Do Imputed Earnings Earn Their Keep? Evaluating SIPP Earnings and Nonresponse with Administrative Records

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ASSA Annual Meetings
San Francisco, CA
1/3/2016

United States Census Bureau
U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov

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How Do Survey & Admin Earnings Compare?

- Historically, survey data has been the main source of information about earnings.
- Previous work has evaluated the quality of survey earnings data by comparison to an alternative data source.
- “Measurement error” appears to be:
  - correlated negatively with earnings — Bound & Krueger (1991), Bollinger (1998), Gottschalk & Huynh (2010), and
  - correlated with earnings determinants — Pedace & Bates (2000), Cristia & Schwabish (2009).
- Abowd & Stinson (2013) suggest that reported survey earnings are similar to administrative earnings in reliability, but...
- imputed survey earnings are less reliable than administrative earnings.

Census Bureau Imputation

- Reported earnings might be missing because:
  - the person was not interviewed or declined to provide any labor force data ("unit nonresponse"), or
  - the person declined to answer earnings questions when asked ("item nonresponse").
- Imputation fills in by copying earnings reported by a "donor" with similar observables.
- Panel surveys can use previous wave data for imputation

To Keep or Not To Keep?

- Hirsch & Schumacher (2004) and Bollinger & Hirsch (2006) show that imputation introduces "match bias" if not all earnings determinants are incorporated.
- Analysts commonly exclude imputed earnings from regressions to mitigate match bias.
- This strategy assumes that earnings nonresponse is unrelated to true earnings ("ignorable").
- Although Bollinger & Hirsch (2013) argue that omitting imputed earners avoids major bias in estimated slope coefficients,...
- Bollinger et al. (2015a,b) show that earnings nonresponse is more likely in the tails of the administrative earnings distribution.

Our Contribution

- Compare labor earnings in the Survey of Income and Program Participation (SIPP) and in the Social Security Administration's Detailed Earnings Record (DER).
- Point to whose earnings would be affected most by replacing survey data with administrative data.
- Investigate the predictors of earnings nonresponse, aiming to understand:
  - who is likely to have noisier earnings data, and
  - whether earnings response bias is ignorable.
- Synthesize these findings by examining implications for estimates of the earnings structure.

Preview of results

- Reported earnings match administrative more closely than imputed earnings.
- There is heterogeneity in how well different methods of imputing survey data match administrative data on average.
- Individuals who are male, more educated, self-employed, and non-recipients of programs have larger average deviations of survey and admin earnings.
- Individuals who are male, self-employed, and non-recipients of programs are more likely to lack earnings data.
- We document a novel pattern of nonresponse along the adminsitrative earnings distribution.
- Ambiguous implications for estimates of earnings regression coefficients.

Road Map

Introduction

Data

Benchmarking

- Graphical Analysis
- Regression Analysis

Predictors of Survey Earnings Nonresponse

Implications for Estimates of the Earnings Structure

Conclusion

Survey of Income and Program Participation

- SIPP is a large, nationally representative, panel dataset.
- 2008 SIPP panel begins in May 2008.
- We use all waves through March 2013.
- At every interview (“wave”), respondents answer a core set of questions about the previous four months.
- Each SIPP wave offers monthly earnings from up to two jobs, up to two businesses, moonlighting, and severance pay.
- For person-year analysis, we aggregate nonresponse and earnings to the annual level.

Detailed Earnings Record

- Specialized extract of uncapped earnings from SSA's Master Earnings File.
- Record of all wages, tips, and other earnings reported on each W-2 received by workers for an employer.
- Record of all taxable income reported on Form 1040, Schedule SE for self-employed workers.
- We aggregate non-deferred earnings, deferred earnings, and self-employment earnings to the person-year level.
- We use 2009 through 2012.

