**dsginideco**

**Decomposition of inequality change into pro-poor growth and mobility components**

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February 2009

**Abstract**
This note describes dsginideco, a user-written Stata package implementing the decomposition of a change in inequality (measured by the generalized Gini coefficient) into progressivity/pro-poor growth and reranking components. The decomposition was proposed by Jenkins & Van Kerm (Oxford Economic Papers, 2006).

**Keywords**

Keywords dsginideco; Stata; generalized Gini; pro-poor growth; reranking

**JEL Classification**
C88; D31

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1 Introduction

This note describes dsginideco, a Stata command that we have written to calculate the decomposition of a change in inequality (measured by a generalized Gini coefficient) into progressivity/pro-poor growth and reranking components. The decomposition was proposed by Jenkins & Van Kerm (2006). The command is available online for installation in net-aware Stata. At the command prompt, type

```
net install dsginideco , from(http://medim.ceps.lu/stata)
```

or

```
ssc install dsginideco
```

2 The decomposition

Jenkins & Van Kerm (2006) showed that the change in income inequality between two time periods could be expressed in terms of two components, one representing the progressivity (pro-poorness) of income growth, and the other representing reranking. Inequality is measured using the generalized Gini coefficient, also known as the S-Gini, \( G(X;\upsilon) \), where \( X \) is the distribution of income at a point in time, and \( \upsilon > 1 \) is a parameter. \( G(X;\upsilon) \) is a distributionally-sensitive inequality index, with larger values of \( \upsilon \) placing greater weight on inequality differences among poorer (lower ranked) observations. The conventional Gini coefficient corresponds to the case \( \upsilon = 2 \).

The decomposition is of the form:

\[
\Delta(\upsilon) = R(\upsilon) - P(\upsilon)
\]

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1The latest version of the dsginideco package is 1.0.2 (of 2009-02-20). Stata 8.2 or later is required.
where
\[
\Delta(\upsilon) = G(X_1; \upsilon) - G(X_0; \upsilon)
\]
is the growth of the generalized Gini coefficient between period 0 and period 1. \(R(\upsilon)\) is a measure of reranking, and \(P(\upsilon)\) is a measure of the progressivity of income growth defined, respectively, as
\[
R(\upsilon) = G(X_1; \upsilon) - C(X_0, X_1; \upsilon)
\]
and
\[
P(\upsilon) = G(X_0; \upsilon) - C(X_0, X_1; \upsilon),
\]
where \(C(X_0, X_1; \upsilon)\) is the generalized Concentration coefficient of period 1 incomes against period 0 ranking. \(P(\upsilon)\) can be interpreted as an indicator of how much growth has benefited disproportionately to individuals towards the bottom of the distribution in the initial time period. \(R(\upsilon)\) captures how much a progressive income growth has lead to reranking between individuals, so that the net reduction in inequality is the difference between \(P(\upsilon)\) and \(R(\upsilon)\). \(R(\upsilon)\) may be interpreted as a measure of mobility (in the form of reranking) in its own right (Yitzhaki & Wodon, 2004). Realize that this decomposition is a panel data technique: computation of the \(P(\upsilon)\) and \(R(\upsilon)\) components requires two observations on income for a sample of individuals or households.

In an analysis of cross-country convergence in GDP, O’Neill & Van Kerm (2008) interpreted \(\Delta(\upsilon)\) as a measure of ‘\(\sigma\)-convergence’ and \(P(\upsilon)\) as a measure of ‘\(\beta\)-convergence’, thereby reconciling the two concepts within a single framework.

3 The dsginideco command

3.1 Syntax

dsginideco var0 var1 [if] [in] [weight] [ , parameters(numlist) format(string) percentage percfomat(string) kawani ]

aweights and fweights are allowed; see [U] 11.1.6 weight – Weights.
by, bootstrap, jackknife are allowed; see [U] 11.1.10 Prefix commands.

dsginideco requires panel data, in wide form, on income in two time periods. \(var0\) contains the measure of income in the initial period for each observation. \(var1\) contains the measure of income in the final period for each observation. If the data are held in long form, time-series operators ([U] 11.4.3 Time-series varlists) may be used to define \(var0\) or \(var1\); see Examples below.

From the balanced sample of observations with non-missing income for both \(var0\) and \(var1\), the command computes the generalized Gini coefficient for the initial and final years, the change in the index, and the decomposition components. Optionally, these estimates may also expressed as a fraction of the initial period generalized Gini index.

