Modern Growth Theories
Lecture 6

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Convergence Across-Economies

Inequality in Income

Types of convergence

- **Convergence across-economies** means convergence in per capita income levels (or growth rates).

- **Convergence within an economy** means convergence to the balanced growth path.

  - the rate of convergence (the speed at which economy converges towards the long-run equilibrium),
  - half-life time.

Convergence across-economies

- The widely-discussed issue in growth theory is convergence across-economies.

- Studies of convergence are very important because they address basic questions like:

- Is the degree of income inequality across countries increasing or falling over time?
- Are poor economies catching up with the rich?
- Are the rich getting richer and the poor poorer?

Convergence across-economies

- The theoretical and empirical researches on convergence are extensive and multi-dimensional.

- During the last decades different concepts, interpretations and corresponding convergence measures have been proposed.

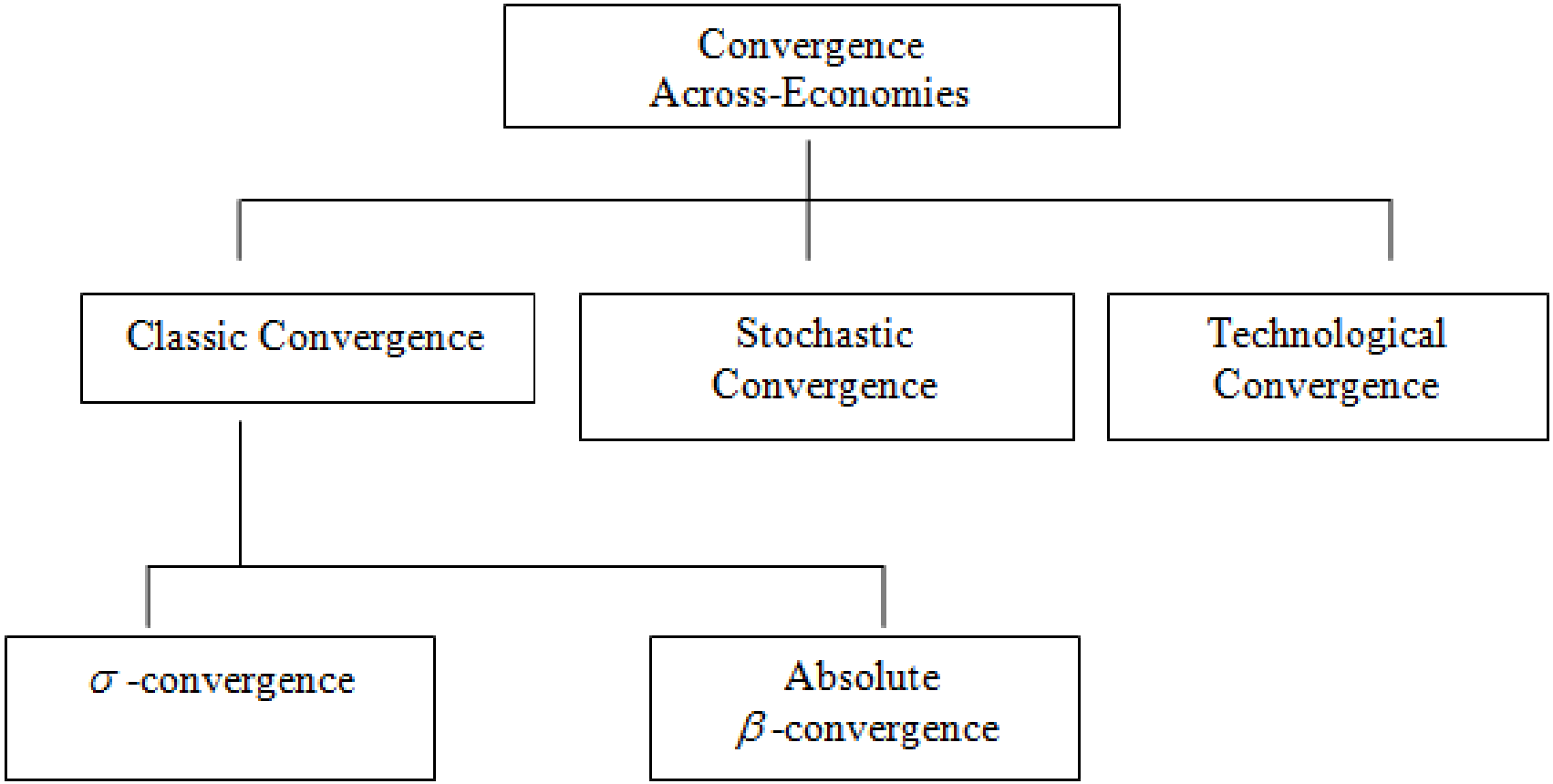
- There are many possibilities to answer the question whether the degree of income inequality across countries is falling over time. Different answers lead to different concepts of convergence across-economies.

