

# Analyzing Poverty Using Tax-Calculator

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- This presentation and code used herein is available at **[github.com/evtedeschi3/tcpoverty](https://github.com/evtedeschi3/tcpoverty)**
- My working paper, “An Analysis of the Earned Basic Income Tax Credit”, is available at **[rebrand.ly/ebitc1](https://rebrand.ly/ebitc1)**

1. Very Brief Background on Census Poverty Measures
  - Official Poverty Measure (OPM)
  - OPM Using Disposable Income
  - Supplemental Poverty Measure
2. Strategy for Linking Tax-Calculator to the CPS ASEC
3. Example Using the EBITC

## **Very Brief Background on Census Poverty Measures**

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- All national Census poverty estimates come from the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC)
- Sometimes called the “March Supplement”
- Survey of 75,000 households
- Conducted in March, generally released in September
- Income data is recollective for prior calendar year (so 2018 ASEC gives data for 2017 poverty)
- **IPUMS** from the University of Minnesota has an excellent interface for creating CPS ASEC extracts

## Three Poverty Measures

1. Official Poverty Measure (OPM)
2. OPM Using Disposable Income
3. Supplemental Poverty Measure (SPM)

## Official Poverty Measure (OPM)



## Official Poverty Measure (OPM)

- **Income Measure:** Money Income (Post Cash Transfer, Pre-Tax)
- **Poverty Threshold:** Absolute. Cost of Minimum Food Food Diet in 1963 Multiplied by 3.
- **Annual Adjustment:** CPI-U
- **Household Adjustment:** Family size, composition, and age
- **Measurement Units:** Families (individuals related by birth, marriage, or adoption) or unrelated individuals



**Bottom line for Tax-Calculator:** Tax-Calculator users will have virtually no need to use the OPM as published.

## Official Poverty Measure (OPM) with Disposable Income

- **Income Measure:** Disposable Income (Post-Transfer, Post-Tax)
- **Poverty Threshold:** Absolute. Cost of Minimum Food Food Diet in 1963 Multiplied by 3.
- **Annual Adjustment:** CPI-U
- **Household Adjustment:** Family size, composition, and age
- **Measurement Units:** Families (individuals related by birth, marriage, or adoption) or unrelated individuals

# Official Poverty Measure (OPM) with Disposable Income

## Advantages

- Will reflect changes to tax policy
- Unambiguously absolute measure
- Straight-forward integration using existing Tax-Calculator parameters

## Disadvantages

- Not an official Census release
- May be difficult for readers to interpret or contextualize

## Supplemental Poverty Measure (SPM)

- **Income Measure:** Net Resources (Post-Transfer, Post-Tax, Post-Work/Medical/Child Support Expenses)
- **Poverty Threshold:** Hybrid. 120% of 33rd percentile of expenditures on food, clothing, shelter, and utilities (FCSU)
- **Annual Adjustment:** Based on five-year moving average of FCSU
- **Household Adjustment:** Family size, composition, and geographic differences in housing costs
- **Measurement Units:** Resource units (OPM family definition + co-resident unrelated children, foster children, and unmarried partners and their relatives) or unrelated individuals

### Advantages

- Will reflect changes to tax policy
- Official Census release, adds context & interpretability

### Disadvantages

- Over time, SPM thresholds are endogenous to policy changes (see next slide)
- Future integration with Tax-Calculator more complex

## Is the SPM an Absolute or a Relative Poverty Measure?

- Surprisingly, there's no conclusive answer yet!
- Recall that SPM thresholds are calculated off of the five-year moving average of the 33rd percentile of expenditures on food, clothing, shelter, and utilities (FCSU).
- **On the one hand**, the reliance on distribution is a feature of relative poverty measures.
- **On the other hand**, the thresholds are based on spending, not income, and only a narrow subset of "necessity" spending at that.

## Is the SPM an Absolute or a Relative Poverty Measure?

- Essentially boils down to: is  $MPC_{FCSU} = 100\%$  for poor families?
  - Very plausible that it is **not**, meaning the SPM is probably not strictly a relative poverty measure.
  - **But**, also plausible that  $MPC_{FCSU} > 0\%$ , making the SPM still a partially **endogenous** measure.