3.2 Options

parameters(numlist) specifies a value or values for \(\upsilon\). The default is 2, leading to a decomposition of the standard Gini coefficient. Multiple parameters may be specified but each value must be greater than 1.
format(string) specifies a format for the displayed results. The default is %5.3f.
percentage requests that decomposition factors be reported as fractions of the initial period generalized Gini coefficient.
percfomat(string) used in conjunction with percentage specifies a format for results expressed as a fraction of initial period generalized Gini coefficient. The default is %4.1f.
kakwani requests reporting of the Kakwani-type measure of progressivity of income growth. (See Jenkins & Van Kerm (2006) for the definition.) This statistic is meaningful only when average income growth is not close to zero.

### 3.3 Saved results

Scalars

- `r(sgini0)`: Initial period inequality index, $G(X^0;υ)$
- `r(sgini1)`: Final period inequality index, $G(X^1;υ)$
- `r(dsgini)`: Change in inequality, $\Delta(υ)$
- `r(pi)`: Average income growth
- `r(R)`: R-component, $R(υ)$
- `r(K)`: Kakwani index of progressivity, if requested
- `r(N)`: Number of observations
- `r(sum_w)`: Sum of weights

Macros

- `r(var0)`: Name of variable `var0`
- `r(var1)`: Name of variable `var1`
- `r(paramlist)`: Values of $υ$

Matrices

- `r(coeffs)`: All estimated statistics
- `r(parameters)`: Vector containing the values of $υ$

When the `percentage` option is specified, an additional set of results is returned, each prefixed by `rel`, containing the estimates expressed as a fraction of the initial period generalized Gini, e.g. `r(rel@dsgini)`. Type `return list` after `dsginideco` to ascertain precisely which results are returned.

When multiple parameters are specified in option `parameters`, returned scalars contain estimates for the smallest parameter only. The complete set of estimated coefficients is available in the matrix `r(coeffs)`.

### 4 Examples

We illustrate `dsginideco` using data from the National Longitudinal Survey of Youth, available from the Stata Press website. These are panel data and stored in long form, so we `tsset` the data and use a time series operator to construct `var0`. We examine year-on-year changes in wage inequality, pro-poor growth and mobility, pooling observations from successive pairs of years.

```stata
. cap use http://www.stata-press.com/data/r9/nlswork , clear
. tsset idcode year
    panel variable: idcode (unbalanced)
    time variable: year, 68 to 88, but with gaps
    delta: 1 unit
. gen w = exp(ln_wage)
. dsginideco L.w w
Decomposition of change in S-Gini coefficient of inequality
Average growth rate = 0.077

<table>
<thead>
<tr>
<th>Parameter</th>
<th>v=2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial S-Gini</td>
<td>0.245</td>
</tr>
<tr>
<td>Final S-Gini</td>
<td>0.266</td>
</tr>
<tr>
<td>Change</td>
<td>0.021</td>
</tr>
<tr>
<td>R-component</td>
<td>0.062</td>
</tr>
<tr>
<td>P-component</td>
<td>0.041</td>
</tr>
</tbody>
</table>
```


Decomposition of change in S-Gini coefficient of inequality

**Average growth rate = 0.077**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>( v=1.5 )</th>
<th>( v=2 )</th>
<th>( v=3 )</th>
<th>( v=4 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial S-Gini</td>
<td>0.163</td>
<td>0.245</td>
<td>0.333</td>
<td>0.383</td>
</tr>
<tr>
<td>Final S-Gini</td>
<td>0.182</td>
<td>0.266</td>
<td>0.353</td>
<td>0.402</td>
</tr>
<tr>
<td>Change</td>
<td>0.020</td>
<td>0.021</td>
<td>0.020</td>
<td>0.019</td>
</tr>
<tr>
<td>R-component</td>
<td>0.047</td>
<td>0.062</td>
<td>0.082</td>
<td>0.097</td>
</tr>
<tr>
<td>P-component</td>
<td>0.028</td>
<td>0.041</td>
<td>0.062</td>
<td>0.078</td>
</tr>
<tr>
<td>K-index</td>
<td>0.386</td>
<td>0.580</td>
<td>0.865</td>
<td>1.098</td>
</tr>
</tbody>
</table>