Convergence across-economies

- For instance, convergence in per capita income levels means that

1. dispersion of per capita income across countries displays a tendency to decline through time (**σ - convergence**);
2. poor countries grow faster than rich countries (**absolute** or **unconditional convergence**);
3. per capita income differentials between economies are stationary or the (log of) per capita income of one economy relative to a benchmark economy is stationary (**stochastic convergence**).

Classification of Different Concepts of Convergence Across-Economies



- **The mechanism behind classic or stochastic** convergence rests on the neoclassical assumption of diminishing returns to capital which implies higher marginal productivity of capital in a capital-poor country.

- In other words, the rate of return to capital is large when the stock of capital is small and vice versa. If only difference across countries is their initial level of capital then poor countries with little capital will grow faster than rich ones.

- Under the assumption of diminishing returns to capital, output per worker for countries with identical technologies and preferences must equalize, regardless of initial endowments. Opening up the country accelerates the convergence process, as capital should flow to capital scarce countries to benefit from higher returns.

- **The mechanism behind technological convergence -** convergence in per capita income levels may be based also on the process of technological catch-up. Then technology transfer is a potential force behind convergence.

- The endogenous growth models do not predict income convergence between rich and poor countries.
- These models imply the possibility of sustained differences in both levels and rates of growth of national income.
- Because of the assumption that returns to capital do not have to be diminishing the only possible outcome is divergence across-economies.

- There are not only different concepts of convergence across-economies but also different methods of testing the particular kind of convergence.

- For testing σ - convergence are used two popular measures of dispersion i.e.: the standard deviation of log income per capita (or worker) and the coefficient of variation. However, these methods are not equivalent.

The standard deviation of log income per capita (or worker)

$$\sigma(t) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\log y_i(t) - \breve{y}(t)\right)^2} \quad \text{where} \quad \breve{y}(t) = \frac{1}{n}\sum_{i=1}^{n}\log y_i(t)\,,$$

$y_i(t)$ the level of product in i-th country.

The coefficient of variation

$$CV = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i - \bar{y}}{\bar{y}}\right)^2}\,, \text{ where } \bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i\,.$$

- The existence of absolute (unconditional) convergence in per capita income levels across countries (or regions within countries) may be tested by running regressions.

- The regressions involve regressing the growth rate in per capita income on its initial level.

- The absolute (unconditional) β-convergence is implied if the coefficient on initial per capita income is negative and statistically significant.

- There is a connection between σ-convergence measured by the standard deviation of log income per capita and absolute β-convergence.

- Absolute β-convergence is necessary but not sufficient for σ-convergence while σ-convergence is sufficient but not necessary for absolute β-convergence.

- The absence of σ-convergence cannot be taken as implying the absence of absolute β-convergence. In other words, the absence of σ-convergence does not allow to conclude that poor economies do not grow faster than rich ones.

- σ-convergence is a stronger criterion than absolute β-convergence.

Stochastic convergence

- Many researchers have investigated convergence across-economies employing time series econometric methods.

- These studies use unit root and cointegration techniques to test convergence.

- The empirical evidence has been mixed and affected by the choice of countries that are analyzed.
- Alternative testing frameworks or datasets have led to different results.
- Studies that employ a cross-section method tend to favour international output convergence among small group of industrialized countries or regions. These countries form **convergence clubs**.
- Tests on the basic of time series analysis find little evidence of convergence even among similar countries.

- Generally, the hypothesis that cross-country disparities tend to decrease over time is not supported by evidence.

- The gap between richest and poorest countries increased extremely, especially after the post war era. This is due to the different growth experience of rich and poor countries.

- Relatively wealthy countries have grown faster than the mean, while relatively poor countries have grown more slowly.

