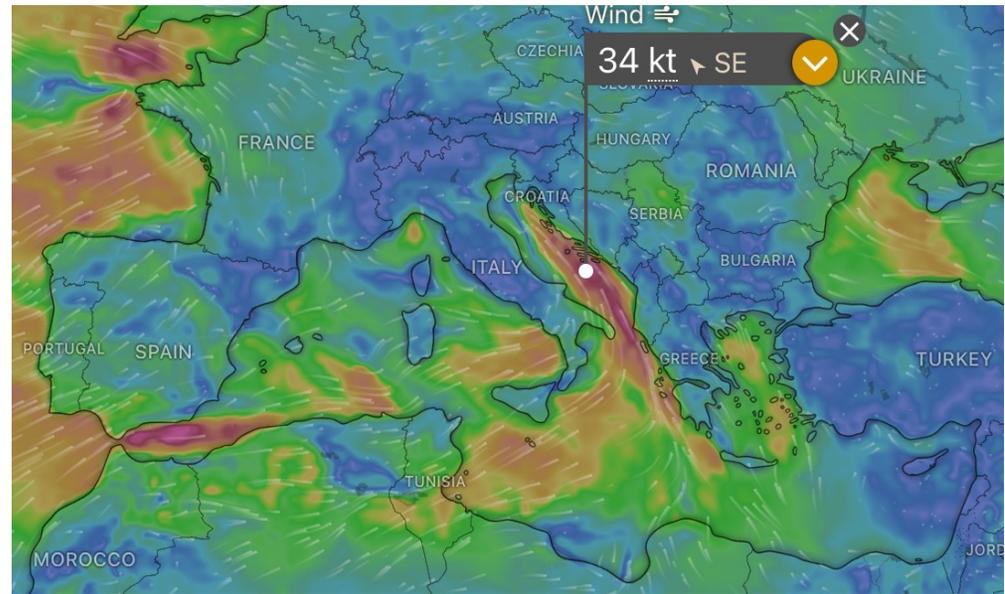# The Roman Empire (topics)
(02/04)

Geography: the Mediterranean Sea

The spine

The Mediterranean sea is to the R. E, what the Nile was for Egypt.

- Travel by water is much cheaper (bulky goods)
- The M. Sea has a culture in itself (even today)
- Travel in the summer (not winter)
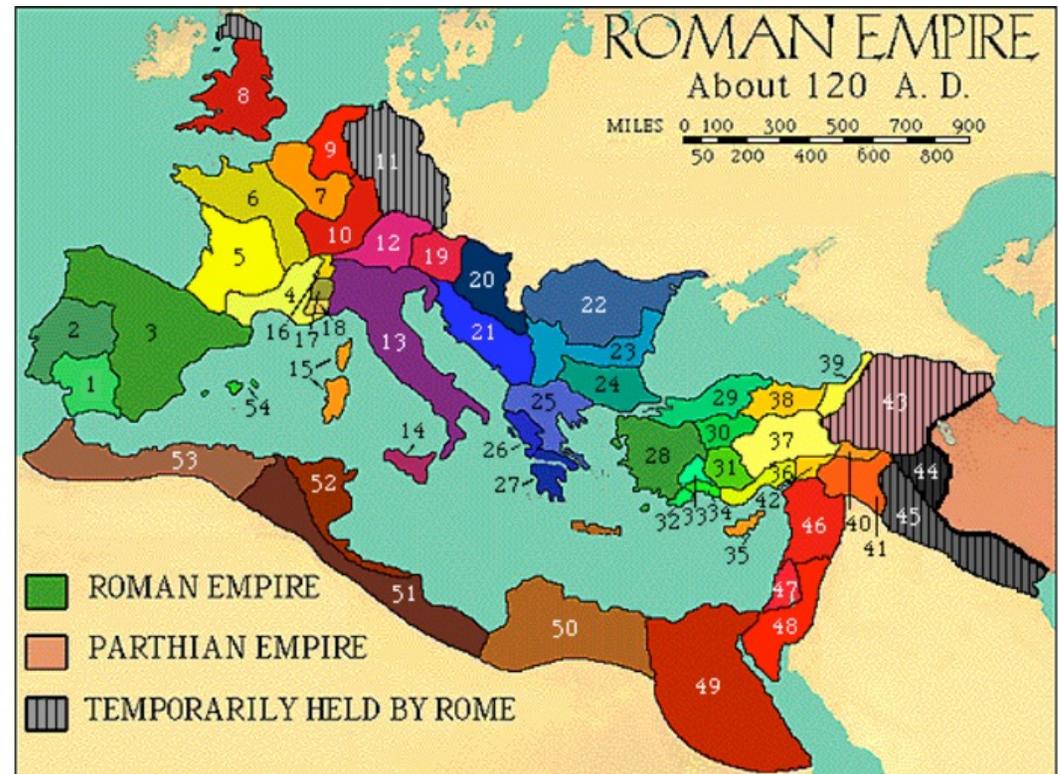- Winds
  - Pliny
  - today

