Topics in Macro 2

Week 3 - TD 3, 4 and 5

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TSE

Tuesday (17:00-18:30)

TD First Part: Inequality (6 Weeks)

What's going on?

- 1 Text: The Height of Inequality (Week 1)
- 2 Exercise: Skilled biased technological change and wage dispersion (Week 2)
- **3 Stylized facts: Top wages and incomes (Week 3)**

How do we measure it?

- **4 Exercise: Interdecile ratios of income (Week 3)**
- **5 Exercise: Lorenz curve and Gini basics (Week 3)**

What do we do?

- 6 Exercise: Taxes, consumption and inequality (Week 4)
- 7 Exercise: Variance based inequality indicators (Week 5-6)
- 8 Exercise: Social Welfare Function and inequality aversion (Week 5-6)
- 9 Exercise: The Atkinson inequality index (Week 5-6)

TD Second Part: Fiscal Multipliers (4 Weeks)

Part I

- Exercise I: Habit Persistence and The Keynesian Multiplier
- Exercise II: A Benchmark Model
- Exercise III: Consumption, Labor Supply and the Multiplier

Part II

- Exercise I: Taxes on the Labor Input and the Multiplier
- Exercise II: Public Spending in Utility Function and the Multiplier
- Exercise III: Labor Supply, Public Spending in Utility and the Multiplier

Part III

- Exercise I: Endogenous Public Spending
- Exercise II: Externality in Production and the Multiplier
- Exercise III: Externality in Labor Supply and the Multiplier

Question on the elasticity.

Suppose $F(K, L)$.

$$\varepsilon_{K,L} = \frac{\%\Delta(L/K)}{\%\Delta(MRS_{L,K})} = \sigma$$

In equilibrium:

$$MRS_{K,L} = -\frac{\frac{\partial F}{\partial L}}{\frac{\partial F}{\partial L}} = \frac{w}{R}$$

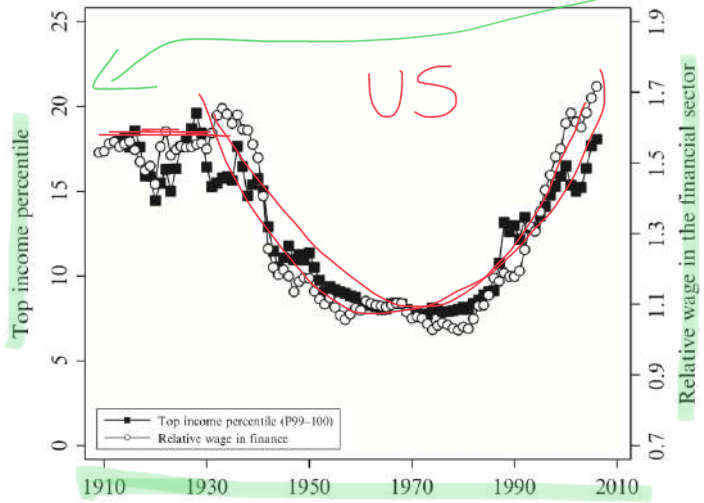
Equivalently (in equilibrium):

$$\varepsilon_{K,L} = \frac{\%\Delta(L/K)}{\%\Delta(MRS_{L,K})} = \frac{\%\Delta(L/K)}{\%\Delta(\frac{w}{R})}$$

σ – Equil.