Income gap among countries

Source: Human Development Report 1999 (http://hdr.undp.org)

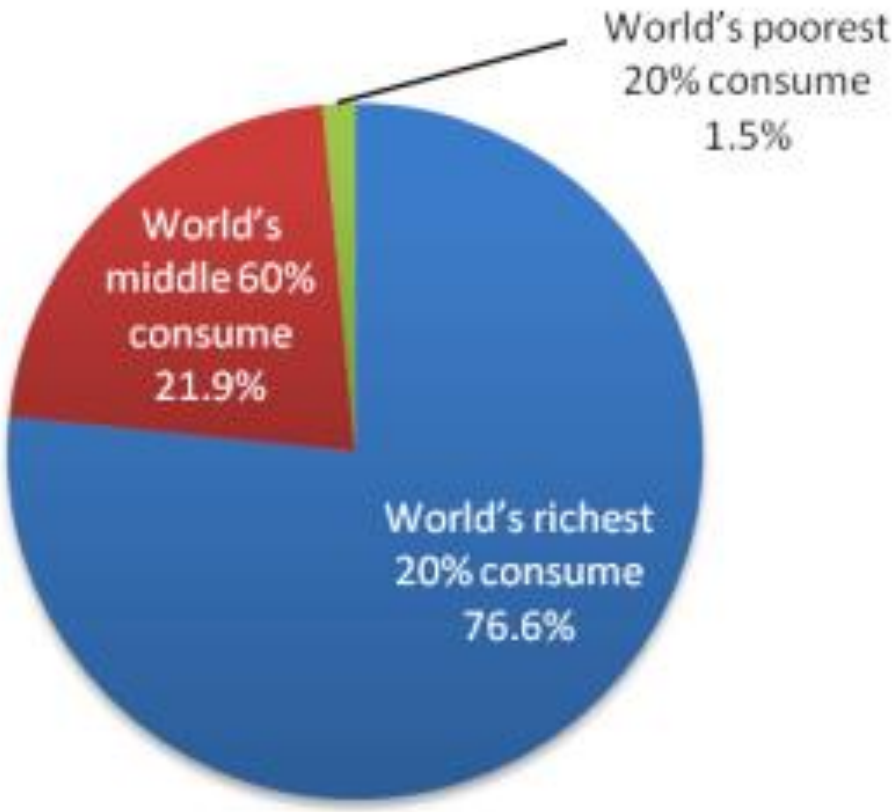
- World inequalities have been rising steadily for last two centuries.
- An analysis of long-term trends shows the distance between the richest and poorest countries was about:
  - 3 to 1 in 1820,
  - 11 to 1 in 1913,
  - 35 to 1 in 1950,
  - 44 to 1 in 1973,
  - 72 to 1 in 1992,
  - 77 to 1 in 1997.

Income gap among countries

- 104 390 USD per capita (Luxembourg) : 177 (Burundi) = **590** in 2010 (World Economic Outlook Database-October 2010, IMF)
- 122 272 USD per capita (Luxembourg) : 197 (Burundi) = **620.7** in 2011 (http://www.imf.org)
- 115 809 USD per capita (Luxembourg) : 217 (Congo (Dem. Rep. of)) = **533.7** in 2012 (http://www.imf.org)
- 137 162 USD per capita (Qatar) : 609 Central African Republic = **225.22** in 2014 (http://www.imf.org)
- 101 994 USD per capita (Luxembourg) : 306 (Burundi) = **333.3** in 2015 (http://www.imf.org)
- 107 708.2 USD per capita (Luxembourg) : 221.9 (South Sudan) = **485.4** in 2017 (http://www.imf.org)

