Measuring Pension Entitlements II

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APEX Pension Models

➤ Apex (Analysis of Pension Entitlements across Countries) is a collection of country pension and tax models based on a **single set of economic assumptions** to ensure comparability across countries

➤ Apex includes user interface employing customized STATA dialogues, and STATA routines describing each country **pension, personal tax** and **social contribution systems** and calculation procedures

➤ Originally developed by Edward Whitehouse and used by the World Bank, OECD, and European Commission

Methodology and Assumptions(1)

➢ All calculations are done for **new pensioners** only and based on national pension and tax system **parameters and rules** at the year of modeling, including legislated reforms that are being phased in

➢ Pension entitlements are computed for individuals entering employment in that year, and as **if they had worked their entire career under currently legislated pension and tax regimes**

Methodology and Assumptions(2)

➢ The results are produced for **different levels of earnings and years of service** (earnings are conveniently presented as a fraction or multiple of the economy-wide average wage)

➢ Uniform **economic assumptions**: inflation (p=2.5%), real earnings growth (w=2%), real rate of return (r=3.5%), real discount rate (z=2%), and mortality rates (m) from the UN Population Database

Key Inputs

| Benefit levels	…as a function of system parameters and economic variables
Defined Benefit Pension =	Accrual Rate * Years of Service * Reference Wage
Defined Contribution Pension =	Account Balance / Annuity Factor **Account Balance** $= C_1*(1+r)^N + C_2*(1+r)^{N-1} +…+ C_N*(1+r)$, where $C_t =$ Contribution Rate$_t$ * Wage$_t$ and N are years of service. **Annuity Factor** is a function of mortality rates (m), indexation to wage growth (w) and/or inflation (p), and a discount rate (z)

Key Outputs (1)

➤ $Gross\ Pension\ Level = \dfrac{Gross\ Pension}{Gross\ average\ economy\ wide\ wage}$

➤ $Gross\ RR = \dfrac{Gross\ Pension}{Gross\ individual\ wage}$

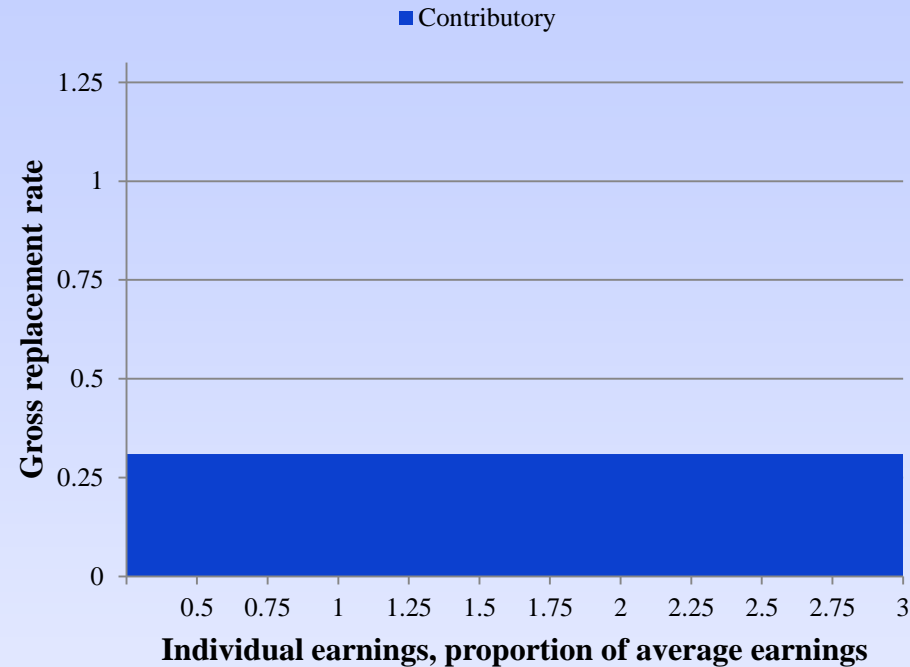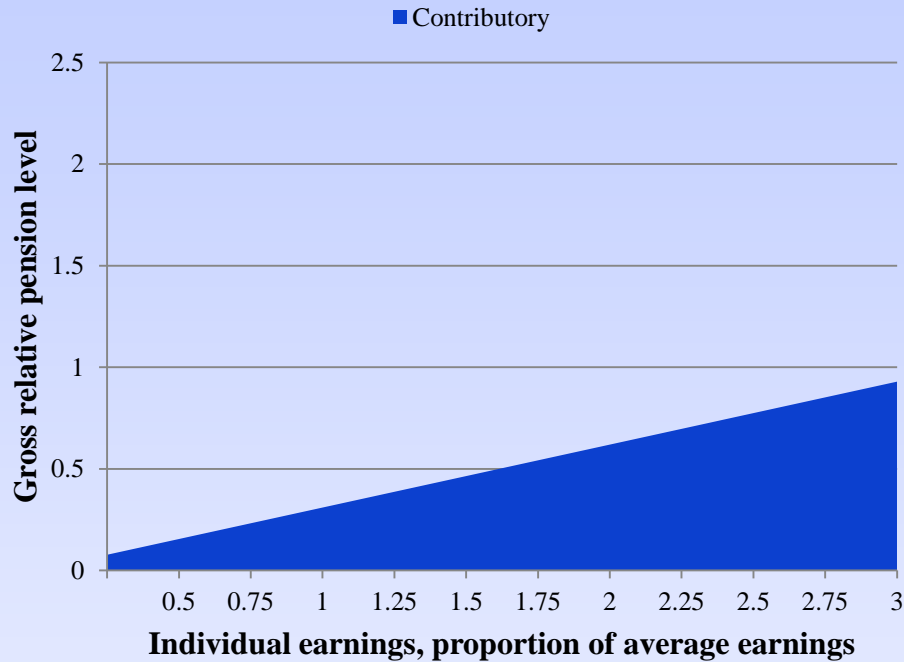➤ $Gross\ Pension\ Wealth = Gross\ Pension\ Level * AF_{ret.age}$

