

# Introduction

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# Object of economic growth theory

- ▶ **Economic growth object:** dynamics of per capita aggregate income across (long) time, and across locations.
- ▶ **Main questions**
  - ▶ what is the meaning of "long time" (millenia, centuries, decennials) ?
  - ▶ what are the main drivers of economic growth ?
  - ▶ why rates of growth differ along historical times ?
  - ▶ why the rates of growth differ accross countries ?
  - ▶ why countries hold inequalities in the GDP per capita while having similar rates of growth ?

## Main takeaways from the course

- ▶ There is economic growth only if there is **an exponential reproduction mechanism**

$$y(t) \approx e^{\gamma t}, \text{ with } \gamma > 0$$

- ▶ The observed increase in the GDP per capita is not a measure of economic growth: we should **distinguish the transition from long term** growth rate

$$\left. \frac{\Delta y}{y} \right|_{\text{observed}} = \gamma_{\text{growth}} + \gamma_{\text{transition}}$$

⇒ we need some **theory** to separate the two

- ▶ **Level of GDP** and **rate of growth of GDP** should be distinguished.
- ▶ Every theory tries to separate (exogenous) factors. In the very long run everything is endogenous.

# Beyond economic growth

## Human impact on Earth's geological phases

The **Anthropocene** as a new geological era (a decision is scheduled for 2021):

- ▶ consensus: there is a geological impact by human activity
- ▶ no consensus: periodization (when did it started ?)
  - ▶ around 8000 BCE ? (deforestation, increase in carbon concentration preventing a "natural" reduction in Earth's temperature)
  - ▶ around 1600 CE ? (exchange in animal and plant species brought about by human activity)
  - ▶ around 1800 CE ? (industrial revolution, increase in earth's temperature)
  - ▶ around 1944 CE ? (clear increase in temperature, start of the atomic era)
- ▶ see <https://en.wikipedia.org/wiki/Anthropocene>



# Main growth factors

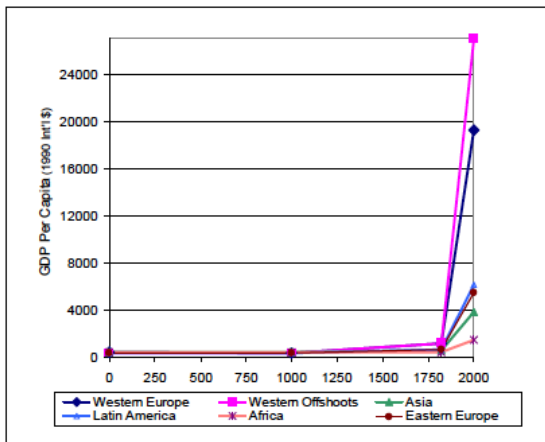
By increasing degree of variability

- ▶ Physical and biological environments: geography, size, resources, biology;
- ▶ Population: demography, human capital, social capital;
- ▶ Technology: capital accumulation, productivity growth (learning by doing, R&D );
- ▶ Aggregation: externalities, public goods;
- ▶ Economic institutions: inclusive/exclusive, financial institutions, trade openness, patent protection;
- ▶ Political institutions: in a broad sense (inclusive/exclusive, rule of law, enforcement, accountability) or a narrow sense (government intervention, governance)
- ▶ Luck (good or bad)

# Phases of economic growth

Secular long run perspective:

- ▶ Malthusian trap and first globalization (goods) : (almost) constant rates of growth (6000 BCE to 1700 CE)
- ▶ Industrial Revolution: transition with modest increases in the rate of growth
- ▶ Modern economic growth and second globalization (goods): rapid economic growth and Great Divergence: post 1820 and until 1990 (according to some authors)
- ▶ Great convergence and third globalization (ideas): post 1990 until ?
- ▶ Recent trends (are humans redundant ?): nature strikes back and automation/robotization



**Figure 1: The Evolution of Regional Income Per Capita, 1-2000 CE**  
 (Source: Maddison, 2003)

Figure: Maddison on the evolution of income per capita



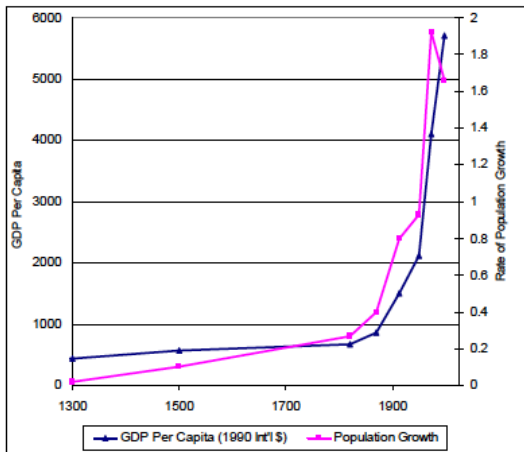


Figure 4: World Population Growth and Income Per Capita  
 (Source: Maddison, 2001)

Figure: Maddison on the evolution of population

# Ancient growth experience

## Malthusian trap

- ▶ low rates of growth: between 0% and 0.5%
- ▶ rises in income implied rises in population (not income p.c.)
- ▶ negative correlation between population growth and real wages
- ▶ big impact of demographic changes and (ex Black-Death (1347-1350) ) and institutions (ex. different responses to it in E. and W.Europe);

# Ancient growth experience

## Malthusian trap

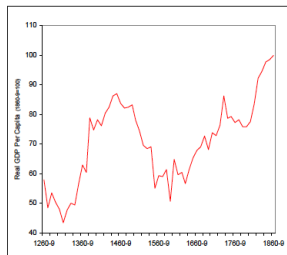


Figure 2: Fluctuations in Real GDP Per Capita in England, 1260-1870 CE  
(Source: Clark, 2005)

