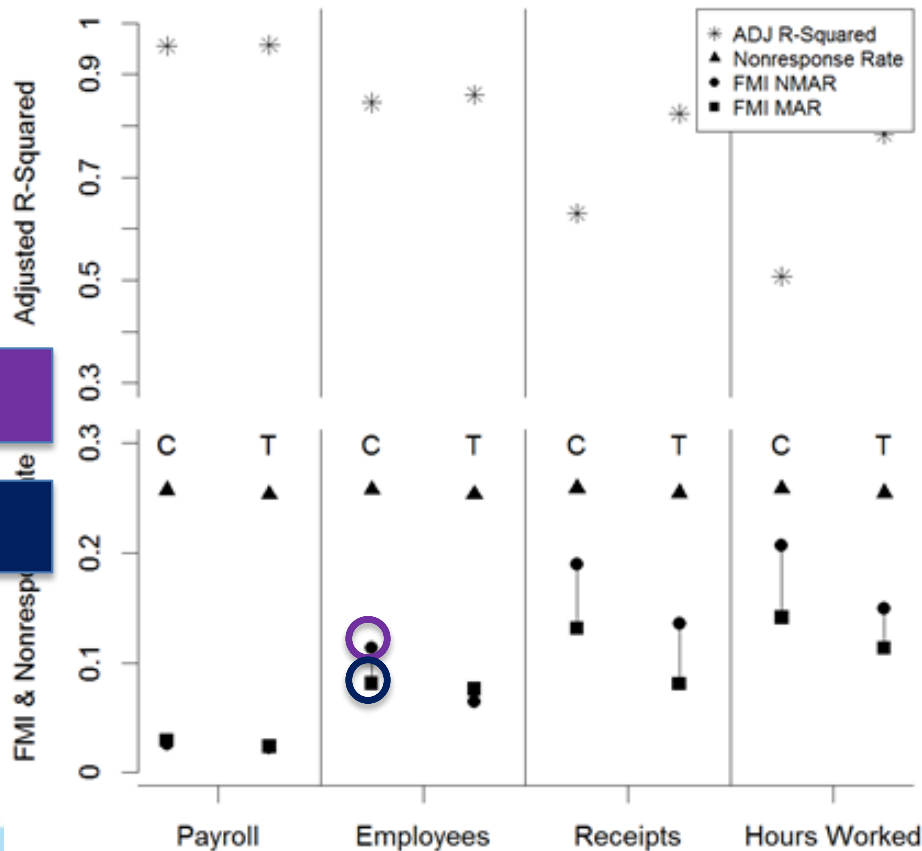


FMI Results – Single Units Targeted Allocation (T)

Strength of Proxy – Stronger in Treatment Panel



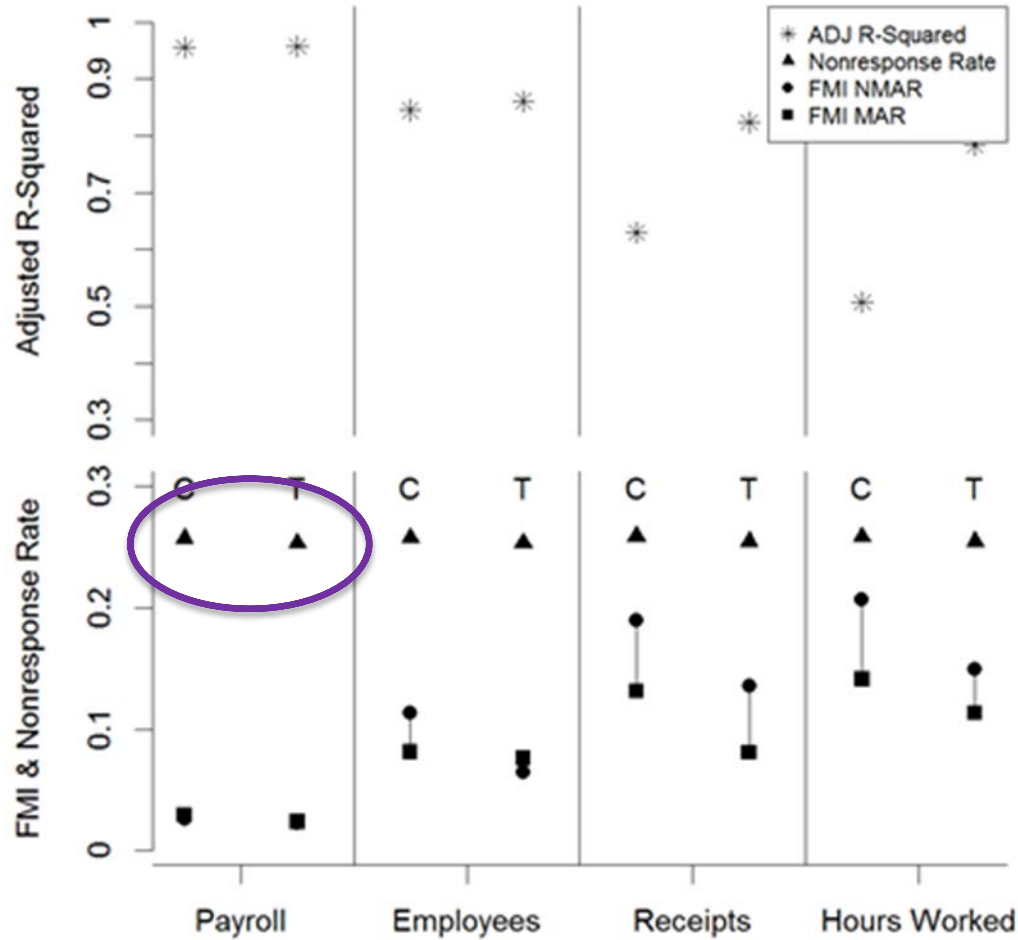
FMI Results – Single Units Targeted Allocation