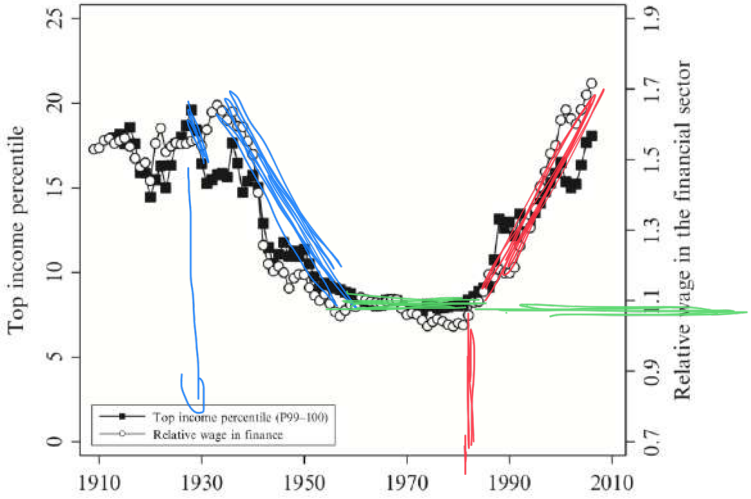
Exercise 3 - Stylized facts: Top wages and incomes

Question 1. Explain what is displayed in this figure.



Hint: Axis and patterns.

Question 2. How can we explain the pattern of the evolution of the top income share?



Hint: Wars, New Deal, Taxes.

Question 3. What can we say about the joint evolution shown on the graph?

- **Statutory**: Deregulation of financial markets.
  - Compensation levels: $MpL < w$.
- **Market**: Winner takes all and super-stars.
  - $MpL + \theta_{Winner} = w$

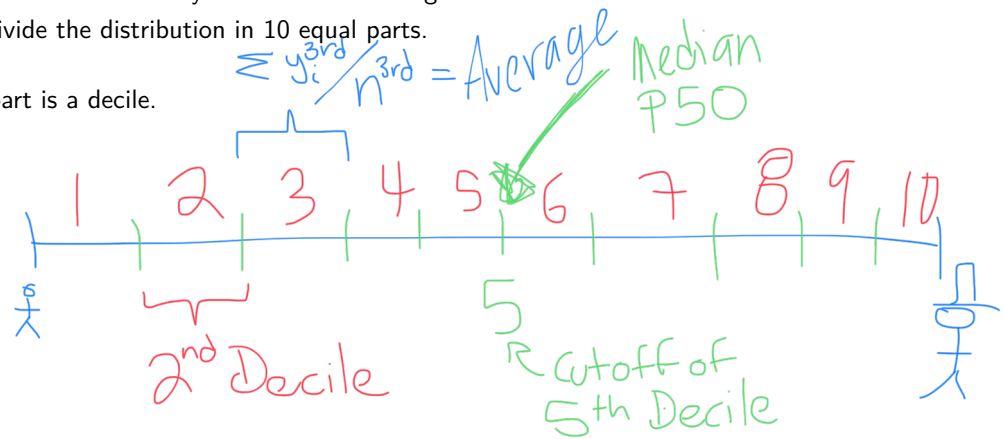
Exercise 4 - Interdecile ratios of income

Question 1. Explain what a decile of income is.

2 Steps

- Order households by income in increasing order.
- Divide the distribution in 10 equal parts.

Each part is a decile.

