

Progressive Policy and Inequality

TheoryGuru applications

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Load Economicreasoning package only if it is not already loaded

```
If[Length@Names["PLTools`*"] < 10,  
  Get["http://economicreasoning.com"]]
```

Notes

Interpret *PreTaxIncome* as the income that people would have without policy intervention.

Tax lists mean-zero additions and subtractions to *PreTaxIncome*. Income with policy is therefore *PreTaxIncome - Tax*

PreTaxIncome and *Tax* are vectors: one element for each resident of the country (or other policy area).

In the Wolfram Language, *x.y* refers to the tensor DOT PRODUCT, NOT scalar multiplication. For TheoryGuru purposes, tensor means vector, so that the result of *x.y* is a scalar.

Analysis

Setup

```
inequality[x_] := (x - average).(x - average)
```

```
ProgressivePolicy = Tax.(PreTaxIncome - average) > 0 ;
```

```
(* on average, low-income people pay a negative tax (i.e., received money)  
  and high-income people pay tax *)
```

```
AfterTaxIncome = PreTaxIncome - Tax;
```

Result 1: Progressive policy could exacerbate the inequality

```
TheoryGuru[
  {ProgressivePolicy, average2 ≥ 0 (* clarify that average income is a scalar *)},
  inequality[AfterTaxIncome] ≥ inequality[PreTaxIncome]
  (* policy exacerbates inequality *)]
True for some, False for others
```

Text interpretations of key inequalities

```
rtext = {First@MostRecentAssumption → "Progressive policy",
  Not@First@MostRecentHypothesis → "policy to reduce inequality."};
```

Result 2: Progressive policy is necessary but not sufficient for policy to reduce inequality

with formulas

```
TheoryOverlap[average2 ≥ 0,
  ProgressivePolicy,
  inequality[AfterTaxIncome] < inequality[PreTaxIncome]]
PreTaxIncome.Tax > average 1.Tax is necessary but not sufficient for 2 average 1.Tax + Tax.Tax < 2 PreTaxIncome.Tax
```

formulas replaced with text interpretations

```
TheoryOverlap[average2 ≥ 0,
  ProgressivePolicy,
  inequality[AfterTaxIncome] < inequality[PreTaxIncome]] /. rtext
Progressive policy is necessary but not sufficient for policy to reduce inequality.
```

Variable interpretations

Result 3: Results 1 and 2 do not need (a) a nonzero average tax, (b) taxes to be so strong as to swap rich and poor

```
AverageTaxisZero = Dot[1, Tax] == 0;
AverageIncomeDefinition = Dot[1, PreTaxIncome] == average Dot[1, 1];
```

```
TradingPlaces = (PreTaxIncome - average) . (AfterTaxIncome - average) < 0;
(* When True: on average, the poor have become the rich and vice versa *)
```

```
TheoryOverlap[{AverageTaxisZero, Not@TradingPlaces, AverageIncomeDefinition},
  ProgressivePolicy,
  inequality[AfterTaxIncome] < inequality[PreTaxIncome]] /. rtext
```

Progressive policy is necessary *policy to reduce inequality.*
but not sufficient for