Welfare Economy

Chapter 4
Efficiency and equity

We present the instruments to analyze inequality and the questions linked to the equity efficiency trade-off

Inequality

Inequality is one of our most urgent social problems. Curbed in the decades after World War II, it has recently returned with a vengeance. We all know the scale of the problem—talk about the 99% and the 1% is entrenched in public debate (i.e. for instance, in France, in 2010, 1% of the richest people earn 11% of the total income, OR, hold 24% of the assets)

How do economists think systematically about the trade-offs between efficiency and inequality ?

How do economists measure poverty of inequality ?

Vocabulary

All of those concepts should be reviewed (in textbooks or in wikipedia)

- Distribution of income

- Lorenz curve

- Poverty threshold

- Poverty gap

- Inequality

- Dalton Atkinson measure

- Headcount ratio

- Giny index

- Trade-off equity efficiency

Map of the talk

1) Measures of inequality

   ☐ Poverty index, poverty gap, Lorenz curve and Gini index, Dalton-Atkinson measures
   ☐ Other dimensions of inequalities

2) Reducing the inequalities

   ☐ trade off efficiency equity
   ☐ The role of the economist

1a. Measures of inequality

□ Poverty index, poverty gap, Lorenz curve and Gini index, Dalton-Atkinson measures
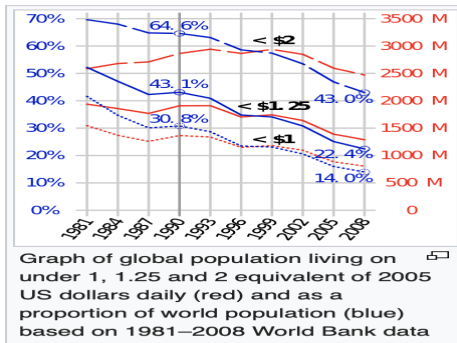
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Definition

The *poverty threshold*, poverty limit or poverty line is the minimum level of income deemed adequate in a particular country.

The common international poverty line has in the past been roughly $1 a day.

Graph of global population living on under 1, 1.25 and 2 equivalent of 2005 US dollars daily (red) and as a proportion of world population (blue) based on 1981—2008 World Bank data

The basic needs approach is one of the major approaches to the measurement of absolute poverty in developing countries. It attempts to define the absolute minimum resources necessary for long-term physical well-being, usually in terms of consumption goods. The poverty line is then defined as the amount of income required to satisfy those needs.

Determining the poverty line is usually done by finding the total cost of all the essential resources that an average human adult consumes in one year. The largest of these expenses is typically the rent required to live in an apartment, so historically, economists have paid particular attention to the real estate market and housing prices as a strong poverty line affector. Individual factors are often used to account for various circumstances, such as whether one is a parent, elderly, a child, married, etc. The poverty threshold may be adjusted annually.

Definition

The Head count ratio (HCR) is the proportion of a population that exists, or lives, below the poverty line.

The Poverty headcount ratio at national poverty line (percentage of population) in India was last reported at 21.9% in 2011-12.

For example, The New York Times in July 2012 reported the poverty headcount ratio as 11.1% of American population in 1973, 15.2% in 1983 and 11.3% in year 2000

Poverty GAP

Given an household, the poverty gap is the relative difference bet-
ween the household 's income and the poverty threshold. For ins-
tance, if the poverty threshold is $ 1,25 and that one household
income is $ 0,50, then the poverty gap is

$$\frac{1,25 - 0,50}{1,25} = 0,6 = 60\%.$$

Definition

The poverty gap index is defined as the average poverty gap in the
population as a proportion of the poverty line

$$\text{PGI} = \frac{1}{N} \sum_{j=1}^{q} \left(\frac{z - y_j}{z} \right)$$

N the size of the population, q
the number of households which
income is below z, q/N being
the HCR.

Features of the Poverty GAP

The poverty gap index can be interpreted as the average percentage shortfall in income for the population, from the poverty line

If you multiply a country's poverty gap index by both the poverty line and the total number of individuals in the country you get the total amount of money needed to bring the poor in the population out of extreme poverty and up to the poverty line, assuming perfect targeting of transfers.