2/4/26

2/5/26

The Roman empire

- Rome founded around 750 BCE

- Gradual expansion until the end of the Republic (44BC- death of Caesar)

- Empire begins with the "principate" of Augustus (31 BCE)
  - Dictator in fact but pretense that the senate (600) still had influence

- Gibbon: The Decline and Fall of the Roman Empire (1776):

  "If a man were called to fix the period in the history of the world, during which the condition of the human race was most happy and prosperous, he would, without hesitation, name that which elapsed from **100 to 180**.

  - Emperors: Nerva, Trajan, Hadrian, Antonius, Marcus Aurelius (Antonine)

Roads.

https://itiner-e.org

Principle of the empire

- Travel spine: Mare nostrum
  - Extension of the Nile…
  - Not much in the winter however (e.g. letters of Cicero and Plinus)
- The empire provides peace and saves on the costs of fighting between regions.
  - Only the external border, and that is essentially Germany and the Orient.
  - Romans were well aware of the benefits they brought: Pax Romana.
  - Analogy with modern time…
- Actually very little effective power for enforcement, hence the devices to bring cohesiveness
  - ideology of the emperor and tolerance for local religions (divisions minimize threats); (incompatible with Christian view).
  - Some autonomy given to the regions (Plinus).
  - Balance between overall stability and saving on local information/enforcement.
  - **Very harsh penalties** (Spartacus rebellion)
  - Balance between totalitarian and tolerant state

Evidence for economic activity: trade

- Index of Mediterranean trade:
- shiwrecks
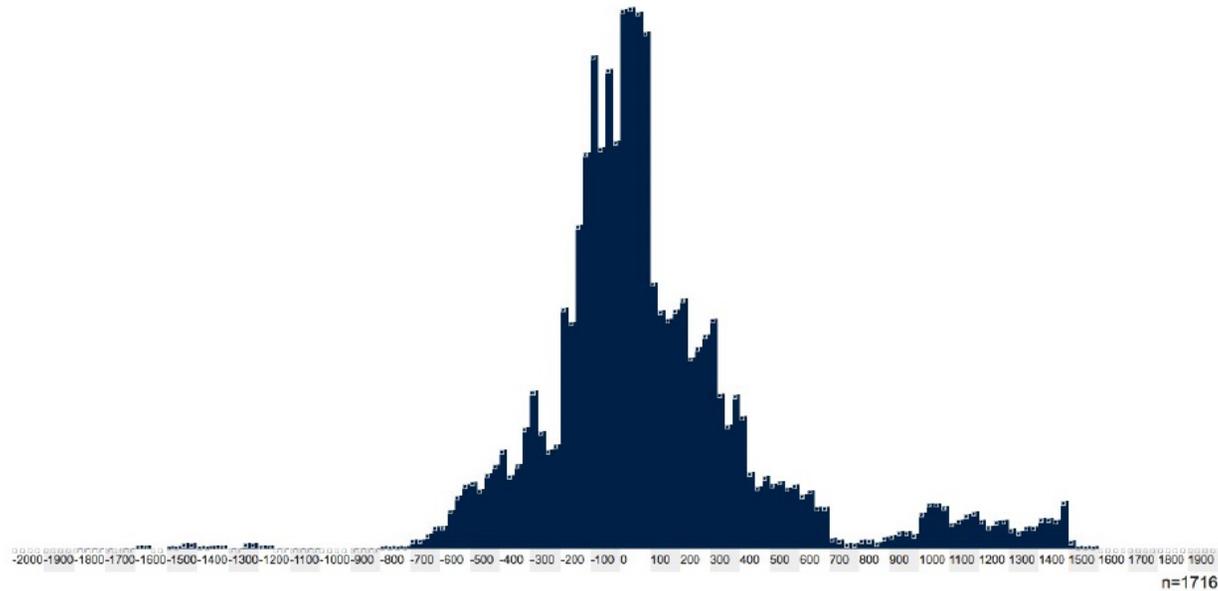
Source: **