● = FMI for NMAR

■ = FMI for MAR

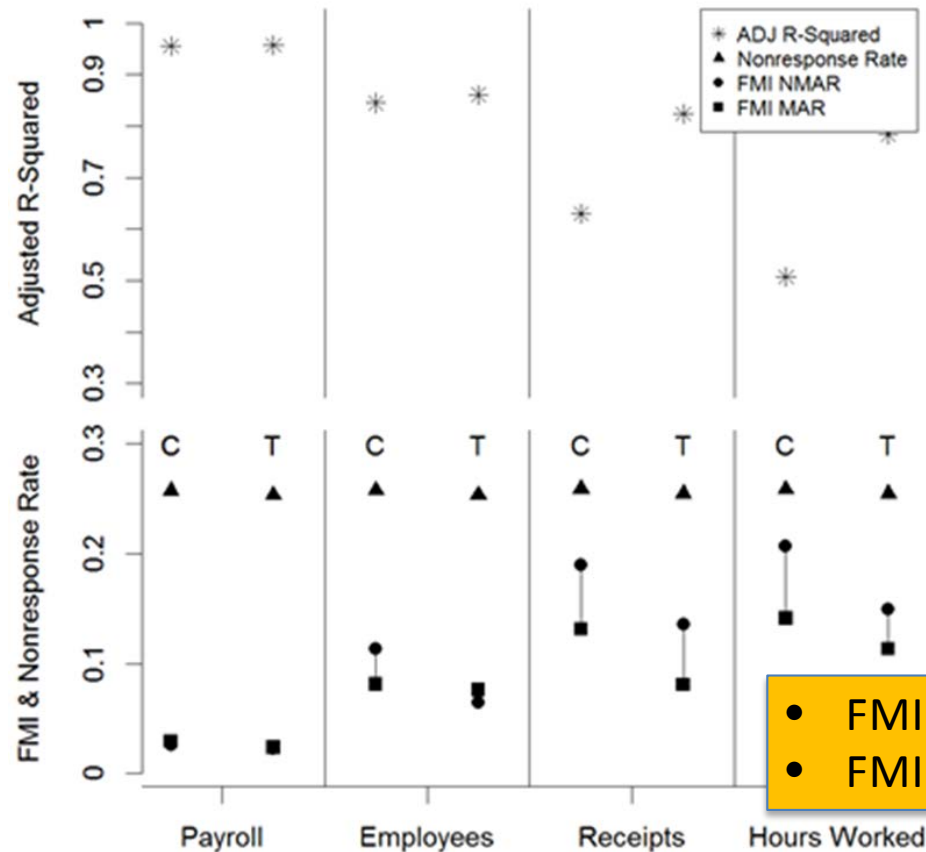
FMI Results – Single Units Targeted Allocation



Unit Nonresponse Rate
 $NRR = 1 - URR$

$FMI < NRR \Rightarrow$ “balanced”
 response set

FMI Results – Single Units Targeted Allocation



Conclusions

- Targeted Allocation Procedure Effective
 - Maintains unit and item response rates
 - No detrimental effects on data quality
 - Reduced cost over current procedure
- No nonrespondent subsampling option
- Plans in place to implement the targeted allocation procedure in
 - 2016 ASM
 - 2017 Economic Census

References

- Kaputa, S.J., L. Bechtel., K.J. Thompson, and D. Whitehead. 2014. Strategies for Subsampling Nonrespondents for Economic Programs.” In *Proceedings of the Section on Survey Research Methods*, August 6, 2014. Alexandria, VA: American Statistical Association.
- Andridge, R.R. and K.J. Thompson. 2015(B). Assessing Nonresponse Bias in a Business Survey: Proxy Pattern-Mixture Analysis for Skewed Data. *Annals of Applied Statistics* 9(4): 2237–2265.
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- Kaputa., S.J. and Thompson, K.J. 2018 (submitted). Adaptive Design Strategies for Nonresponse Follow-Up in Economic Surveys. *Journal of Official Statistics*.
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Thank you

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