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Equality Enhancing Benefit Cut — Possible, but Unlikely

Aboa Centre for Economics

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ABSTRACT

This paper considers whether a replacement rate cut can be income equality enhancing and with what conditions. The logical answer to the question is yes, if the propensity of moving from low income state to high income state is high enough. The main contribution of this paper is to derive an analytical expression of income equality improving elasticity. It specifies the limit, after which replacement rate cut is equality enhancing measured by Gini coefficient.

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1 Introduction

The demand for distributional analysis has grown in recent years. Many countries are extending the legislative process by including various distributional analyses in the legislative proposals. An often cited example is Sweden, wherein the gender analysis of income distribution is conducted as a part of preparing government's budget proposals. In Britain, the Institute for Fiscal Studies, IFS, is systematically compiling extensive distributional analysis on budget proposals (e.g. Keiller and Waters (2020)).

Distributional analysis is often conducted using microsimulation models, of which many of them are static in nature. Widely used microsimulation model Euromod, covering 28 European countries, is the best known example of a static model.[1] Static models depart from behavioral[2] responses and analyze the world as if the time was stopped and all behavioral elasticities were set to zero. Resources are then transfered from one party to another, thus, bringing forth distributional effects. In one sense, the analysis is overly simplified; increasing public expenditures for low-income agents almost always moderates income inequality, and vice versa.

A static model can be very useful, but at the same time, it paints an inaccurate picture of the world. Furthermore, often the dynamic response of a reform is essential instead of the static response. To give an example related to this paper, a cut in unemployment benefit replacement rate is usually not motivated by the static cuts

[1]A comprehensive description of the model is given at Euromod homepage.

[2]Terms *behavioral* and *dynamic* are used as synonyms in this article.

that the unemployed face, but by the dynamic behavioral employment effects that the reform induces.[3]

The aim of this paper is to illustrate the importance of behavioral effects. The analysis is not, however, left there. In the Laffer curve literature it is discussed whether or not tax-cuts can increase public revenues. There is a somewhat analogous question present in the context of social security; could a benefit cut actually be income equality improving? A simple, yet applicaple framework is constructed in order to derive a condition when a benefit cut could be income equality improving.

On the question of existense of income equality enhancing benefit cuts, the answer is: ”in theory it is possible, but in practice probably not”.

2 Gini Coefficient as a Metric

Gini-coefficient is a widely used metric for income inequality. It is not, by any means, a perfect indicator as it is impossible to compress the complexity of income inequality into one number. But when interpreted corectly, Gini coefficient is still a very useful indicator.

Consider the most general case of only two population groups. The mathematical interpretation of the Gini coefficient is straightforward; the higher the income share of the lower income group, the lower the gini coefficient, and vice versa. The Gini coefficient, G, can be calculated from Figure 1 as the area A divided by $A+B$ which

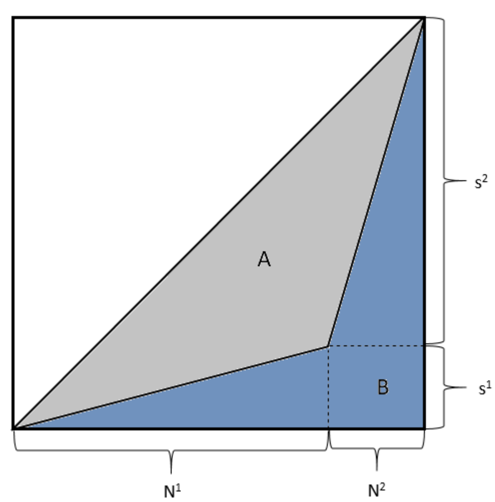
[3]Another related and very important dimension is the agent's lifetime. This question is not addressed in here further, but see Levell et al. (2015) for redistribution from a lifetime perspective.

is equivalent to defining $G = 1 - 2B$. Mathematically it can, thus, be defined as follows:

$$\begin{aligned} G &= 1 - 2B \\ &1 - 2\left(\frac{N^1 s^1}{2} + N^2 s^1 + \frac{N^2(1-s^1)}{2}\right) = 1 - s^1 - N^2, \end{aligned} \quad (1)$$

where s^1 is the *income* share of the lower income group and N^2 is the *population* share of higher income group. Interpretation of equation (1) is that G is the area above the Lorenz Curve divided by a right triangle with both sides equal to unity. The smaller the area A becomes, the smaller the Gini coefficient is and, thus, income is distributed more equally. A two group Gini coefficient is a simple measure, but it can still be avery useful measure in practice as a rule-of-thumb.

Figure 1: Lorenz Curve and Gini-coefficient $\left(= \frac{A}{A+B}\right)$



3 Behavior Response and the Income Equality Improving Elasticity

Define replacement rate (rr) to be the disposable income of lower income group divided by the disposable income of the higher income group: $rr = \frac{w^1}{w^2}$. Further assume, that there is an elasticity, ϵ, that induces a flow of agents from one group to another as a response of change in the replacement rate:

$$
\begin{aligned}
\frac{\partial N^2}{\partial rr} &= -\epsilon N^1, \qquad (2)\\
\frac{\partial N^1}{\partial rr} &= \epsilon N^1, \qquad (3)\\
\epsilon &> 0
\end{aligned}
$$

Notice the obvious fact that $\frac{\partial N^1}{\partial rr} + \frac{\partial N^2}{\partial rr} = 0$, because the population of the system is assumed to stay constant.