Figure 4.3: Shipwrecks by (approximate) date

Inflow of precious metals

- How much silver was extracted? And when?

- Two types of evidence

  - Discarded ore around mines

  - Pollution: Lead–silver ore processing is directly linked to silver production. Lead pollution serves as an economic indicator of lead and silver mining and smelting output, and may be considered a proxy of wider economic performance particularly when silver is a key component of currency.

  - in the atmosphere

    - Measured now in arctic ice and swiss bogs.

  - Both evidences agree.

Metal	Density	Value	Melting point (C^o)
Gold	19.32	1,200	1,063
Silver	10.49	100	900-961*
Copper	8.96	0.6	1,085
Lead	11.35	0.05	327.5
Tin	7.28	3.9	232
Iron	7.85	0.2	1150
Bronze	7.4-8.9	1.0	

Record from mines

- The record from the mines (Patterson, 1972)
  - Mines at different places in Europe, but especially in Spain
  - Estimated silver production:

Table 6. *Estimated World Silver Relationships During Roman Growth and Decline*

(calculated using equation for S listed in the text and L = 0·02 yr⁻¹)

| Period	Total world silver produced during period (metric tons)	Average production during period (tons/year)	World stocks at end of period (metric tons)
350–250 B.C.	*	25	1,500
250–150 B.C.	6,000	60	3,000
150–50 B.C.	10,000	100	5,000
50 B.C.–A.D. 100	30,000	200	10,000
A.D. 100–200	10,000	100	7,000
A.D. 200–300	3,000	30	2,000
A.D. 300–400	2,500	25	1,300

* Alexandrian treasure involved.