Share of world's private consumption, 2005

Source: World Bank Development Indicators, 2008

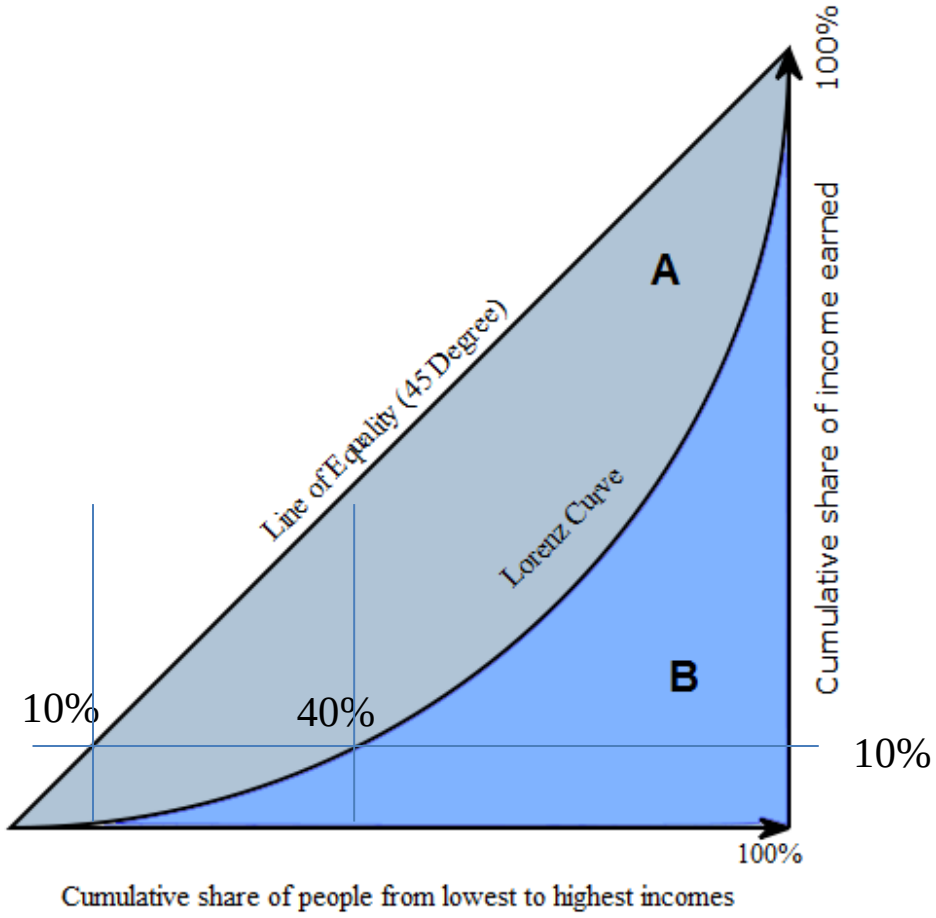


Inequality in Income – the Lorenz Curve

- A curve is showing the proportion of national income earned by a given percentage of population.

- E.g. What proportion of national income is earned by the top 10% of the population.

The Lorenz Curve of Income Distribution



Inequality in Income – Gini Coefficient

- Gini coefficient - the proportion of the area taken up by the Lorenz Curve (A) in relation to the overall area under the line of equality (A+B).
- The measure of income distribution inequality.
- It ranges between 0 and 1 (or if multiplied by 100 – between 0 and 100%).

Inequality in Income – Gini Coefficient

- A low Gini coefficient indicates more equal income or wealth distribution, while a high Gini coefficient indicates more unequal distribution.
- 0 corresponds to perfect equality (everyone having exactly the same income) and 1 corresponds to perfect inequality (where one person has all the income, while everyone else has zero income).
- The Gini coefficient requires that no one have a negative net income or wealth.

Income Gini Coefficient, 2005-2013

Source: Human Development Report 2015 (http://hdr.undp.org)

Country	Gini Coefficient	Country	Gini Coefficient
Slovenia	24.9	Seychelles	65.8
Sweden	26.1	South Africa	65.0
Iceland	26.3	Comoros	64.3
Slovakia	26.6	Namibia	61.3
Norway	26.8	Botswana	60.5
Finland	27.8	Brazil	52.7