▸ Linking SIPP to DER

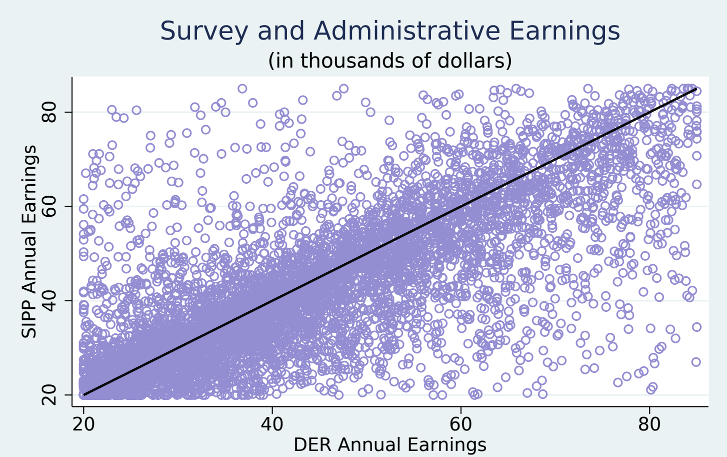
The Average Deviation of SIPP and DER Earnings

	(1)	(2) Absolute	(3)
	DER-SIPP	Difference	Obs
Including Zero Earners	$969	$6,277	158,168
Excluding Zero Earners	$1,928	$10,429	89,418

▸ Presence of Earnings

▸ Measurement Error?

DER vs SIPP: Earnings

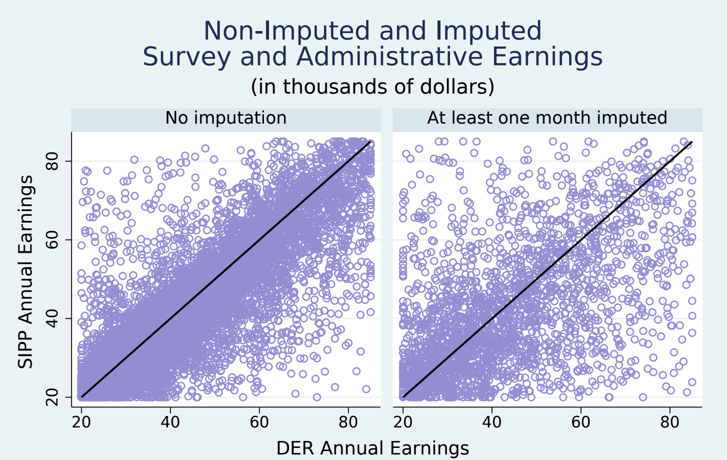


Source: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Waves 1 through 14 and the Social Security Administration's Detailed Earnings Record, calendar years 2009 through 2012.

▸ Histogram

DER vs SIPP: Earnings

By Imputation Status



Source: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Waves 1 through 14 and the Social Security Administration's Detailed Earnings Record, calendar years 2009 through 2012.

DER-SIPP Regressions

Any Nonresponse, Including Nonemployed

	(1)	(2)
VARIABLES	DER-SIPP	Absolute Difference
Any nonresponse	-1,919.228***	6,898.190***
	(150.799)	(115.027)
Female	-681.496***	-3,068.404***
	(98.211)	(80.129)
Black, non-Hispanic	633.243**	512.375**
	(266.341)	(221.789)
Asian, non-Hispanic	1,278.955***	791.004**
	(423.778)	(341.302)
White, non-Hispanic	367.802	626.719***
	(234.691)	(196.445)
Hispanic	1,344.658***	347.540
	(293.877)	(241.735)
Married, spouse absent	324.423	-83.473
	(486.621)	(413.664)
Never married	-405.975**	-1,326.117***
	(159.209)	(130.404)
Previously married	-104.780	-502.648***
	(121.522)	(100.496)
Any transfer income	-730.051***	-3,050.304***
	(92.119)	(94.792)
	(CONTINUED...)	

	(1)	(2)
VARIABLES	DER-SIPP	Absolute Difference
Elementary school	-275.560	-114.830
	(173.785)	(151.381)
Some high school	23.273	-483.810***
	(118.404)	(102.572)
Some college	327.244**	651.344***
	(138.261)	(113.620)
Associate's degree	291.111**	532.843***
	(130.985)	(106.704)
Bachelor's degree	975.960***	2,909.959***
	(172.324)	(139.714)
Master's degree	1,239.306***	4,055.376***
	(272.902)	(218.525)
Professional degree	2,851.460***	10,487.695***
	(869.993)	(693.289)
Doctorate degree	2,214.646***	6,993.012***
	(781.239)	(630.579)
Foreign-born, citizen	740.761***	431.731**
	(252.788)	(202.519)
Non-English speaker	-463.043**	343.148**
	(218.351)	(173.367)
Observations	158,168	158,168
R-squared	0.010	0.182