For example, suppose a country has 10 million individuals, a poverty line of $500 per year and a poverty gap index of 5%. Then an average increase of $25 per individual per year would eliminate extreme poverty. Note that $25 is 5% of the poverty line. The total increase needed to eliminate poverty is US$250 million—$25 multiplied by 10 million individuals.

Recent measures of the Poverty GAP

The poverty gap index is an important measure beyond the commonly used headcount ratio. Two regions may have the similar headcount ratio, but distinctly different poverty gap indexes. A higher poverty gap index means that poverty is more severe.

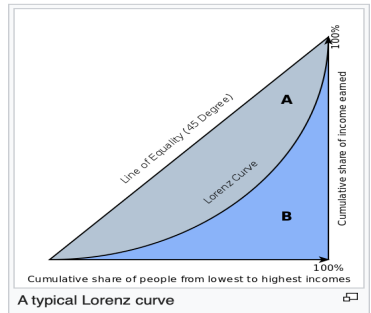| Country	Poverty line ($/month)	Headcount ratio	Poverty gap index	Year
Albania	38	0.62	0.19	2008
Brazil	38	6.14	3.62	2009
Cameroon	38	9.56	1.2	2007
Comoros	38	46.11	20.82	2004
Laos	38	44	12.1	2002
Congo, Dem. Rep.	38	87.72	52.8	2005
Iran	38	1.45	0.34	2005
Yemen	38	17.5	4.2	2005
Australia	959	12.4	2.93	2010
France	861	7.1	1.44	2010
Germany	918	11	3.67	2010
Ireland	934	14.8	3.08	2010
Switzerland	1148	8.7	3.37	2010
United Kingdom	1027	8.3	2.06	2010
United States	1232	17.1	6.55	2010

In economics, the Lorenz curve is a graphical representation of the distribution of income or of wealth (of a group, a country for example). It was developed by Max O. Lorenz in 1905 for representing inequality of the wealth distribution.
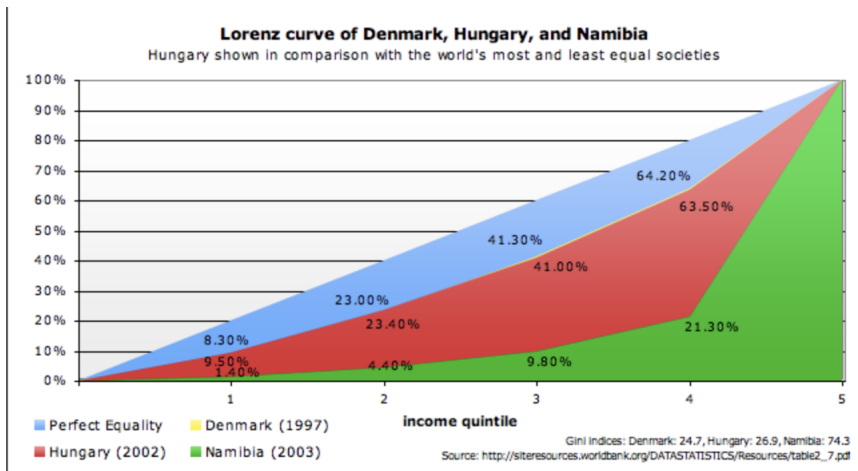
Definition

The curve is a graph showing the proportion of overall income or wealth assumed by the bottom x% of the peoplePoints on the Lorenz curve represent statements like "the bottom 20% of all households have 10% of the total income"

- The situation of the country is depicted by the curve between the area A and B
- A perfectly equal income distribution would be one in which every person has the same income. In this case, the bottom N% of society would always have N% of the income. This can be depicted by the straight line $y = x$; called the "line of perfect equality."
- By contrast, a perfectly unequal distribution would be one in which one person has all the income and everyone else has none. In that case, the curve would be at $y = 0\%$ for all $x < 100\%$, and $y = 100\%$ when $x = 100\%$. This curve is called the "line of perfect inequality."