## Is the SPM an Absolute or a Relative Poverty Measure?

- **Bottom line for Tax-Calculator:**

- Because the SPM uses 5-year moving averages of FCSU, single-year SPM poverty estimates done at Year 1 of implementation likely have few possible endogeneity issues.
- But multi-year SPM estimates would probably need to make an assumption, or offer a parameter to the user, about the feedback effects between policy changes and the SPM thresholds
- Separately, any future SPM integration into Tax-Calculator will require assumptions about how the FCSU thresholds evolve, e.g. relative to CPI or GDP.



## **Strategy for Linking Tax-Calculator to the CPS ASEC**

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## Four Basic Steps

- **Step 1:** Create a CPS ASEC extract
- **Step 2:** Convert ASEC extract into data usable by Tax-Calculator
- **Step 3:** Run policy through Tax-Calculator using ASEC extract
- **Step 4:** Merge results back into the CPS ASEC and aggregate changes by appropriate poverty units

- Because this approach involves microdata, I will be using the Tax-Calculator command line interface (CLI)

## Step 1: Create a CPS ASEC extract

- My example uses a Stata file: **tcpov1\_make\_asec.do**
- In this case, I use the 2018 CPS ASEC which gives data on 2017 poverty
  - Latest available as of publication
  - Avoids need for assumptions about FCSU evolution in the future
  - Still interpretable: what SPM poverty “would have been” under policy changes

## Step 1: Create a CPS ASEC extract


- I recommend using IPUMS (**[www.ipums.org](http://www.ipums.org)**)
- Alternatively, can use raw BLS fixed-width files, but variable names will be different than what I used here.
  - Data: **[thedataweb.rm.census.gov/ftp/cps\\_ftp.html#cpsmarch](http://thedataweb.rm.census.gov/ftp/cps_ftp.html#cpsmarch)**
  - Variable libraries: **[www.nber.org/data/cps\\_progs.html](http://www.nber.org/data/cps_progs.html)**

# Step 1: Create a CPS ASEC extract

# IPUMS


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IPUMS provides census and survey data from around the world integrated across time and space. IPUMS integration and documentation makes it easy to study change, conduct comparative research, merge information across data types, and analyze individuals within family and community context. Data and services available free of charge.




U.S. Census and American Community Survey microdata from 1850 to the present.

[VISIT SITE](#)



Current Population Survey microdata including basic monthly surveys and supplements from 1962 to the present.

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World's largest collection of census microdata covering nearly 100 countries, contemporary and historical.

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IPUMS International: An Introduction




March 28th, 2019

11 a.m. CST

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### CENSUS BUREAU DATA UPDATES

Stay updated on planned changes for



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# Step 1: Create a CPS ASEC extract



[HOME](#) | [SELECT DATA](#) | [MY DATA](#) | [FAQ](#) | [HELP](#)

## SELECT SAMPLES

Variable documentation on the web site can be filtered to display only material corresponding to chosen datasets ([more information](#) on this feature).

SUBMIT SAMPLE SELECTIONS

☐ All Default samples

ASEC (1 of 57 selected)

BASIC MONTHLY (0 of 517 selected)

SUPPLEMENT TOPICS

ASEC data come from the Annual Social and Economic Supplement of the Current Population Survey.

### [Documentation](#)

☐ Select All Samples

☐ 2010s

☒ 2018

☐ 2017

☐ 2016

☐ 2015

☐ 2000s

☐ 2009

☐ 2008

☐ 2007

☐ 2006

## Step 1: Create a CPS ASEC extract

- You will need the following IPUMS variables in your CPS ASEC extract:

year serial relate depstat pernum sex age statefip schllcoll  
proptax momloc poploc sploc eitcred fedretir fedtax statetax  
adjginc capgain taxinc fedtaxac fica caploss stataxac incdivid  
incint incrent incother incalim incasist incss incwelfr  
incwkcom incvet incchild incunemp inceduc gotveduc gotvothe  
gotvpens gotvsurv incssi incwage incbus incfarm incsurv incdisab  
incretir spmfamunit spmtotres spmthresh spmwt

- Also any other variables you may want for demographic analysis
  - E.g. **race** for race, **educ** for educational attainment, etc.
- You can download directly from IPUMS in CSV format.