DER-SIPP Regressions

Detailed Nonresponse, Including Nonemployed

	(1)	(2)
VARIABLES	DER-SIPP	Absolute Difference
Any hot-deck imputation	-6,625.835***	3,681.865***
	(317.637)	(243.895)
Any Type-Z imputation	2,239.581***	162.567
	(193.760)	(170.977)
Any longitudinal labor force imputation	-3,051.713***	2,686.463***
	(448.855)	(343.988)
Any imputation based on last month — Reported	408.605	2,269.766***
	(309.375)	(232.990)
Any imputation based on last month — Imputed	3,515.126***	7,322.420***
	(431.305)	(313.817)
Any imputation based on last month — Logical	1,264.158	5,519.321***
	(828.437)	(624.038)
Any logical imputation	861.216***	387.869**
	(210.012)	(163.952)
Any proxy response	663.439***	192.747**
	(105.395)	(87.480)
Observations	158,168	158,168
R-squared	0.019	0.177

▸ Types of Imputation

DER-SIPP Regressions

Detailed Nonresponse, Positive Earners Only

VARIABLES	DER-SIPP	Absolute Difference
Any hot-deck imputation	-2,373.737***	-1,860.838***
	(454.256)	(335.743)
Any Type-Z imputation	3,218.760***	1,312.942***
	(655.354)	(504.035)
Any longitudinal labor force imputation	-2,671.681***	-493.946
	(776.459)	(589.965)
Any imputation based on last month — Reported	-603.211*	2,826.048***
	(361.068)	(272.946)
Any imputation based on last month — Imputed	1,844.083***	11,223.464***
	(569.619)	(410.897)
Any imputation based on last month — Logical	2,918.492***	6,352.998***
	(972.768)	(750.235)
Any logical imputation	267.916	247.797
	(239.249)	(185.570)
Self-employed	-11,713.350***	11,776.952***
	(503.736)	(375.654)
Any transfer income	-665.609	-900.633**
	(450.033)	(360.909)
Observations	82,936	82,936
R-squared	0.057	0.184

The Predictors of Survey Earnings Nonresponse

VARIABLES	(1) Any Non- response	(2) Unit Non- response	(3) Item Non- response
Number of household members	0.021***	0.026***	-0.005***
	(0.001)	(0.001)	(0.001)
Age	-0.023***	-0.021***	0.008**
	(0.001)	(0.001)	(0.003)
Age squared	0.001***	0.001***	-0.000***
	(0.000)	(0.000)	(0.000)
Female	-0.028***	-0.012***	-0.004**
	(0.001)	(0.001)	(0.001)
Elementary school	-0.012***	-0.008***	-0.012**
	(0.002)	(0.001)	(0.005)
Some high school	-0.018***	-0.009***	-0.016***
	(0.002)	(0.001)	(0.003)
Some college	-0.008***	-0.008***	-0.010***
	(0.001)	(0.001)	(0.002)
Associate's degree	-0.002*	-0.004***	-0.008***
	(0.001)	(0.001)	(0.002)
Bachelor's degree	0.000	-0.011***	-0.002
	(0.001)	(0.001)	(0.002)
Master's degree	-0.003	-0.013***	-0.002
	(0.002)	(0.001)	(0.003)

(CONTINUED...)

	(1)	(2)	(3)
	Any Non-	Unit Non-	Item Non-
VARIABLES	response	response	response
Professional degree	0.031***	-0.008***	-0.010*
	(0.005)	(0.002)	(0.006)
Doctorate degree	-0.005	-0.013***	-0.030***
	(0.005)	(0.002)	(0.006)
Self-employed	—	—	0.197***
			(0.003)
Foreign-born, citizen	0.015***	0.008***	0.008***
	(0.002)	(0.001)	(0.003)
Foreign-born, non-citizen	0.008***	0.009***	-0.001
	(0.003)	(0.002)	(0.003)
Proxy response	-0.050***	-0.086***	0.054***
	(0.001)	(0.001)	(0.001)
Any sample gaps	0.035***	0.019***	0.034***
	(0.001)	(0.001)	(0.002)
Attritor	0.039***	0.030***	0.023***
	(0.001)	(0.001)	(0.002)
Any children under 18	-0.042***	-0.035***	-0.021***
	(0.001)	(0.001)	(0.002)
Change in family composition	-0.023***	-0.017***	-0.014***
	(0.002)	(0.001)	(0.003)
Any transfer income	-0.027***	-0.006***	-0.008
	(0.002)	(0.001)	(0.006)