Examples (1)

➤ **Flat rate pension scheme**
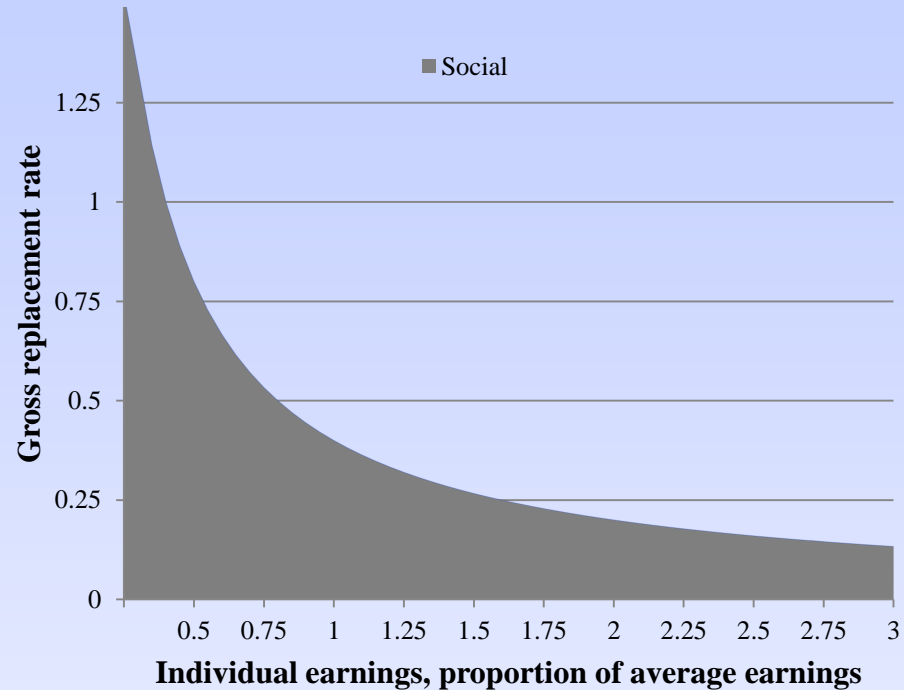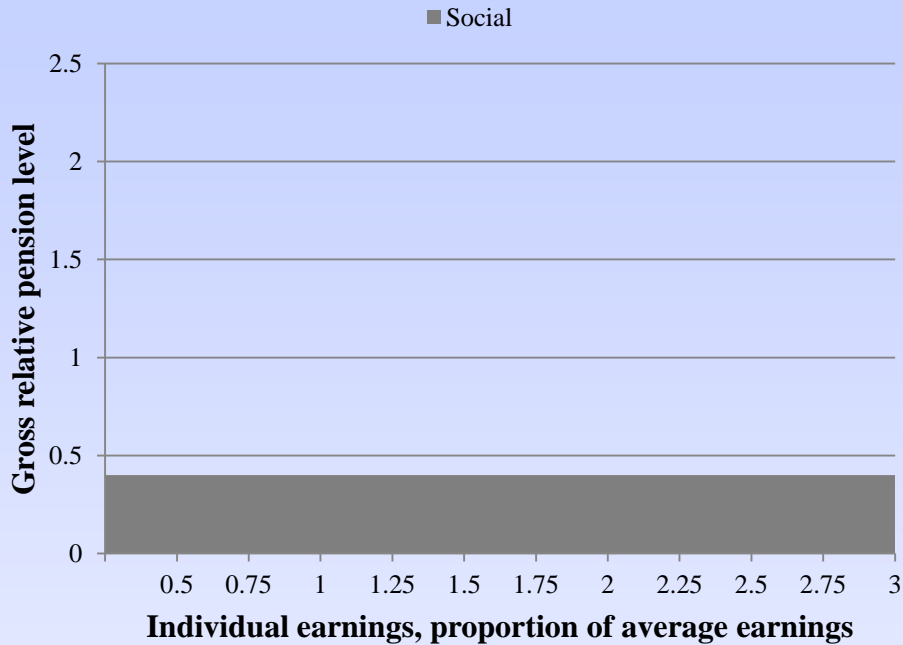
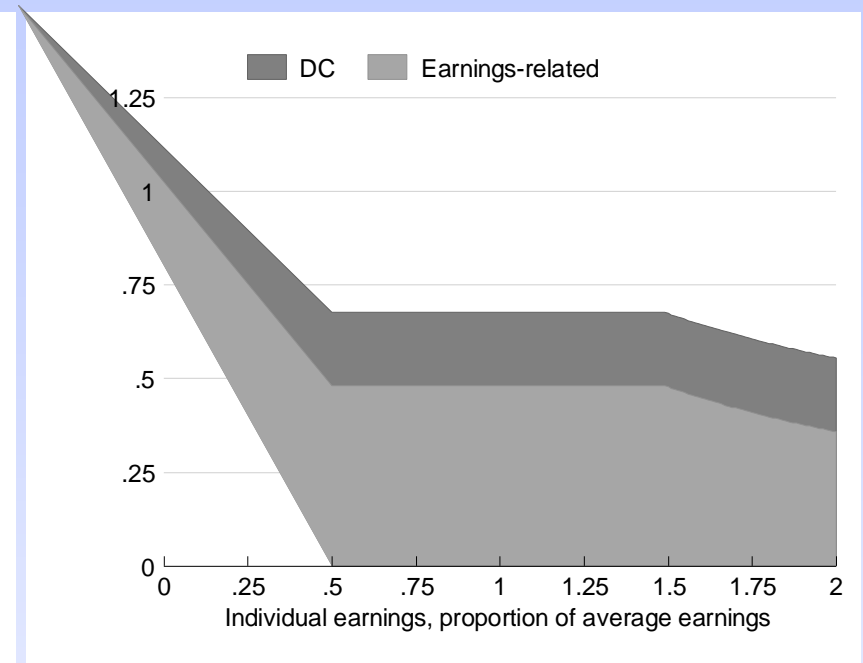|	Individual earnings, multiple of average				
	0.5	0.75	1.0	1.5	2.0
Gross pension level (% of average earnings)	40.0	40.0	40.0	40.0	40.0
Gross replacement rate (% of individual earnings)	80.0	53.3	40.0	26.7	20.0
Gross pension wealth, male (multiple of average earnings)	7.2	7.2	7.2	7.2	7.2

Examples (2)