## Step 2: Convert ASEC extract into data usable by Tax-Calculator

- Two sub-steps:
  - **Step 2a:** Convert ASEC extract (individuals/households) into TAXSIM27 (tax units) format
  - **Step 2b:** Convert TAXSIM27-compatible file into Tax-Calculator format

## Step 2a: Convert ASEC extract into TAXSIM27 format

- R file: **tcpov2a\_make\_taxsim27.R**
- I heavily rely on R code from Sam Portnow.
  - Original: **[users.nber.org/~taxsim/to-taxsim/cps/cps-portnow/TaxSimRScriptForDan.R](https://users.nber.org/~taxsim/to-taxsim/cps/cps-portnow/TaxSimRScriptForDan.R)**
  - I made some minor edits to update how tax units are defined
- I also modify this code to output two files:
  - **c17\_taxsim** (intentional lack of file extension): the filer data to be called in Step 2b
  - **ids.csv**: a crosswalk linking the synthetic RECIDs created in the above file back to the `serial` and `pernum` ASEC variables; key for merging final results.

## Step 2b: Convert TAXSIM27-compatible file into Tax-Calculator format

- `tcpov2a_make_taxsim27.R` saves `c17_taxsim` in your `/Tax-Calculator/taxcalc/validation/taxsim` folder (you will need to modify this directory in the code)
- In that same folder, run the `taxcalc.sh` on `c17_taxsim`. E.g.:

```
cd '~/Tax-Calculator/taxcalc/validation/taxsim'  
./taxcalc.sh c17_taxsim save
```

- `taxcalc.sh` will create a new file with the same name but a `*.csv` file extension, e.g. `c17_taxsim.csv`

### Step 3: Run policy through Tax-Calculator using ASEC extract

- Call `c17_taxsim.csv` as your filer data file
- Note that in the CLI you will need both a baseline and a reform run.

E.g.:

```
tc c17_taxsim.csv 2017 --dump
```

```
tc c17_taxsim.csv 2017 --dump --reform 'policy.json'
```

## Step 4: Merge results back into the CPS ASEC and aggregate changes by appropriate poverty units

- Stata file: **tcpov4\_merge\_back.do**
- Reopen your IPUMS extract
- Merge in **ids.csv** on **RECID**
  - Not every ASEC record became a tax unit, so make sure you keep master non-matches!
- Merge in the change in after-tax income between your baseline and your reform
  - I usually generate a file with **RECID** and the change in ATI (**dati**) from the CLI dumps
  - Note that this approach means **dati** is positive when taxes fall

## Step 4: Merge results back into the CPS ASEC and aggregate changes by appropriate poverty units

ASEC SPM Variable	Description
<b>spmfamunit</b>	SPM unit sequencer
<b>spmtotres</b>	SPM total resources
<b>spmthresh</b>	SPM poverty threshold for that unit
<b>spmwgt</b>	Weight for calculating SPM poverty

## Step 4: Merge results back into the CPS ASEC and aggregate changes by appropriate poverty units

- Sum up **dati** by **spmfamunit**
  - I'll call the resulting aggregate **sum\_dati**
- A family is in SPM poverty in the baseline if  
**spmtotres < spmthresh**
- A family is in SPM poverty under the policy change if  
**(spmtotres + sum\_dati) < spmthresh**
- Weight the cell counts of these conditions by **spmwgt** to calculate total number and percentages.

## **An Applied Example Using the Earned Basic Income Tax Credit (EBITC)**

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## The Earned Income Tax Credit (EITC)

- Wage subsidy that phases in with earnings
- Starts at \$0 credit at \$0 earnings
- Phases in at different rates depending on number of children
- Phase-in stops once credit hits maximum
- Credit starts phasing out at different income thresholds depending on number of children and marriage status
- Phase-out rate varies by number of children

## The Earned Income Tax Credit (EITC)

- Example: **joint married filer with two kids** in 2018
  - Credit is \$0 at \$0 earnings
  - Then \$40 additional credit for every \$100 additional earnings thereafter up to maximum
  - Maximum EITC is \$5,716 reached at \$14,290 in earnings
  - Beyond \$24,250 in income, EITC starts phasing out
  - EITC falls by \$21.06 for every \$100 in earnings above \$24,250
  - EITC fully exhausted after \$51,392 in income