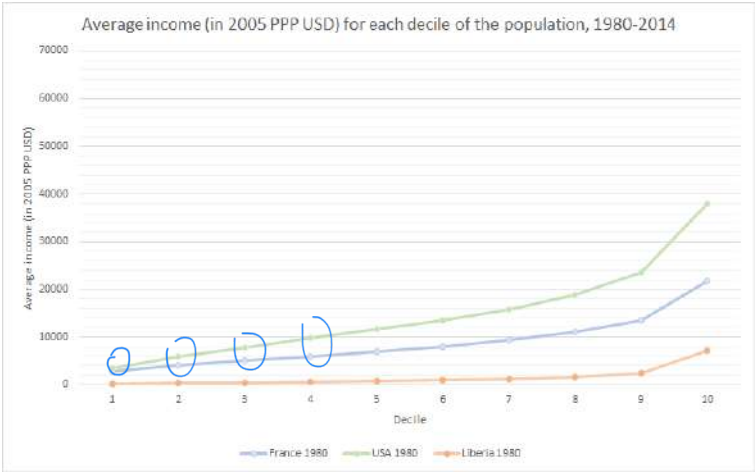


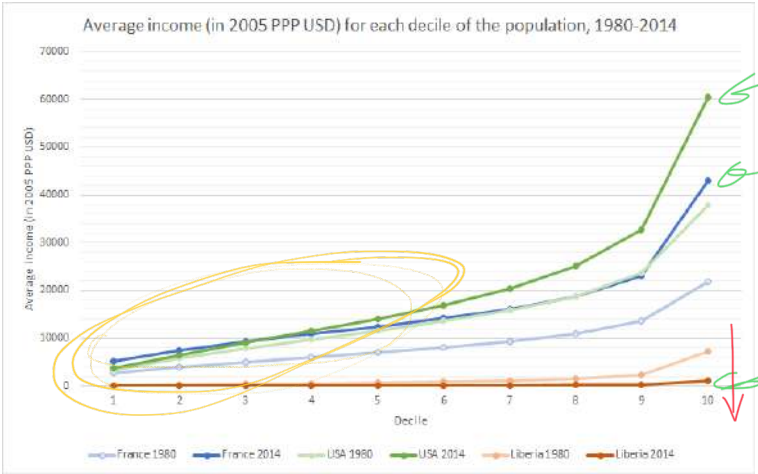
Question 2. Comment the main information found on Table (Table 1).

	France			USA			Liberia		
	1980	1990	2014	1980	1990	2014	1980	1990	2014
D1	2765	3037	5137	3392	3191	3778	125	35	17
D2	3983	4884	7402	5820	5805	6534	272	76	38
D3	5032	6318	9225	7855	8090	9069	403	113	56
D4	6014	7577	10860	9724	10248	11552	542	152	75
D5	7002	8790	12456	11574	12428	14132	703	197	97
D6	8066	10062	14148	13549	14792	16993	904	253	125
D7	9312	11524	16112	15843	17575	20429	1174	329	163
D8	10946	13432	18701	18839	21252	25061	1584	444	219
D9	13556	16522	22971	23622	27209	32763	2363	662	327
D10	21824	27732	43023	37949	45984	60418	7175	2010	994

- Average income (in 2005 PPP USD) for each decile of the population for France, USA and Liberia in 1980, 1990 and 2014.
- Average income in the decile, measured over the total population.

Purchasing Power Parity


Average income (in 2005 PPP USD) for each decile of the population, 1980-2014
70000
60000
50000
40000
30000
20000
10000
0
Average income (in 2005 PPP USD)
1
2
3
4
5
6
7
8
9
10
Decile
France 1980
USA 1980
Liberia 1980


Average income (in 2005 PPP USD) for each decile of the population, 1980-2014
Average income (in 2005 PPP USD)
70000
60000
50000
40000
30000
20000
10000
0
1
2
3
4
5
6
7
8
9
10
Decile
France 1980
France 2014
USA 1980
USA 2014
Liberia 1980
Liberia 2014

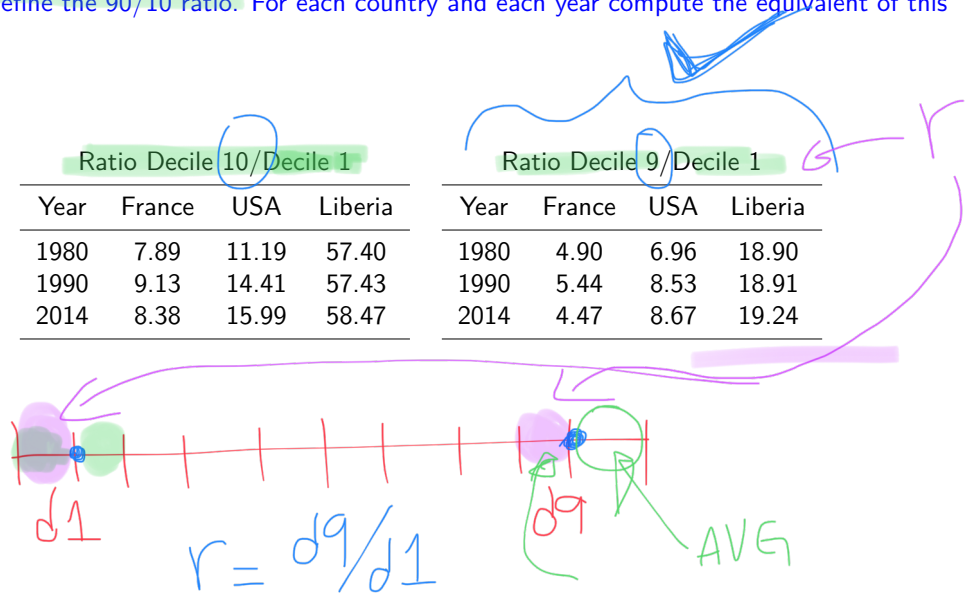
Question 3. Define the 90/10 ratio. For each country and each year compute the equivalent of this ratio here.