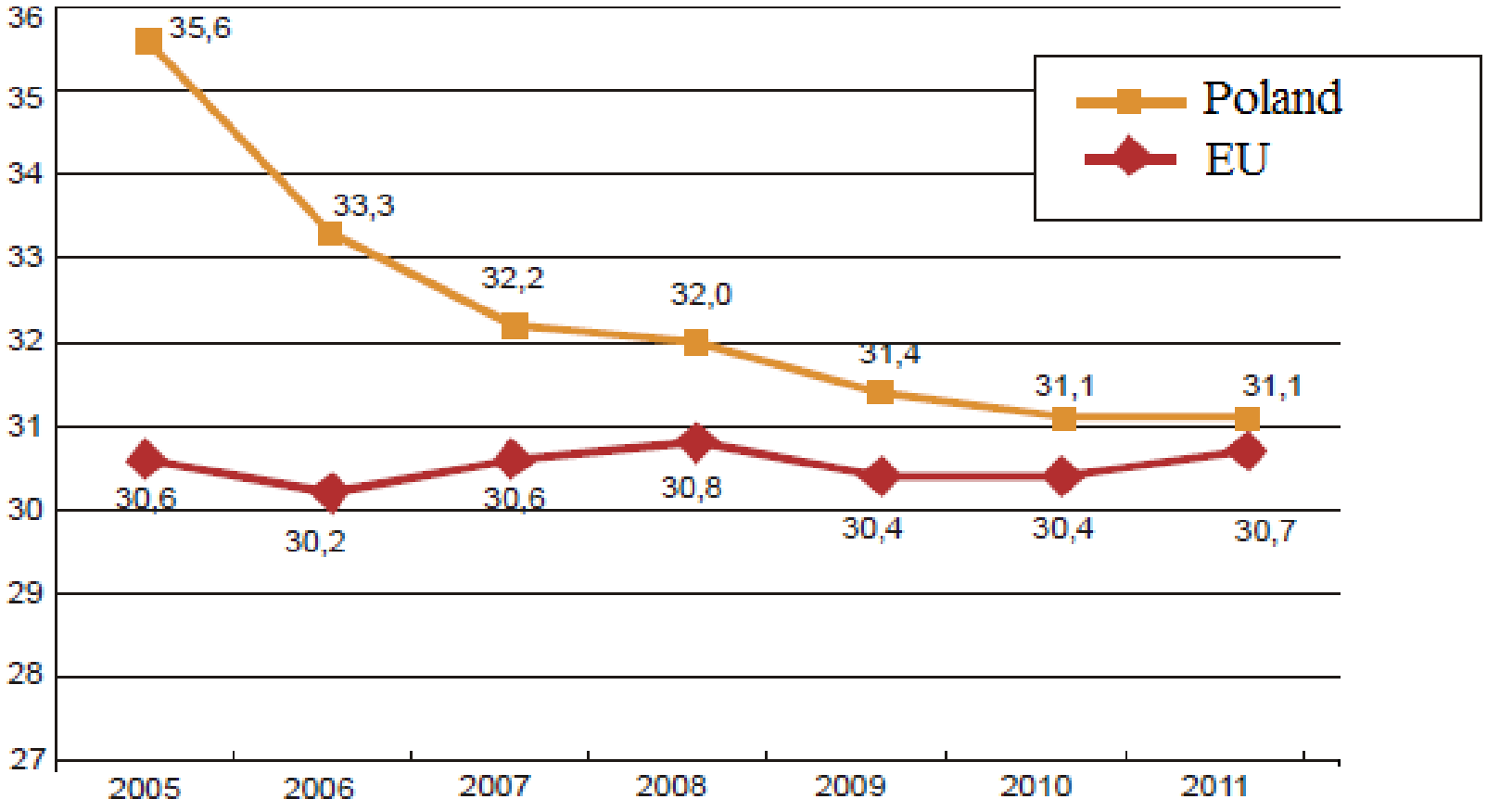
Income Gini Coefficient, 2010-2015

Source: Human Development Report 2016 (http://hdr.undp.org)

Country	Gini Coefficient	Country	Gini Coefficient
Colombia	53.5	Lithuania	35.2
France	33.1	Poland	32.1
Georgia	40.1	Sri Lanka	39.2
Germany	30.1	Turkey	40.2
Italy	35.2		

Income Gini Coefficient, 2005-2012, Poland and EU

http://www.stat.gov.pl (Central Statistical Office of Poland)