➢ **Earnings related pension scheme**

	Individual earnings, multiple of average				
	0.5	0.75	1.0	1.5	2.0
Gross pension level (% of average earnings)	15.5	23.2	31.0	46.5	62.0
Gross replacement rate (% of individual earnings)	31.0	31.0	31.0	31.0	31.0
Gross pension wealth, male (multiple of average earnings)	2.14	3.21	4.28	6.42	8.56

Examples (3)

➤ **Two tiers of pension system in Bulgaria**
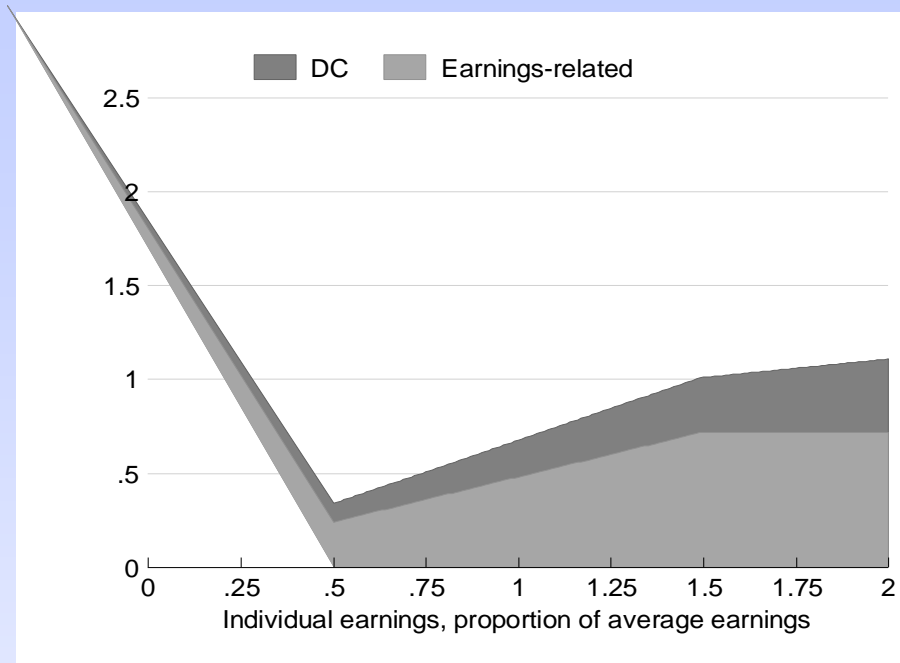
	Individual earnings, multiple of average				
	0.5	0.75	1.0	1.5	2.0
Gross pension level (% of average earnings)	33.8	50.7	67.6	101	110.8
Gross replacement rate (% of individual earnings)	67.6	67.6	67.6	67.3	55.4
Gross pension wealth, male (multiple of average earnings)	9.1	9.1	9.1	9.1	7.5

Key Outputs (2)

➤ $Gross\ Pension\ Level = \dfrac{Gross\ Pension}{Gross\ average\ economy\ wide\ wage}$