At its peak around the mid-2nd century AD, Roman stock is estimated at 10,000 t, five to ten times larger than the combined silver mass of medieval Europe and the Caliphate around 800 AD
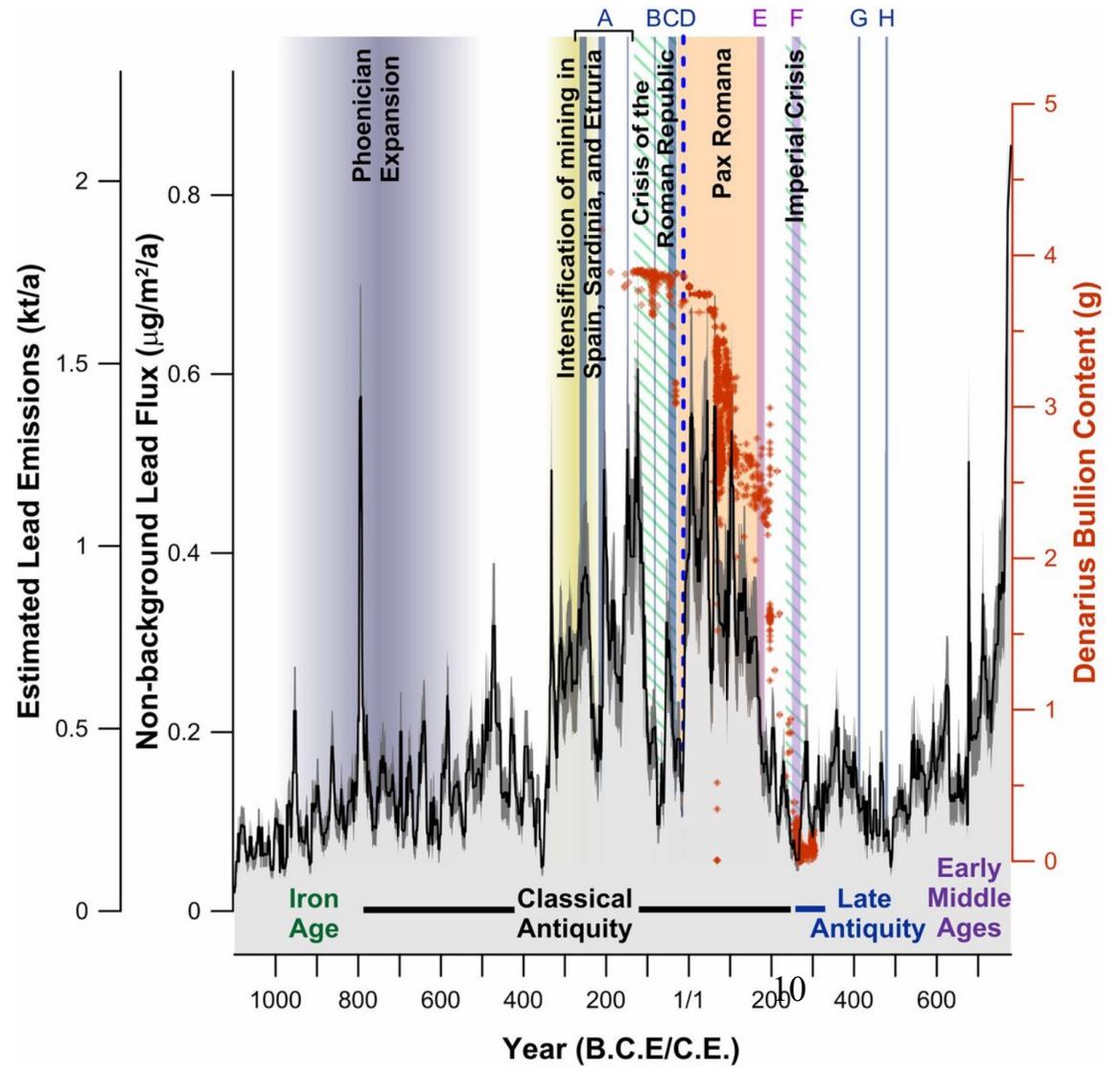
Lead pollution

Lead pollution recorded in Greenland ice indicates European emissions tracked plagues, wars, and imperial expansion during antiquity

Joseph R. McConnell[a,b,1], Andrew I. Wilson[c,d], Andreas Stohl[e], Monica M. Arienzo[a], Nathan J. Chellman[a], Sabine Eckhardt[e], Elisabeth M. Thompson[d], A. Mark Pollard[d], and Jørgen Peder Steffensen[f]

[a]Division of Hydrologic Sciences, Desert Research Institute, Reno, NV 89512; [b]Visiting Fellow, All Souls College, University of Oxford, OX1 4AL Oxford, United Kingdom; [c]Faculty of Classics, University of Oxford, OX1 3LU Oxford, United Kingdom; [d]School of Archaeology, University of Oxford, OX1 3TG Oxford, United Kingdom; [e]Department of Atmospheric and Climate Research, Norwegian Institute for Air Research, N-2027 Kjeller, Norway; and [f]Centre for Ice and Climate, University of Copenhagen, DK-1017 Copenhagen, Denmark