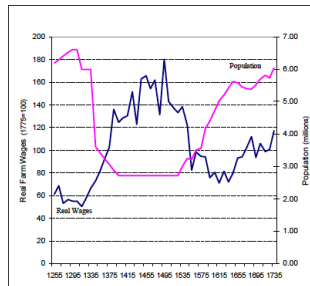


Figure 5: Population and Real Wages in England, 1250-1750 CE  
(Source: Clark, 2005)

Figure: Clark on the UK's population and real wages

# Ancient growth experience

## Limits to growth

- ▶ labor was the main factor of production
- ▶ land had an impact on growth because of decreasing returns;
- ▶ there were some gains in productivity, although not related to a purposeful activity as R&D;

# Ancient growth experience

## First globalization

- ▶ there was a small difference in GDP per capita across the world (Eurasian continent)

**Table:** Ratio richest to poorest region: before the great divergence

1000	1500	1820
1.1:1	2:1	3:1

- ▶ E. and SW. Asia were richer (see Frankopan (2016))
- ▶ first globalization: a first decoupling between production and consumption took place with trade in a small number of (luxury) goods (Silk road)
- ▶ physical distance was a major factor

# Modern economic growth

## Main features

- ▶ modern economic growth: permanent positive rates of growth;
- ▶ it may have started in the UK around 1800;
- ▶ it was contemporaneous with a demographic revolution, but growth became independent from the growth population;
- ▶ non-Malthusian features: rise in wages and almost stationary rate of return of capital

# Modern economic growth

## Main factors

- ▶ Two driving forces: increases in productivity and capital accumulation (physical, human, social)

Table: Growth accounting

	1900	1929	1950	1973	1990	2008
factor	59	59	37	39	28	30
TFP	41	41	63	61	72	70

Source: Crafts and Woltjer (2020)

- ▶ but intensive has become more important than extensive growth

# Modern economic growth

## Main factors

- ▶ physical capital accumulation: massive, helped by the development of financial system
- ▶ better allocation: huge reduction in transport costs;
- ▶ technologic progress: rise in productivity as a purposeful activity (R&D, fundamental research);
- ▶ unprecedented accumulation of human capital: schooling and knowledge (but quality is becoming more important than quantity see Hanushek and Woessmann (2015))
- ▶ social capital: institutions (protection of property rights, contract enforcement, reduction in uncertainty, etc)
- ▶ non-renewable natural resources: no decreasing returns ?



# Modern economic growth

## Great divergence

### ► **The Great divergence:**

Table: Ratio richest to poorest region: after the great divergence

1820	1870	1913	1950	2001
3:1	5:1	9:1	15:1	18:1

- increase in disparities and change of the economic center
- second globalization (inter-industrial trade): huge reduction in transport costs lead to an increase in the trade in **inter-industrial** and the Ricardo comparative advantage mechanism start working massively;
- relative free capital movement re-inforced this movement and lead to an international alignment of interest rates;
- increasing agglomeration of economic activity in a few centers (at national and international levels)

# A new phase ?

## Global convergence and local divergence

- ▶ Extensive factors are becoming less important and intensive (distributional factors) are becoming dominant
- ▶ Technical progress: drivers
  - ▶ IT lead to a reduction of costs in the movement of **ideas**;
  - ▶ **robotization** leads to a substitution of routine tasks by machines
  - ▶ new energy sources ?
- ▶ third globalization (**intra-industrial trade**): a large part of international trade is related to the supply chains of some multinational corporations (see Baldwin (2017))
- ▶ allowed high increases in wages in a few (7) countries (technology from the "North" and wages from the "South") and competition between countries for parts of the supply chains.

# A new phase ?

## Empirics and consequences

- ▶ Empirical observations:
  - ▶ the elephant curve (see Milanovic (2016), Baldwin (2017)): reduction of inequality at a global level;
  - ▶ polarization curve (v.g <https://voxeu.org/article/job-polarisation-and-decline-middle-class-workers-wages>): increase in inequality within countries;
  - ▶ global warming
- ▶ Potential consequences:
  - ▶ institutional consequences: rebalances of the inclusive/exclusive attitudes around the world ?
  - ▶ limits to growth as a result of the environmental impact of human activity ?

# However: history seems to move in cycles

- ▶ Inequality in the very long run: Scheidel (2017) and Milanovic (2016)

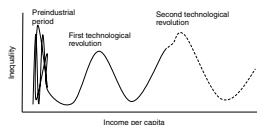
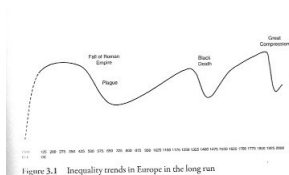


FIGURE 2.4. Expected pattern of changes in inequality versus income per capita from the preindustrial through the postindustrial period and into the future (dotted line)

- ▶ the labor share in the long run: with hindsight it seems that big technological changes start with substitution of labor with machines <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2251~e73a1e85d1.en.pdf>

# This course

- ▶ We will address just some of those issues;
- ▶ Using as stepping stones the benchmark models which tried to address them;
- ▶ We will refer to the stylized facts those models tried to address when they were proposed;
- ▶ Today with the huge amount of information and the computational capabilities, the research in the field requires a fairly large amount of skills (conceptual, statistical, theoretical and computational). But the central issues remain the same.

# References

- ▶ Anthropocene: Lewis and Maslin (2018)
- ▶ Long-run growth facts: Maddison (2007)
- ▶ Stylized facts on economic growth: (Acemoglu, 2009, ch. 1, 2) , (Barro and Sala-i-Martin, 2004, ch. 10,11,12)
- ▶ Pre-modern and modern economic growth: (Galor, 2011, ch 2)
- ▶ Inequality: Milanovic (2016), Scheidel (2017)

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