(*CONTINUED...*)

VARIABLES	(1) Any Non-response	(2) Unit Non-response	(3) Item Non-response
Any admin records	0.053***	0.010***	-0.078***
	(0.002)	(0.001)	(0.004)
Number of admin records	0.031***	0.002***	0.024***
	(0.001)	(0.001)	(0.001)
Bottom admin earnings quintile	-0.006***	-0.004***	0.045***
	(0.002)	(0.001)	(0.003)
Second admin earnings quintile	0.015***	-0.005***	0.018***
	(0.002)	(0.001)	(0.002)
Fourth admin earnings quintile	-0.010***	-0.002	-0.003
	(0.002)	(0.001)	(0.002)
Top admin earnings quintile	-0.002	-0.002	0.004**
	(0.002)	(0.001)	(0.002)
Observations	1,910,102	1,910,102	1,055,629
R-squared	0.054	0.076	0.080

▸ Person-Job-Month Regressions

Implications for Estimates of the Earnings Structure

Mincer Regression

VARIABLES	(1) SIPP	(2) DER	(3) Reported SIPP	(4) SIPP-DER Hybrid
Years of education	0.138***	0.137***	0.145***	0.140***
	(0.002)	(0.002)	(0.002)	(0.002)
Potential experience	0.091***	0.099***	0.093***	0.097***
	(0.001)	(0.001)	(0.001)	(0.001)
Potential experience^2	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	88,971	88,971	60,994	88,971
R-squared	0.259	0.239	0.275	0.255

Future Work: 2014 Panel

- SIPP has been redesigned for the forthcoming 2014 panel.
- Data will be released after processing is complete.
- How are earnings nonresponse and the deviation of survey and admin earnings affected by the combination of:
    - changing interview frequency from every four months to annual,
    - relying less on prior months' earnings in the data collection and editing processes,
    - offering ranges when individuals initially decline to provide wage/salary data, and
    - more transparancy with users regarding reported earnings net of taxes.

Conclusion

- Imputed survey earnings differ from administrative earnings by more than reported survey earnings do on average.
- There is heterogeneity in how well different methods of imputing survey data match administrative data on average.
- Individuals who are male, more educated, self-employed, and non-recipients of programs have larger average deviations of survey and admin earnings.
- Individuals who are male, self-employed, and non-recipients of programs are more likely to lack earnings data.
- We document a novel pattern of nonresponse along the adminsitrative earnings distribution.
- Ambiguous implications for estimates of earnings regressions.

Thank You!

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Linking SIPP to DER

- SIPP respondents are assigned a Protected Identification Key (PIK) based on self-reported SSN, name, sex, race, and age.
- DER records are also assigned a PIK, then linked to SIPP data.
- Bond et al. (2013) show that PIKs are less likely to be assigned to individuals who are:
  - mobile,
  - less educated,
  - worse English speakers,
  - non-employed,
  - minorities, and
  - non-participants in programs.
- We restrict our sample to person-years aged 15 and over,...
- who are assigned a PIK, and...
- who are present in the survey for all 12 months.

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Interpretation

- Previous literature has often framed DER-SIPP comparisons as evaluations of measurement error in survey earnings.
- Abowd & Stinson (2013) and Bollinger et al. (2015) take a more agnostic approach, due to:
  - conceptual differences in earnings across datasets (*e.g.* health insurance, off-the-books earnings, some non-wage benefits),
  - reporting errors in administrative data as well as survey data, and
  - the possible misassignment of PIKs.
- We pursue the latter interpretation, characterizing the difference between SIPP and DER earnings.

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DER vs SIPP: Presence of Earnings

	No DER earnings	Positive DER earnings	Total
No SIPP earnings	56,410	8,216	64,626
Positive SIPP earnings	4,745	90,394	95,139
Total	61,155	98,610	159,765

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Different Types of Imputation

- Unit nonresponse:
    - If no known employment at the start of the reference period based on last wave's data, impute full record from a donor.
    - If known employment at the start of the reference period, project last wave's labor force data through current wave.
- Item nonresponse:
    - If no known earnings from last month, impute only earnings from a donor based on observable characteristics.
    - If known earnings from a job/business last month, impute only earnings from a donor based on last month's earnings.
    - If strong reason to believe earnings were reported incorrectly, impute logically using hourly pay rate and hours worked, reported annual pay rate, or weeks away without pay.