➤ $Gross\ RR = \dfrac{Gross\ Pension}{Gross\ individual\ wage}$

➤ $Gross\ Pension\ Wealth = Gross\ Pension\ Level * AF_{ret.age}$

➤ $Net\ RR = \dfrac{Net\ Pension}{Net\ individual\ wage}$

➤ $Net\ Pension\ Wealth = Net\ Pension\ Level * AF_{ret.age}$
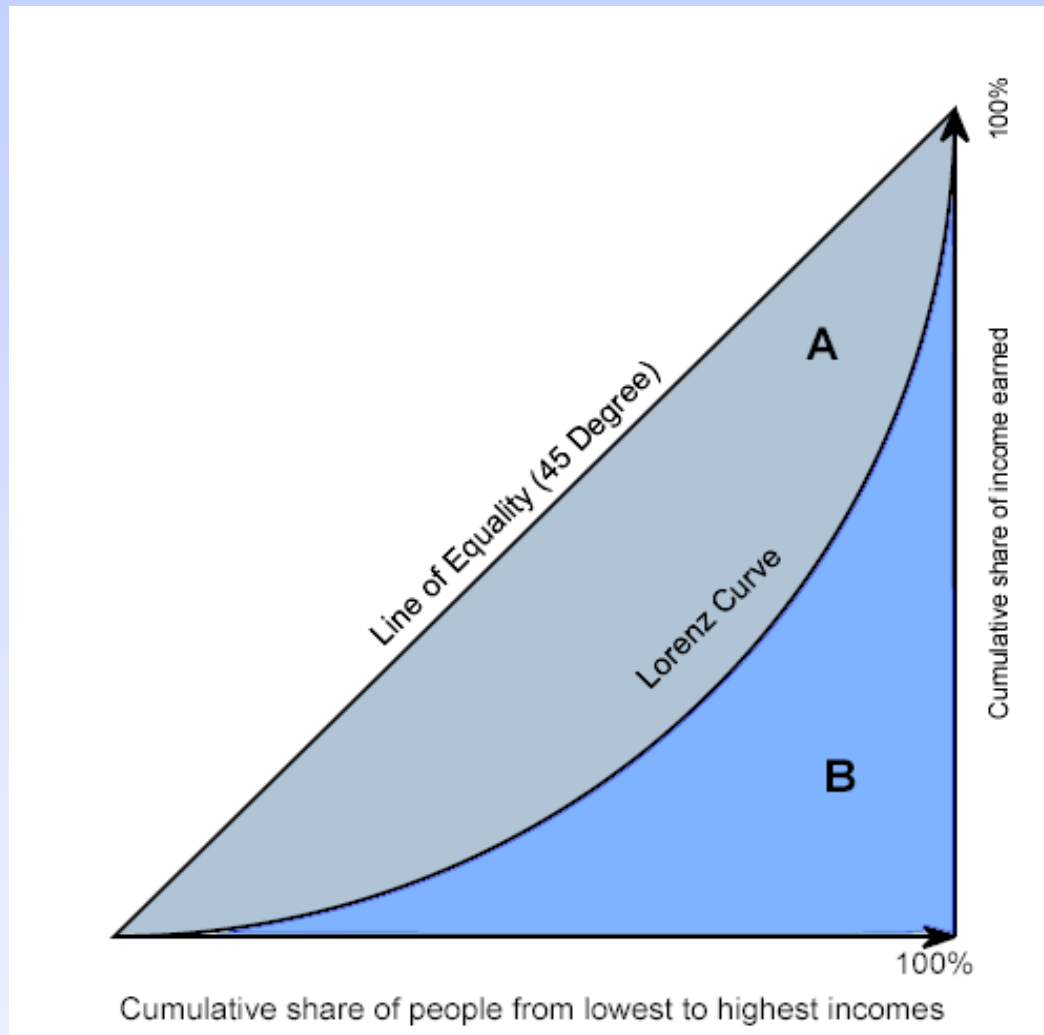
Examples (4)