NGRIP
Ice Core

Lead
Pollution

Roman
Lead/Silver Mines
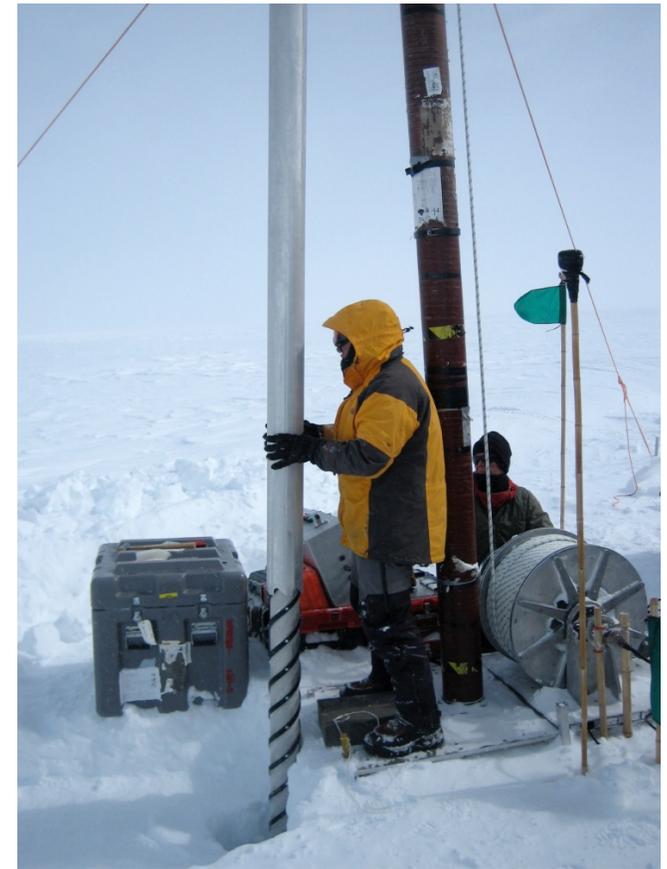
Results:

Lead pollution and trade
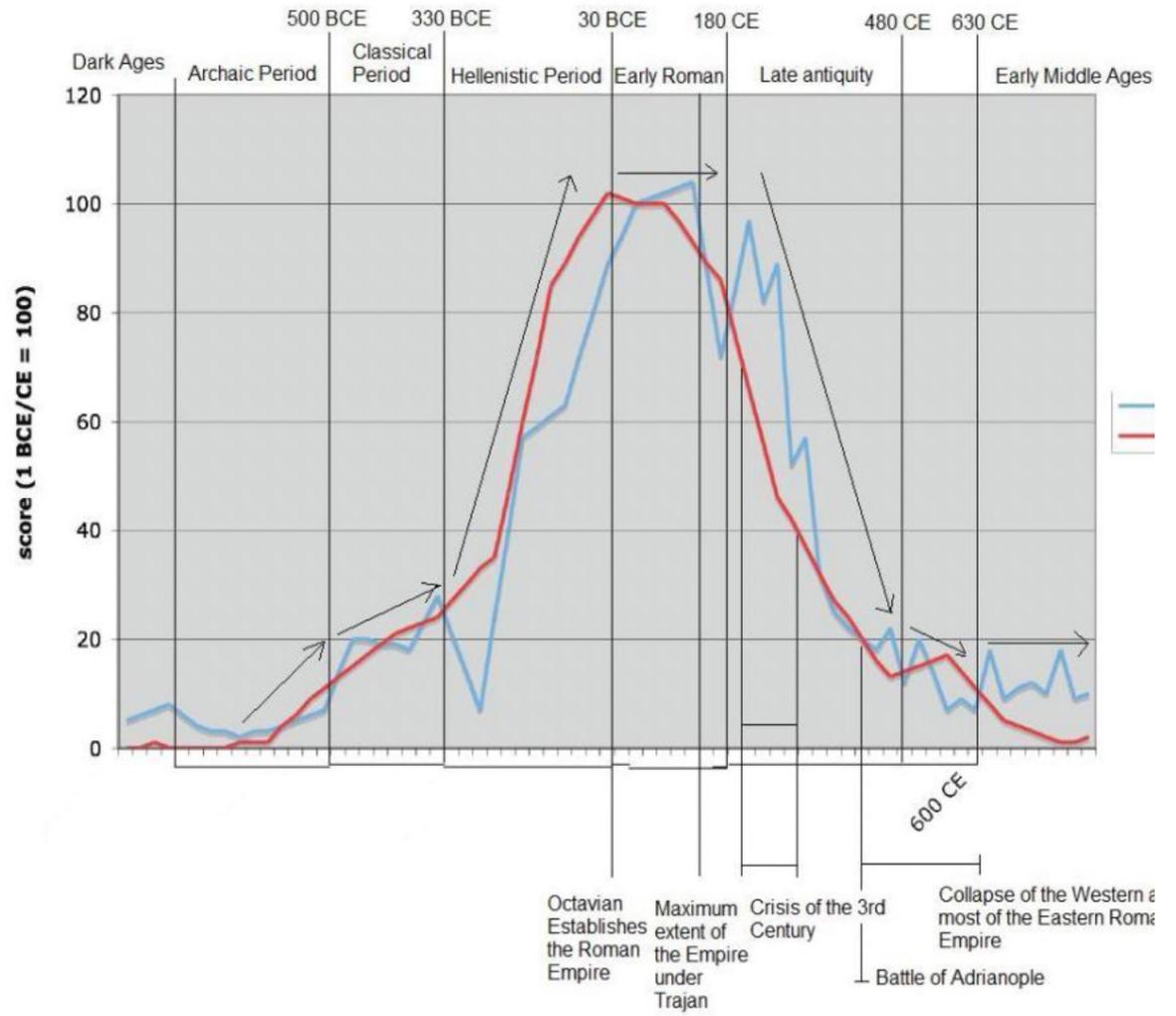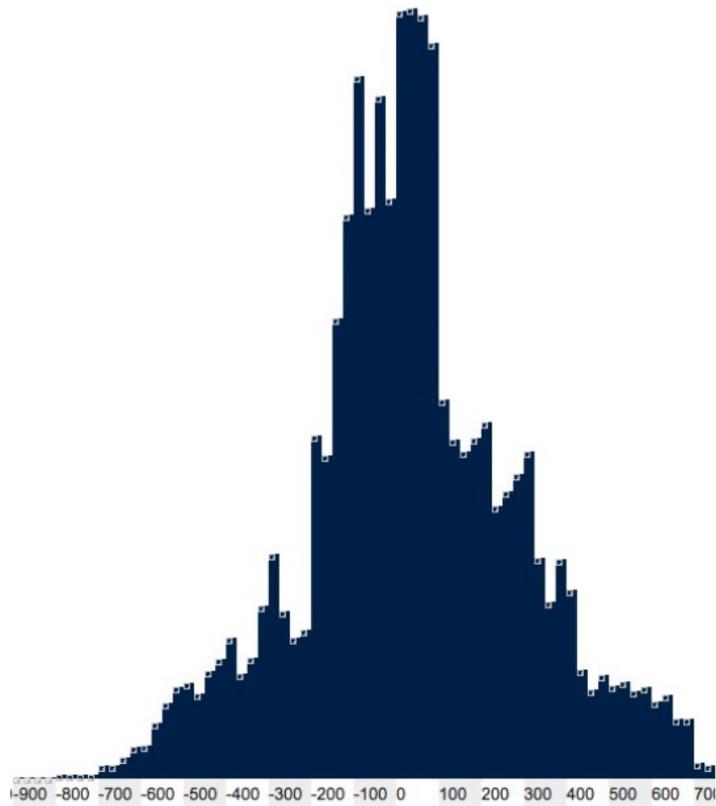
Source: Manning.

Gold and silver coins

- Small value coins cannot be in gold

- Large value coins cannot be in silver

- Hence, bi-metallic system

- In place, theoretically until the 20th century

- In Rome

  - 1 Aureus (gold) = 25 denarius (silver) = 100 sesterces (bronze)

  - 1 Aureus struck at 40-45 to the pound (327 gr), about 8gr

  - Today, 1 ounce (28gr) is about $1000 (comment), aureus about $300

  - 1 HS about $3 (according to the weight in precious metal– comments)

  - Difficulty in comparing developed and underdeveloped economies.