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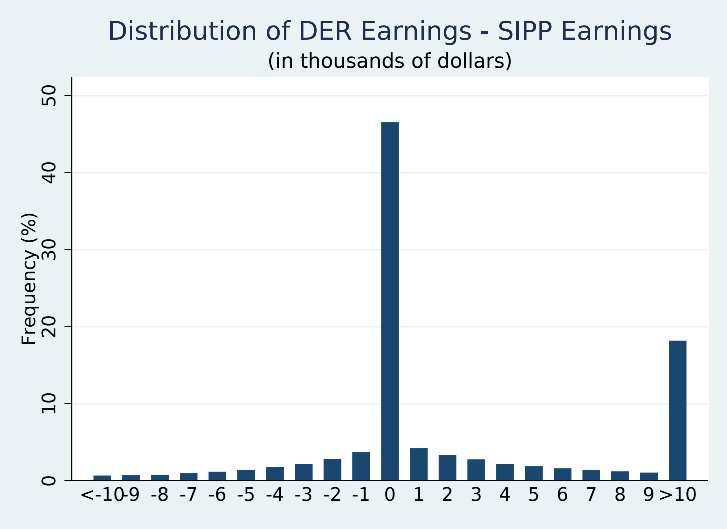
DER vs SIPP: Earnings



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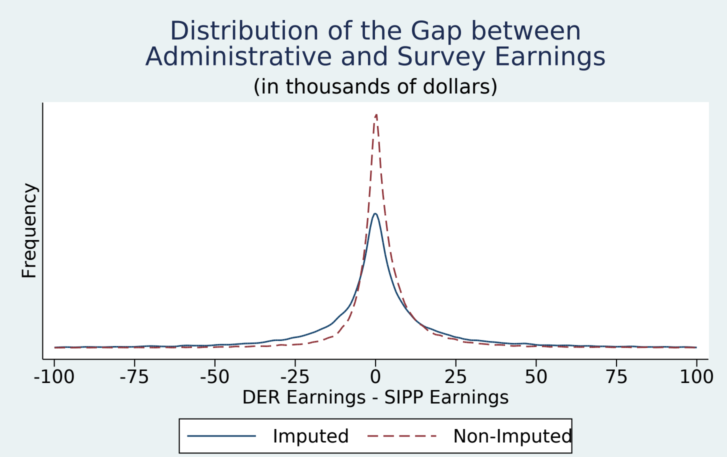
DER vs SIPP: Earnings

By Imputation Status

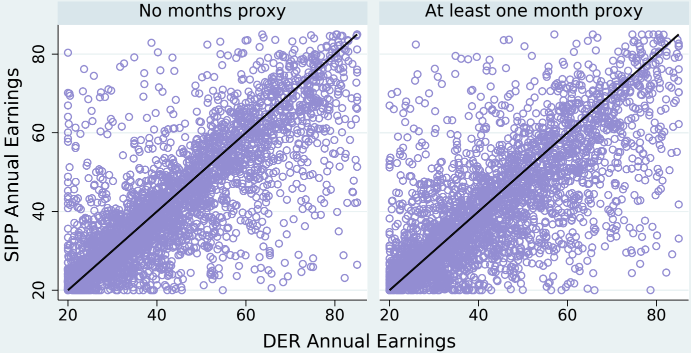


Source: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Waves 1 through 14 and the Social Security Administration's Detailed Earnings Record, calendar years 2009 through 2012.

DER vs SIPP: Earnings

By Proxy Response Status

Non-Proxy and Proxy
Survey and Administrative Earnings
(in thousands of dollars)



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The Predictors of Survey Earnings Item Nonresponse

	(1)	(2)	(3)
VARIABLES	Jobs	Jobs	Businesses
Weeks worked	-0.003***	—	0.013***
	(0.001)		(0.004)
Hours worked	-0.001***	-0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Stopped work	0.045***	—	0.003
	(0.002)		(0.018)
Paid hourly	-0.019***	-0.018***	—
	(0.001)	(0.001)	
Contingent worker	—	0.058***	0.205***
		(0.007)	(0.058)
Salaried	—	—	-0.025***
			(0.004)
Other income	—	—	0.218***
			(0.014)
Observations	1,703,276	1,756,622	201,191
R-squared	0.027	0.026	0.039

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