➤ **Two tiers pension system in Bulgaria**

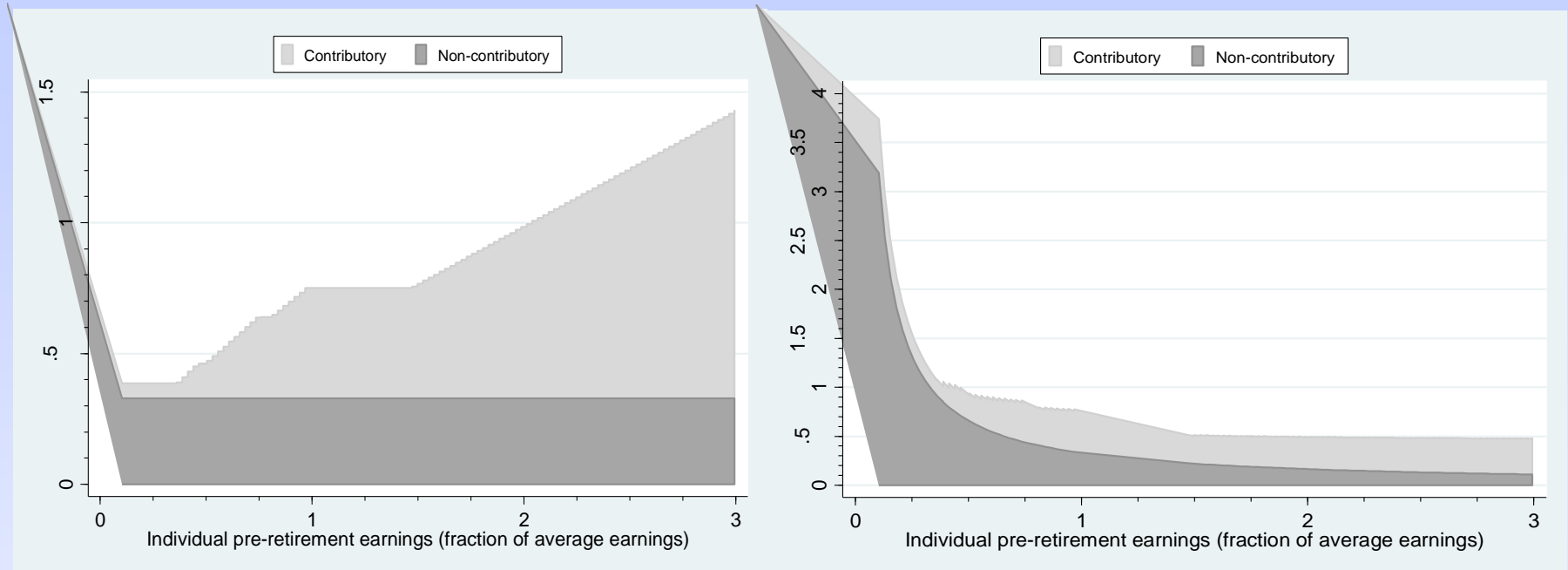|	**Individual earnings, multiple of average**				
	0.5	0.75	1.0	1.5	2.0
Net replacement rate (% of individual earnings)	86.8	90.5	92.5	94.9	79.3
Net pension wealth, male (multiple of average earnings)	*9.1*	*9.1*	*9.1*	*9.1*	*7.5*
Average tax rate: worker (% of individual earnings)	22.1	25.3	26.9	29.1	30.2
Average tax rate: pensioner (% of individual earnings)	0.0	0.0	0.0	0.0	0.0

Key Outputs (3)

- $Gross\ Pension\ Level = \dfrac{Gross\ Pension}{Gross\ average\ economy\ wide\ wage}$