Change, P- and R-components as percentage of initial S-Gini:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>( v=1.5 )</th>
<th>( v=2 )</th>
<th>( v=3 )</th>
<th>( v=4 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>12.1</td>
<td>8.6</td>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>R-component</td>
<td>29.0</td>
<td>25.4</td>
<td>24.5</td>
<td>25.4</td>
</tr>
<tr>
<td>P-component</td>
<td>16.9</td>
<td>16.9</td>
<td>18.5</td>
<td>20.4</td>
</tr>
<tr>
<td>K-index</td>
<td>237.7</td>
<td>236.9</td>
<td>259.6</td>
<td>286.4</td>
</tr>
</tbody>
</table>

**dsiginideco** reports point estimates, but does not compute the sampling covariance matrix of the decomposition components. However, resampling-based inference may be implemented using Stata’s built-in `bootstrap` (or `jackknife`) prefix, as in the following examples (see Sanchez, 2007). It is the user’s responsibility to ensure that the resampling technique implemented with the prefix command.
. gen newid = idcode
. tsset newid year
    panel variable: newid (unbalanced)
    time variable: year, 68 to 88, but with gaps
delta: 1 unit
. bootstrap dG=r(dsgini) R=r(R) P=r(P) ///
> , cluster(idcode) idcluster(newid) reps(250) nodots:
> dsginideco L.w w if !mi(L.w) & !mi(w)

Warning: Since dsginideco is not an estimation command or does not set
  e(sample), bootstrap has no way to determine which observations are
  used in calculating the statistics and so assumes that all
  observations are used. This means no observations will be excluded
  from the resampling because of missing values or other reasons.
  If the assumption is not true, press Break, save the data, and drop
  the observations that are to be excluded. Be sure that the dataset
  in memory contains only the relevant data.

Bootstrap results
Number of obs = 10891
Replications = 250

command: dsginideco L.w w
dG: r(dsgini)
R: r(R)
P: r(P)

(Replications based on 3700 clusters in idcode)

<table>
<thead>
<tr>
<th></th>
<th>Observed</th>
<th>Bootstrap</th>
<th>Normal-based</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>Std. Err.</td>
<td>z</td>
</tr>
<tr>
<td>dG</td>
<td>0.0209448</td>
<td>0.0037565</td>
<td>5.58</td>
</tr>
<tr>
<td>R</td>
<td>0.0622644</td>
<td>0.0061849</td>
<td>10.07</td>
</tr>
<tr>
<td>P</td>
<td>0.0413197</td>
<td>0.0039909</td>
<td>10.35</td>
</tr>
</tbody>
</table>

. jackknife dG=r(dsgini) R=r(R) P=r(P) ///
> , cluster(idcode) idcluster(newid) rclass nodots:
> dsginideco L.w w if !mi(L.w) & !mi(w)

Jackknife results
Number of obs = 10891
Replications = 3700

command: dsginideco L.w w if !mi(L.w) & !mi(w)
dG: r(dsgini)
R: r(R)
P: r(P)
n(): r(n)

(Replications based on 3700 clusters in idcode)

<table>
<thead>
<tr>
<th></th>
<th>Jackknife</th>
<th></th>
<th></th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>Std. Err.</td>
<td>t</td>
<td>P&gt;</td>
</tr>
<tr>
<td>dG</td>
<td>0.0209448</td>
<td>0.0037447</td>
<td>5.59</td>
<td>0.000</td>
</tr>
<tr>
<td>R</td>
<td>0.0622644</td>
<td>0.0045442</td>
<td>13.70</td>
<td>0.000</td>
</tr>
<tr>
<td>P</td>
<td>0.0413197</td>
<td>0.0036637</td>
<td>11.28</td>
<td>0.000</td>
</tr>
</tbody>
</table>

References


Citation, liability, conditions of use

The program should work as described, but it is freely offered ‘as-is’ to the research community. Use at your own risk! Of course, we appreciate bug reports, as well as comments and suggestions (email philippe.vankerm@ceps.lu).

Please cite as:

Acknowledgements

This work is part of the MeDIM project (Advances in the Measurement of Discrimination, Inequality and Mobility) supported by the Luxembourg ‘Fonds National de la Recherche’ (contract FNR/06/15/08) and by core funding for CEPS/INSTEAD by the Ministry of Culture, Higher Education and Research of Luxembourg. Jenkins’s research is supported by core funding from the University of Essex and the U.K. Economic and Social Research Council for the Research Centre on Micro-Social Change and the United Kingdom Longitudinal Studies Centre.