## The Earned Basic Income Tax Credit (EBITC)

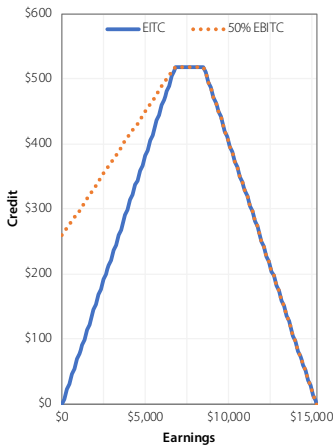
- Modifies the EITC so that zero-income filers receive some share  $S$  of the maximum credit
  - Baseline specification of 50%
- The EITC phase-in rate is then lowered by  $(1 - S)$ 
  - So under a 50% EBITC, a 40% EITC phase-in rate becomes a  $40\% * (1 - 50\%) = 20\%$  phase-in
- The maximum credit, thresholds, and phase-out rates remain unchanged

## The Earned Basic Income Tax Credit (EBITC)

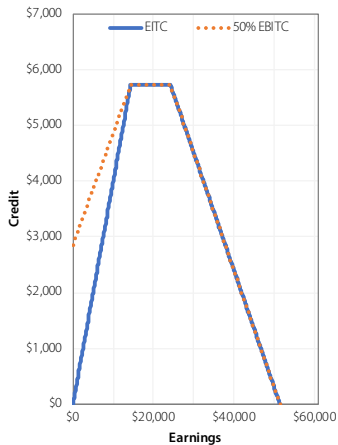
- Example: **joint married filer with two kids**
  - Maximum credit is \$5,716 reached at \$14,290 in earnings
  - Under EITC, credit is \$0 at \$0 earnings
    - Then filer earns \$40 additional credit for every \$100 additional earnings thereafter up to maximum
  - Under a 50% EBITC, credit is \$2,858 at \$0 earnings
    - Then filer earns \$20 additional credit for every \$100 additional earnings thereafter up to maximum

# Illustration of an EBITC

Single Childless Filers in 2018



Married 2 Children Filers in 2018



- Reform JSON requires only one argument:

```
{  
  "policy": {  
    "_EITC_basic_frac":  
      {"2017": [0.5]}  
  }  
}
```

```
bysort spmfamunit: egen sum_dati = total(dati)  
  
gen spm1 = spmtotres < spmthresh  
  
gen spm2 = (spmtotres + sum_dati) < spmthresh  
  
gen out_of_spm = spm2 == 0 & spm1 == 1
```

# Tabulating SPM Poverty Effects

```
. tab spm1 [iw=spmwgt]
```

spm1	Freq.	Percent	Cum.
0	272,185,683	86.13	86.13
1	43837638.6	13.87	100.00
Total	316,023,322	100.00	

```
. tab spm2 [iw=spmwgt]
```

spm2	Freq.	Percent	Cum.
0	273,263,642	86.47	86.47
1	42759679.9	13.53	100.00
Total	316,023,322	100.00	

```
. tab out_of_spm [iw=spmwgt]
```

out_of_spm	Freq.	Percent	Cum.
0	314,945,363	99.66	99.66
1	1,077,959	0.34	100.00
Total	316,023,322	100.00	



# Tabulating SPM Poverty Effects for Children

```
. tab spm1 if age < 18 [iw=spmwgt]
```

spm1	Freq.	Percent	Cum.
0	61176971.5	84.50	84.50
1	11219225.5	15.50	100.00
Total	72396197.1	100.00	

```
. tab spm2 if age < 18 [iw=spmwgt]
```

spm2	Freq.	Percent	Cum.
0	61,694,414	85.22	85.22
1	10701783.1	14.78	100.00
Total	72396197.1	100.00	

```
. tab out_of_spm if age < 18 [iw=spmwgt]
```

out_of_spm	Freq.	Percent	Cum.
0	71878754.6	99.29	99.29
1	517,442.46	0.71	100.00
Total	72396197.1	100.00	

**Thank You! Questions?**

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