- $Gross\ RR = \dfrac{Gross\ Pension}{Gross\ individual\ wage}$

- $Gross\ Pension\ Wealth = Gross\ Pension\ Level * AF_{ret.age}$

- $Net\ RR = \dfrac{Net\ Pension}{Net\ individual\ wage}$

- $Net\ Pension\ Wealth = Net\ Pension\ Level * AF_{ret.age}$

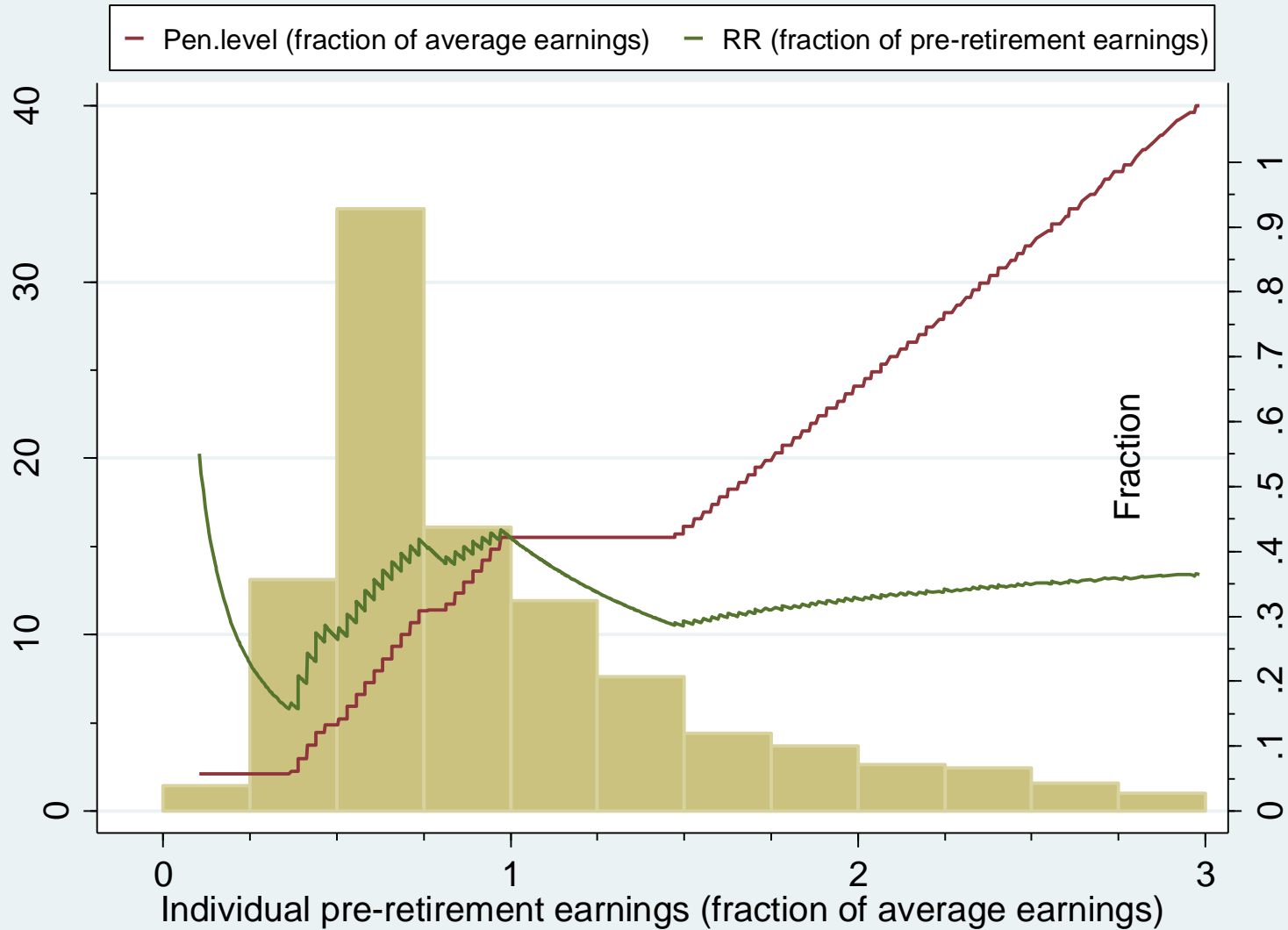- $Progressivity\ Index = 1 - \dfrac{Pension\ Gini}{Earnings\ Gini}$

> Gini = A/(A+B)

Line of Equality (45 Degree)

Lorenz Curve

A

B

100%

100%

Cumulative share of income earned

Cumulative share of people from lowest to highest incomes

Examples (5)

➢ **Two tiers of pension system in Seychelles**

	Individual earnings, multiple of average				
	0.5	0.75	1.0	1.5	2.0
Gross pension level (% of average earnings)	46.2	63.9	75.0	76.8	98.4
Gross replacement rate (% of individual earnings)	92.5	80.0	75.8	51.2	49.2
Gross pension wealth, male (multiple of average earnings)	6.3	8.9	10.5	10.8	14.0

Examples (6)

➢ **Contributory pension and distribution of earnings**

Progressivity of pension formulae

	Pension Gini	Progressivity index	Gini wage
Sweden	26.4	-14.4	23.1
Seychelles (contributory only)	**41.6**	**-1.8**	**40.9**
Italy	23.3	1.8	23.7
Netherlands	24.3	5.7	25.7
Finland	22.6	5.9	24
Spain	25.7	17.1	31.1
Germany	19.8	24.7	26.3
Norway	13.6	38.1	22
Seychelles (incl. non-contributory)	**23.2**	**43.2**	**40.9**
Japan	14.3	46	26.4
United States	16.1	50.8	32.7
Belgium	10.2	52.6	21.6
Czech Republic	8.8	65.5	25.5
Korea	10.2	65.5	29.6
Australia	8.1	70.1	27.2
United Kingdom	5.1	82.4	28.9
Ireland	0	100	29.6
New Zealand	0	100	27.7
OECD 18	**16.2**	**39.8**	**27.2**

Thank You!