The first question now arises: how does the Gini-coefficient change in response to a replacement rate change? The question can be answered with a simple derivation using equations (1), (2) and (3) and the definition of s^1 which is given by:

$$
s^1 = \frac{w^1 N^1}{w^1 N^1 + w^2 N^2} = \frac{rr N^1}{rr N^1 + N^2}, \qquad (4)
$$

The effect of replacement rate on Gini coefficient is:

$$\begin{aligned}
\frac{\partial G}{\partial rr} &= -\frac{\partial s^1}{\partial rr} - \frac{\partial N^2}{\partial rr} \\
&= -\frac{N^1}{rrN^1 + N^2} - \frac{rr\epsilon N^1}{rrN^1 + N^2} + \frac{rrN^1}{(rrN^1 + N^2)^2}\left(N^1 + rr\epsilon N^1 - \epsilon N^1\right) + \epsilon N^1
\end{aligned} \tag{5}$$

We are now approaching the heart of this paper: by setting the equation (5) to zero and solving for ϵ, we find the elasticity value that is required for a replacement (or benefit) cut to be equality enhancing action when measured by Gini coefficient. Denote this by $\hat{\epsilon}$. After a little bit of algebra, the solution is as follows:

$$\hat{\epsilon} = \frac{N^2}{(rrN^1 + N^2)^2 - rr} > 0 \tag{6}$$

The equality enhancing elasticity $\hat{\epsilon}$ has the following properties:

$$\frac{\partial \hat{\epsilon}}{\partial rr} > 0, \tag{7}$$

$$\frac{\partial \hat{\epsilon}}{\partial N^1} > 0 \tag{8}$$

Equation (7) states, that the higher the replacement rate is, the higher the elasticity must be in order to the replacement rate cut to be equality enhancing. If the replacement rate is already very high, the larger share of individuals must flow from lower income state to higher income state in order to enhance equality, thus, the elasticity must be higher.

Furthermore, equation (8) states that larger the share of low income agents leads to higher equality enhancing elasticity. The mechanism is the same as previously, that is, if the number of low income individuals is high, replacement rate cut must make more individuals to move from low-income state to high-income state in order to lower the Gini coefficient. The next section applies the formula to a concrete example.

4 An Application of the Formula

As an example, consider the labor market. Narrow the analysis down to the unemployed and the employed. I will use the Finnish economy as an example for the practical reason that the relevant data is most available to me.

First, we need information on population shares, N^1 and N^2, and the replacement rate. Let N^1 denote the insured unemployed and N^2 the insured wage-earners. In the last day of 2019 there were approximately 1.9 million insured individuals and 120,000 unemployed, thus, population shares are set $N^1 = 0.06$ and $N^2 = 0.94$. The average replacement rate is close to 60 %. Note, that the analysis addresses the insured only and the considerable number uninsured individuals, both employed and unemployed, are not included in the numbers presented here.

Unemployment insurance benefit semi-elasticities are typically reported as changes in unemployment duration in a response to replacement rate change (in percentage points). Tatsiramos and van Ours (2014) in their literature survey report that benefit semi-elasticities are typically estimated to be between 0.4 and 1.0. The number of unemployed is a good proxy for duration of unemployment when assuming constant working hours.. We use the elasticity of 0.7 in the baseline dynamic calculation. Table 1 reports the relevant parameter values and results.

Table 1: Effects of Replacement Rate Cut from 60 % to 50 %

Scenario	N^1	rr	s^1	G	ϵ
Baseline	6,0 %	60 %	3.7 %	2.3 %	
Static	6,0 %	50 %	3.1 %	2.9 %	0
Dynamic/1	5,6 %	50 %	2.9 %	2.7 %	0.7
Dynamic/2	4,7 %	50 %	2.4 %	2.3 %	2.1

Gini coefficient equals 2.3 % in the *baseline* scenaario. The scenario called *static* measures the very typical static calculation where there are no behavioral effects present ($\epsilon = 0$). Only income shares change (s^1) due to the replacement rate cut and therefore the Gini coefficient increases up to 2.9 %. Obviously the static scenario paints a false pircture if in reality there are behavioral effects at play. The larger the value of elasticity, the larger the gap between results of static and dynamic scenario are.

In the first dynamic scenario, Dynamic/1, a concensus estimate of ϵ parameter is used. We now see that the share of unemployed declines due to the behavioral effect and the Gini coefficient is now 2.7 %. The effect of the reform is not small, but in terms of Gini-coefficient, income inequality clearly increases due to the replacement rate cut. Approximately one third of increased inequality is neutralized do to behavioral effect that runs the other way.

Finally, the second dynamic scenario, Dynamic/2, shows what would happen, if the elasticity value was calculated according to equation (6): $\hat{\epsilon} = 2.1$. A large share of unemployed would have moved to employment, whereas the Gini coeffient remains the same. Over 20 percent of the unemployed find jobs, which is enough to compensate the income losses due to the replacement rate cut. The problem with this final scenario in practice is that the value of the elasticity is unrealistically high in the context of unemployment insurance.

5 Discussion

The model framework presented here is, despite its simplicity, a reasonable description of reality. The model brings forth that a static measure of change in income equality may not be sufficient. The main contribution of this paper is, however, to derive a limit for elasticity, that induces replacement rate cut not to be inequality increasing. This allows us to think more profoundly about the domains in which this somwhat counter-intuitive mechanism could be at play.

According to the application of this paper, tt seems that as a general policy, cuts in unemployment replacement rate do not improve income equality as the empirical estimates of benefit elasticities are found to be considerably smaller than would be required. But the unemployment insurance scheme is not the only field of application. The framework can be extended to many other domains including many parts of social insurance policies, taxation, public subsidies and so on. It is not impossible, however, to find other contexts in which the elasticity value might be large enough. Identification of these domains should be a very important aspect of future research.

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