Share of Income or Expenditure: Poorest 10% and Richest 10%

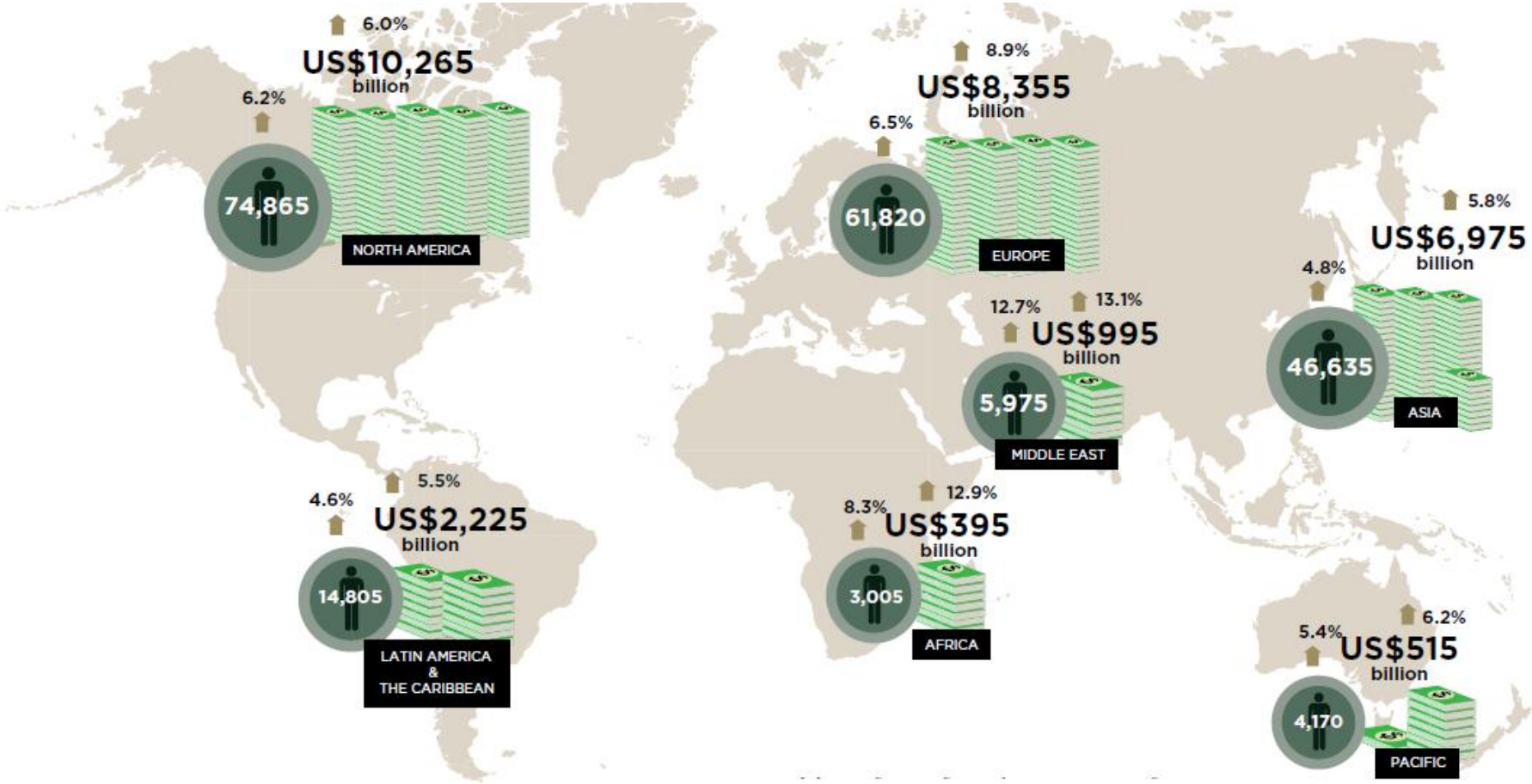
Source: Human Development Report 2009 (http://hdr.undp.org)