Ratio Decile 10/Decile 1

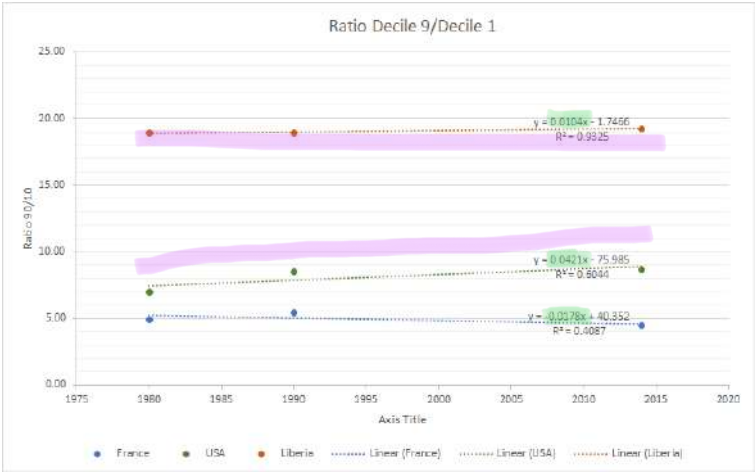
Year	France	USA	Liberia
1980	7.89	11.19	57.40
1990	9.13	14.41	57.43
2014	8.38	15.99	58.47

Ratio Decile 9/Decile 1

Year	France	USA	Liberia
1980	4.90	6.96	18.90
1990	5.44	8.53	18.91
2014	4.47	8.67	19.24



Question 4. Based on the 90/10 ratios, comment the evolution of income inequality in the 3 countries.



Exercise 5 - Lorenz curve and Gini basics

We consider a fictitious economy with 10 individuals that each has the income y_i that we report in the following table:

Income	130	200	230	25	400	10	160	15	35	60

Question 1. Compute the cumulative shares of population and income in this distribution.

Share of Income

$$\mathcal{C}_j = \frac{\sum_{i=1}^{j} y_i}{\sum_{i=1}^{10} y_i}$$

Example

$$\mathcal{C}_1 = \frac{\sum_{i=1}^{1} y_i}{\sum_{i=1}^{10} y_i} = \frac{y_1}{\sum_{i=1}^{10} y_i}$$

$$\mathcal{C}_2 = \frac{\sum_{i=1}^{2} y_i}{\sum_{i=1}^{10} y_i} = \frac{y_1 + y_2}{\sum_{i=1}^{10} y_i}$$

$$\mathcal{C}_3 = \frac{\sum_{i=1}^{3} y_i}{\sum_{i=1}^{N} y_i} = \frac{y_1 + y_2 + y_3}{\sum y_i}$$

Share of Population

$$\mathcal{P}_j = \frac{\sum_{i=1}^{j} x_i}{\sum_{i=1}^{10} x_i}$$

Before computing the cumulative shares we first put the income by increasing order:

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}
Income	10	15	25	35	60	130	160	200	230	400

$$C_1 = \frac{10}{\Sigma y} = \frac{10}{1265} = 0.0079$$

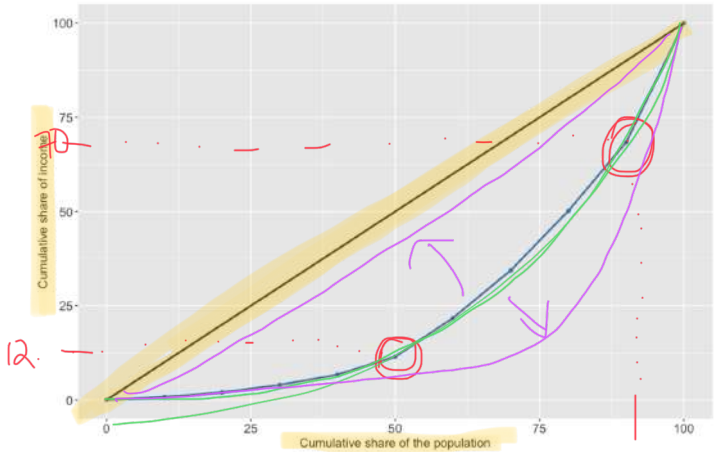
This gives us:

	1	2	3	4	5	6	7	8	9	10
Income	10	15	25	35	60	130	160	200	230	400
C_j	0.0079	0.0198	0.0395	0.0672	0.1146	0.2174	0.3439	0.5020	0.6838	1.0
$\mathcal{P}_j$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1

$$C_2 = \frac{10+15}{1265} = 0.0198$$

Question 2. Define the Lorenz curve and plot the Lorenz curve for the above income and population shares as well as the line of equality.

Definition: Cumulative share of income held by the corresponding cumulative share of the population.



Plot $\mathcal{C}$ as a function of $\mathcal{P}$.

Question 3. Compute the income Gini index in this economy.

(Full distribution of income)

5 Steps

1. Put income in increasing order.
2. Compute the mean income:

$$\bar{Y} = \frac{1}{n}\sum_{i=1}^{n} y_i$$

3. Compute the absolute difference of all pairs of income:

$$M = \frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} |y_i - y_j|$$

diff

n^2 = possible diff.

4. Compute the relative mean absolute difference:

$$RMAD = \frac{M}{\bar{Y}}$$

← step 3

← step 2

5. Gini is half the *RMAD*:

$$Gini = \frac{1}{2} RMAD$$

Step 1

Individual	1	2	3	4	5	6	7	8	9	10
Income	10	15	25	35	60	130	160	200	230	400

Lorenz

Step 2

$$\bar{Y} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{1,265}{10} = 126.5$$

Step 3

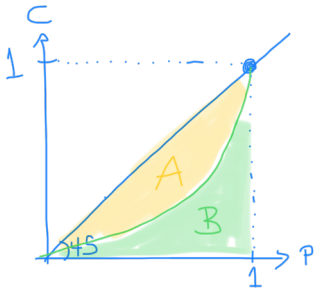
	10	15	25	35	60	130	160	200	230	400
10	0	5	15	25	50	120	150	190	220	390
15	5	0	10	20	45	115	145	185	215	385
25	15	10	0	10	35	105	135	175	205	375
35	25	20	10	0	25	95	125	165	195	365
60	50	45	35	25	0	70	100	140	170	340
130	120	115	105	95	70	0	30	70	100	270
160	150	145	135	125	100	30	0	40	70	240
200	190	185	175	165	140	70	40	0	30	200
230	220	215	205	195	170	100	70	30	0	170
400	390	385	375	365	340	270	240	200	170	0

$$M = \frac{1}{n^2} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j| = \frac{12670}{100} = 126.7$$

Step 4

$$RMAD = \frac{M}{\bar{Y}} = \frac{126.7}{126.5} = 1.0016$$

Step 5



$$Gini = \frac{1}{2} RMAD = \frac{1}{2} * 1.0016 = 0.5008$$

$Gini = 2A$, $A + B = \frac{1}{2}$

$= 2\left(\frac{1}{2} - B\right)$

$= 1 - 2B$