A typical Lorenz curve

Lorenz curve of Denmark, Hungary, and Namibia

Hungary shown in comparison with the world's most and least equal societies

Perfect Equality   Denmark (1997)
Hungary (2002)   Namibia (2003)

income quintile

Gini Indices: Denmark: 24.7, Hungary: 26.9, Namibia: 74.3
Source: http://siteresources.worldbank.org/DATASTATISTICS/Resources/table2_7.pdf

As you can see the income distributionst of Hungary and Denmark are almost the same
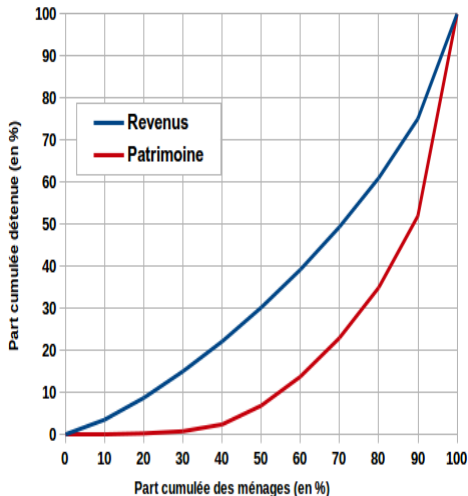
Lorenz curve and GINI index

- Lorenz curve is convex and below the 45 degree line ;

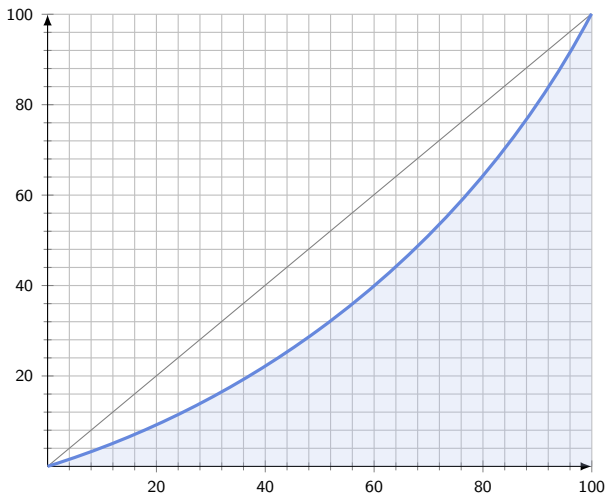- The more LC is convex, the more the inequality

▶ Here, more inequality on Patrimony than in Income

- The proportion of the area above the lorenz curve relative to the area below the 45 degree line is called the *GINI index*

▶ Here, the Gini index for Patrimony is Greater than the Gini index for Income (that is more and less 32.7 %)
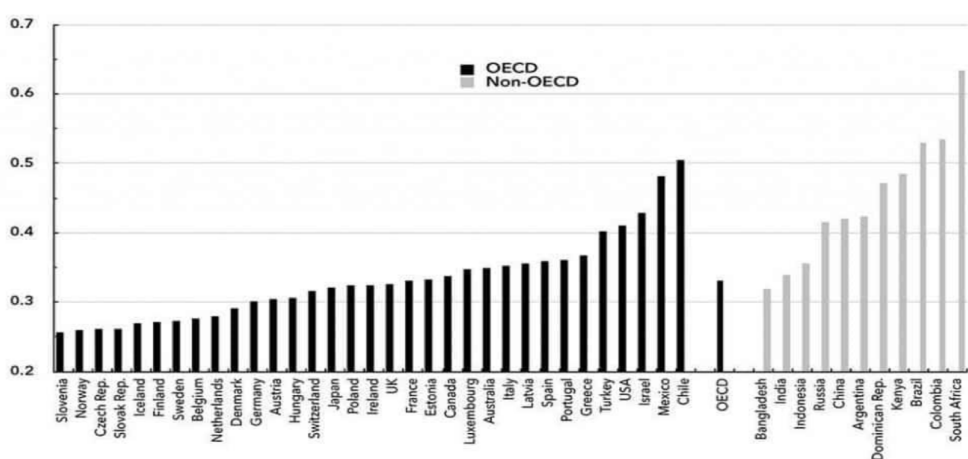
Make an approximation of the GINI index