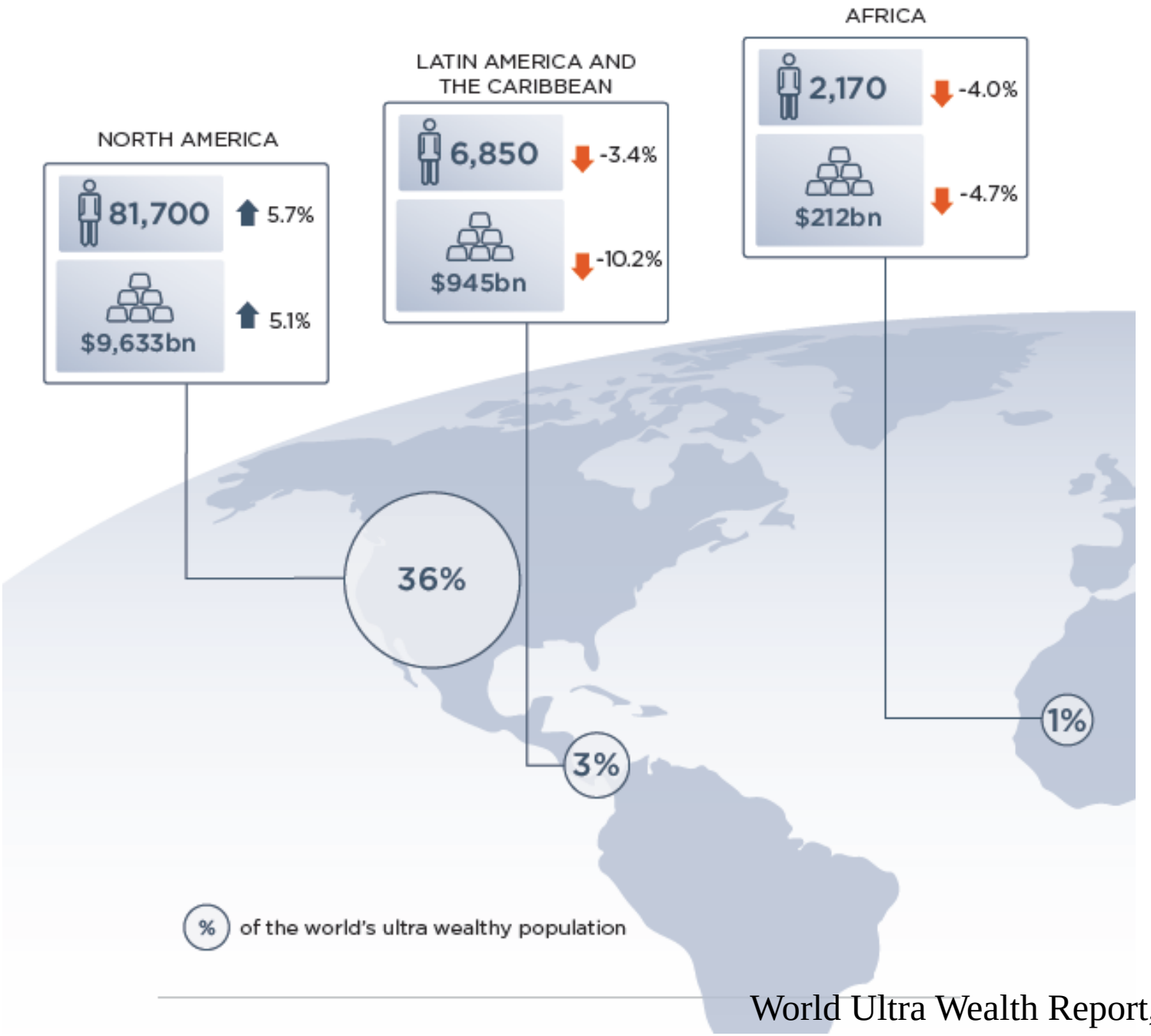
Country	Poorest 10%	Richest 10%	Country	Poorest 10%	Richest 10%
Azerbaijan	6.1	17.5	Boliwia	0.5	44.1
Japan	4.8	21.7	Namibia	0.6	65.0
Czech Rep.	4.3	22.7	Angola	0.6	44.7
Ethiopia	4.1	25.6	Colombia	0.8	45.9
Finland	4.0	22.6	Botswana	1.3	51.2