- 100 is divided by 4*5 thicks,
- Half whole area is $\frac{25*25}{2} = 312,5$ squares
- The approximations of squares below the lorenz curve (by column) is $0,25 + 0,6 + 1 + 1,5 + 2,1 + 2,5 + 3,2 + 3,7 + 4,5 + 5,2 + 6 + 6,75 + 7,5 + 8,5 + 9,5 + 10,5 + 11,5 + 12,7 + 14 + 15,5 + 16,7 + 18,5 + 20,2 + 22,4 + 25 = 229,8$
- The Gini Index : $(312,5 - 229,8)/312,5 \approx 0,26$

Gini Coefficients for Selected Countries

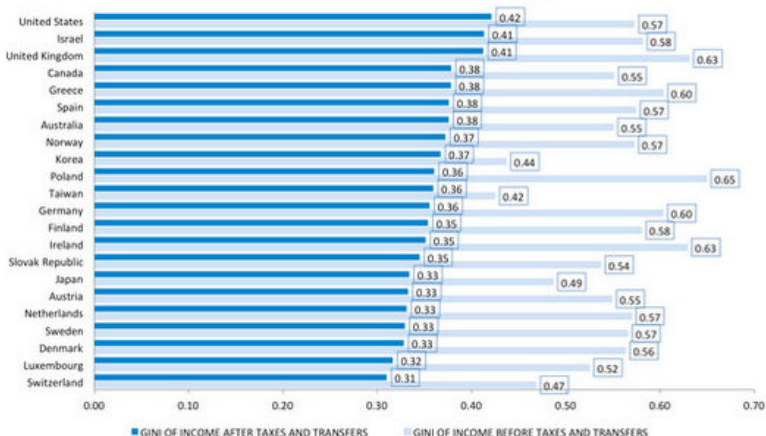## Income Inequality and Redistribution

The U.S. government does less than many other rich countries to reduce market-generated income inequality.
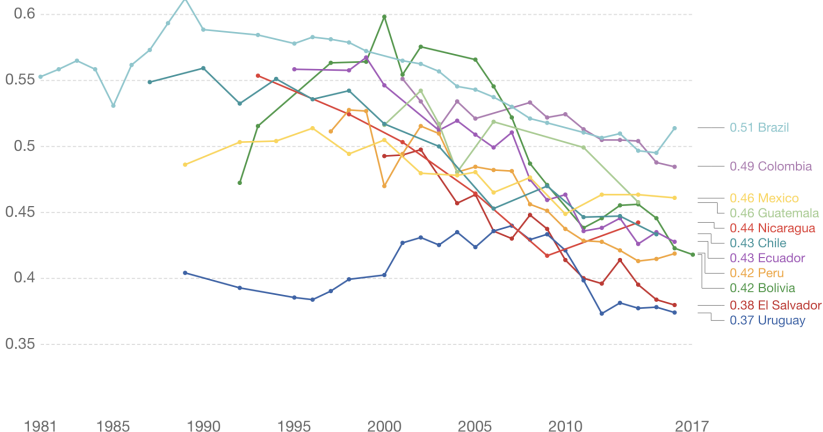
Country	GINI after taxes and transfers	GINI before taxes and transfers
United States	0.42	0.57
Israel	0.41	0.58
United Kingdom	0.41	0.63
Canada	0.38	0.55
Greece	0.38	0.60
Spain	0.38	0.57
Australia	0.38	0.55
Norway	0.37	0.57
Korea	0.37	0.44
Poland	0.36	0.65
Taiwan	0.36	0.42
Germany	0.36	0.60
Finland	0.35	0.58
Ireland	0.35	0.63
Slovak Republic	0.35	0.54
Japan	0.33	0.49
Austria	0.33	0.55
Netherlands	0.33	0.57
Sweden	0.33	0.57
Denmark	0.33	0.56
Luxembourg	0.32	0.52
Switzerland	0.31	0.47

■ GINI OF INCOME AFTER TAXES AND TRANSFERS   □ GINI OF INCOME BEFORE TAXES AND TRANSFERS

Inequality and redistribution in Latin america

Income inequality in Latin America

The Gini index measures the distribution of household equivalized income, including zero income. A higher Gini index is indicative of a more unequal distribution of income.