UHNW – ultra high net worth individuals, 2014

Source: World Ultra Wealth Report, 2014

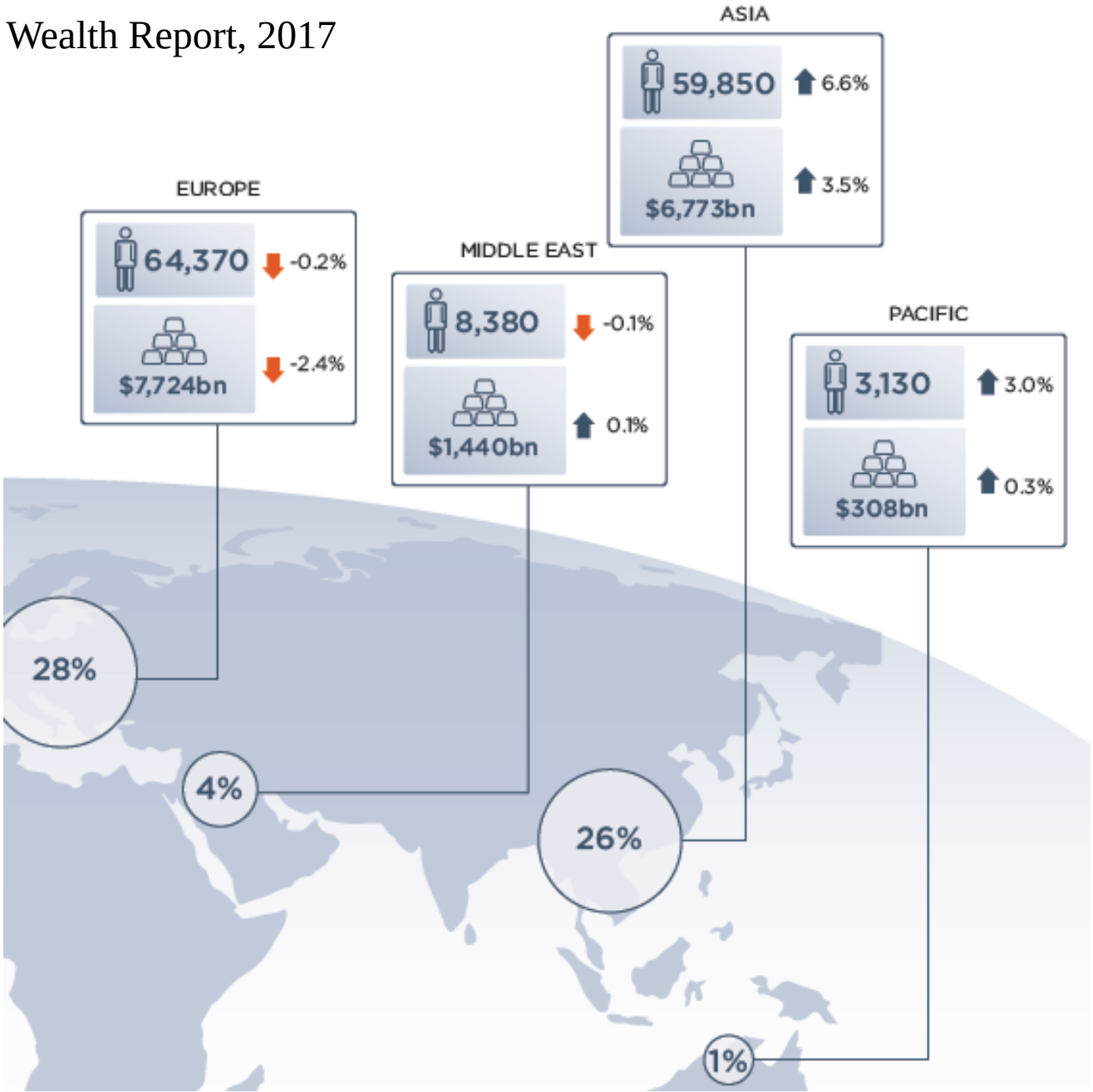
Net Worth	UHNW POPULATION	TOTAL WEALTH US$ billion
$1 billion +	2 325	7 291
$750 million to $999 million	1 295	1 075
$500 million to $749 million	3 590	2 464
$250 million to $499 million	9 335	3 530
$200 million to $249 million	14 580	3 170
$100 million to $199 million	25 400	3 660
$50 million to $99 million	63 120	4 775
$30 million to $49 million	91 630	3 760
TOTAL	**211 275**	**29 725**


6.0%
US$10,265
billion
6.2%
74,865
NORTH AMERICA
8.9%
US$8,355
billion
6.5%
61,820
EUROPE
5.8%
US$6,975
billion
4.8%
46,635
ASIA
12.7%
13.1%
US$995
billion
5,975
MIDDLE EAST
5.5%
4.6%
US$2,225
billion
14,805
LATIN AMERICA
&
THE CARIBBEAN
8.3%
12.9%
US$395
billion
3,005
AFRICA
6.2%
5.4%
US$515
billion
4,170
PACIFIC



World Ultra Wealth Report, 2017

World Ultra Wealth Report, 2017



World Ultra Wealth Report, 2017

Rank	Country	UHNW population 2016	UHNW wealth ($bn) 2016
1	United States	73,110	8,719
2	Japan	16,740	1,546
3	China	16,040	1,950
4	Germany	13,420	1,570
5	United Kingdom	8,860	994
6	France	8,630	924
7	Canada	8,590	914
8	Hong Kong	7,650	986
9	Switzerland	5,940	788
10	Italy	5,530	624
11	India	4,510	604
12	South Korea	4,230	409
13	Russia	3,780	666
14	Brazil	3,570	451
15	Spain	3,190	395

Source: Human Development Report 2015 (http://hdr.undp.org)

Overseas Development Institute (ODI)

- 29% of the population in 101 developing countries, or about **1.5** billion people, experience multidimensional poverty.

- The **1.5** billion people live on less than $1.25 a day and the **2.5** billion people live on less than $2 a day (ODI).