Our World in Data

0.51 Brazil
0.49 Colombia
0.46 Mexico
0.46 Guatemala
0.44 Nicaragua
0.43 Chile
0.43 Ecuador
0.42 Peru
0.42 Bolivia
0.38 El Salvador
0.37 Uruguay

Source: Socio-Economic Database for Latin America and the Caribbean (CEDLAS and The World Bank)

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Definition

A distribution of income is a mathematical function that provides the probabilities of occurrence of different level of income.

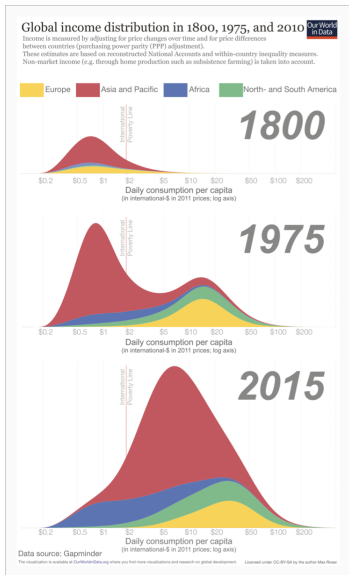**Distribution of Household Income: 2014**

SEPTEMBER 16, 2015
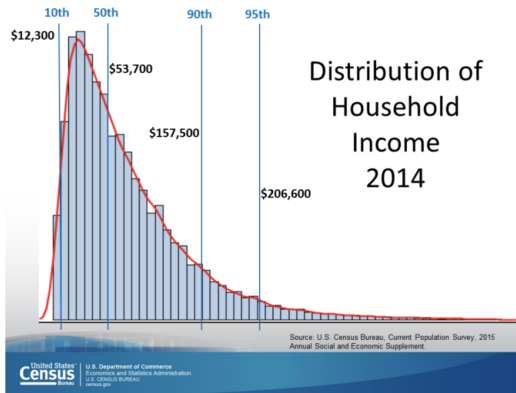
How to read the picture :

- 50% of the population have an income below $ 53.700

- 45% of the population (different from the preceding group) have an income between $ 53.700 and $206.600

- The top 5% have an income above $206.600

The distribution gathers always more information

Comparing distributions of income across countries and time

Global income distribution in 1800, 1975, and 2010
Income is measured by adjusting for price changes over time and for price differences between countries (purchasing power parity (PPP) adjustment).
These estimates are based on reconstructed National Accounts and within-country inequality measures.
Non-market income (e.g. through home production such as subsistence farming) is taken into account.

Europe   Asia and Pacific   Africa   North- and South America

1800
1975
2015

Data source: Gapminder

To make incomes comparable across counties and time, daily income is measurd in constant international dollars.

The normalized areas have been differentiated amongst the continents. The total area of Europe (Yellow) is equal to one. A the extreme the total area of Asia (red) is equal to one, but it have been multipleed by 4. At the end, what is important is the shape of the distribution.

In 1800, the majority of the world lived in poverty ; the mean income (and the mode) are quite similar, almost \$ 0,75.

in 1975 the world much more unequal, and particularly asian distribution was bimodal

In 2015 world inequality declined, the two-humped camel shape changed into a one-humped dromedary.

The measure introduced by Sir Hugh Dalton is based on the premise that socie-ties, under the assumption of a same mean, prefer more egalitarian distributions, as the right distribution "equitable" in the next figure :
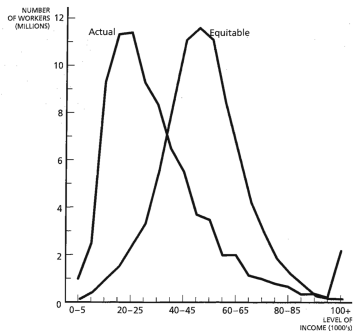
▶ low and big income receive less weight, intermediaries income receive more. This is the contrary of a spread. HOWEVER, this reconcentration is not always possible when the mean is preserved.

Definition

The Dalton-Aktkinson measure of inequality is the fraction of mean income a society be willing to give up to obtain a situation where income is completely equally distributed

Formally, Suppose a utilitarian Social Welfare Function D is such that

$$U((1 - D)Y) = \frac{1}{N} \left(U(Y_1) + \cdots + U(Y_N) \right) \tag{1}$$

$$\text{with} \qquad Y = \frac{1}{N} \left(Y_1 + \cdots + Y_N \right) \tag{2}$$

1b. Measures of inequality

☐ Other dimensions of inequalities

Education has positive effects on earnings :

⟹ Differences in opportunities to invest in human capital, its levels and quality, together with poor redistributive policies may result in increased inequality.

⟹ Higher educational attainment and more equal distribution of education should enhance economic growth and more equal income distribution.

Employment is not only a source of income ; it also provides individuals with social relationships and identity.

Unemployment thus has both economic and social costs to individuals and societies ; it affects income, inequality and happiness.

Joblessness is expected to be negatively correlated with individual wellbeing and health.

Let define ill health as the rate of mortality. Deaton in a no so recent study (2001) concludes that there is no direct link from income inequality to ill health. However,

Income inequality is an indicator of the quality of social arrangements, of stress in rich countries, and of mortality in poor countries.

Indeed, in the US, White mortality and incomes are lower in places where the fraction of blacks is higher.

The growth and inequality literature has recognized that it may be the distribution of assets, rather than income, that underlies effects of inequality on growth by restricting access to credit markets (Stiglitz and Weiss, 1981).

In testing the robustness of the inequality–growth relationship using country level data for 108 countries during 1960-92 on income and land distribution Deininger and Squire (1998) show that there is a strong negative relationship between initial inequality in asset distribution and long- term growth.

Inequality reduces income growth for the poor, but not for the rich.

2a. Reducing the inequalities

- trade off efficiency equity

The evaluation of a public programs entails balancing its consequences for economic efficiency and for the distribution of income.

How can we conceptualize the trade-offs between efficiency and equity?

Let consider a simple exchange economy, with two household, Robinson Crusoe and Friday. In the process of transfer from Robinson to Friday, one orange gets losts.

Robinson Initially	-4	Robinson, after redistribution
Friday, Initially	+3	Friday after redistribution

Most of the inequity has been eliminated, but in the process, the total number of oranges available has been diminished.

In considering a trade-off like the one presented in the preceding slide, two sources of disagreements will occur

- ☐ What is the nature of the trade-off ? For instance, within the mechanism that implement the process of Transfer between Robinson and Friday, is that true that only one orange will be lost ?

- ☐ What is the relative decrease of inequality in terms of decrease of efficiency ? Some people argue that even if one wishes to help the poor, in the long run, the best wayward to do that is to increase the size of the pie.

Going back to the first talk of the curse on Welfare, the project was to measure collective welfare, and at the collective level, the Pareto measure was doing the job. **How can we reconcile the Pareto frontier of the Economy with the preceding trade-off between efficiency and equity?**

Next figure, coming from "Lectures on Publics Economics" by T. Atkinson and J. Stiglitz (chapter 12), will help to summarize and to do a synthesis. There are two classes of individuals whose utility are plotted on the axes. The drawn curve represents the feasible frontier, and the outcome, given the initial entitlements is at N.
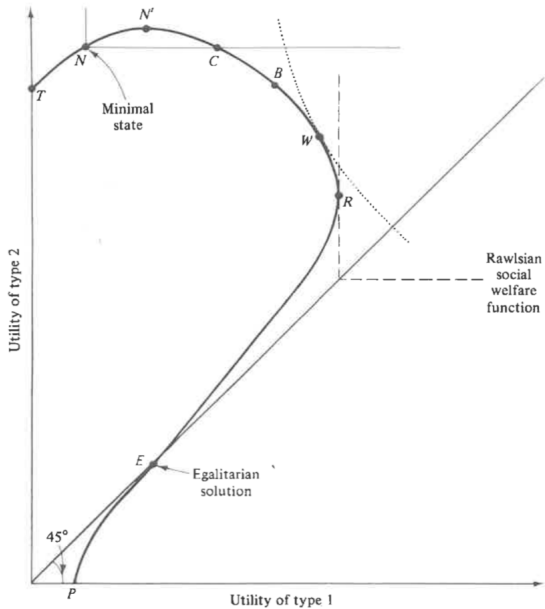
Utility of type 2

N'

N

T

Minimal
state

C

B

W

R

Rawlsian
social
welfare
function

E

Egalitarian
solution

45°

P

Utility of type 1
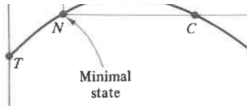
Nozick develops in *Anarchy, State and Utopia* a minimalist approach to the functions of the state, "limited to the narrow functions of protection agains force theft, fraud, enforcement of contracts, ... Any more extensive state will violate person's right not to be forced to do certain things and is unjustified"

The support of this position is in term of the process by which a given outcome emerges. Justice is defined not with respect to a particular distribution of incomes, but in term of the processes that generated those incomes.

(this is a state of nature of anarchy, with limited recognition of the rights of others.)
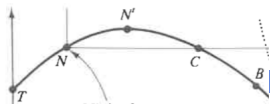
Buchanan and Tullock (1962) allow the government to carry out unanimously approved activities.

"This allow to consider taxation to make at least one person better off and no one worse off. Individuals acting in their self interest will agree to such measures and, since they need no coercition, it can be argued that no violation of individual right is involved."

Starting from N, any point on NC represents a Pareto improvement, and a move to any point on NC would be unanimously approved.
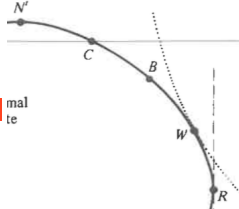
With a benthamist social welfare function, one can argue that some point on the efficient frontier (between N' & R) could be chosen by the government. In the case of the picture, W is the best choice, relative to the criterium of the particular dotted SWF.

The ethical justification of for the adoption of the SWF approach has been discussed, and in particular, one consider a person that is uncertain of its position in a community where there is this particular distribution of endowment.
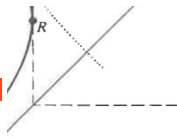
Rawlsian
social
welfare
function

The Rawlsian objective is to maximize the objective of the worst-off individual (maxi-min).

The ethical justification of for the adoption of the Rawlsian outcome is more drastic. It is assumed that when they vote, people does not know the original state, which ensure that their choice "under the veil of ignorance" is impartial or just.
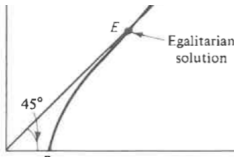
Non paretian objective (E for instance)

The allocation E is the Egalitarian solution, that is when we want that the utility of all the individuals be the same.

In the considered case, the Egalitarian solution is far from the Rawlsian solution.

2b. Reducing the inequalities

□ The role of the economist

A possible role of economist is to explore the relationship between specified objectives and the policy recommandations to which these objectives lead. In particular, there should be anticipations about the behavior of the taxed people.

If the objective, under the veil of ignorance, is efficiency, then the economist will provide the Pareto efficiency curve, and different solutions corresponding to different SWF

If the objective is short term redistribution, then, the economist will analyze the different process that could get to some objective

If the objective is more equity, the economist will provide some measure of loss of efficiency to get to more equity

What should be the design of the indirect tax system ? Should we have a single rate of indirect tax on all commodities, or should the rates be differentiated ?

To minimize distorsion   In order to minimize distorsion, one unique rate should be chosen.

For redistributive purpose   Luxuries should be taxed more heavily

The exploration of the structure of arguments may lead to the revision of attitudes to certain objectives.

For instance, if ti transpires that principal 1 leads consistently to policies that are unattractive, then this may make acceptance of this principle less likely or may lead to its being revisd.