Denarius (19mm)

Sestertius (36mm)

12

Legionnaire annual pay

A roman legionnaire's yearly pay
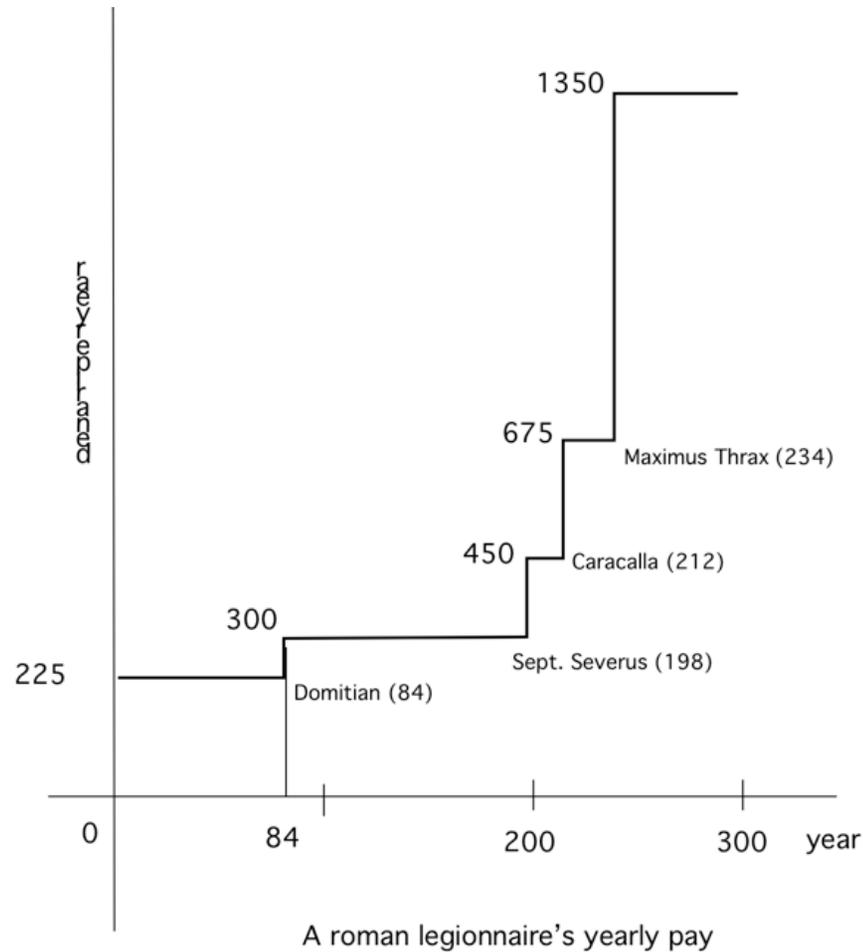
- Paid in aureus three times a year

- Pay in denarius withy round numbers: 9 aurei per year = 225 denarii.

- Pay increase: 1 aureus = 3 aureii per year   = 75 denarii (in y. 84)

- About 900 HS   during 1st cent. CE.

- Legionnaire had to buy his own equipment

- Retirement benefit (land)

Methods of estimation

- No statistics. Numbers were there, but we have to find them indirectly.
- Yearly pay in 3 installments
  - probably as a multiple of the Aureus (25 Denarii)
- Available evidence:
  - 225, 300,
  - Sept. Severus increased the pay
  - Caracalla raised the pay by 50 percent
  - Some (vague but independent) estimate of the total cost for Caracalla's raise
- Inference:
  - Severus' raise was an even number of Aurei, 2 or 4 (per installment)
  - Given the total cost for Caracalla, the number must be 2 per payment or 6 per year.

Estimating the money supply

- Hoards and dies (Duncan-Jones, 1994)
  - Method: from hoards,
    - identify dies (irregularities of coins)
    - Estimate the number of dies
    - Multiply by the number of coins made by each die (estimate)
- Estimate is about the number of coins
  - Duncan-Jones claims that his results are in global agreement with Patterson
    - Harl (1996) finds the analysis of Duncan-Jones "vitiated". D-J discusses the issue of re-minting which may not have been that important before 75 A.D.. More analysis is probably required

Coin supplies

FLUCTUATIONS OF MONEY SUPPLY IN THE ROMAN EMPIRE

Index of new silver coin supply

Legend:
- S. GERMANY (Single Finds)
- S. GERMANY (Hoards)
- N. ITALY (Museum Collections)
- BRITAIN, GAUL (Hoards)
- BRITAIN, GAUL (Museum Collections)
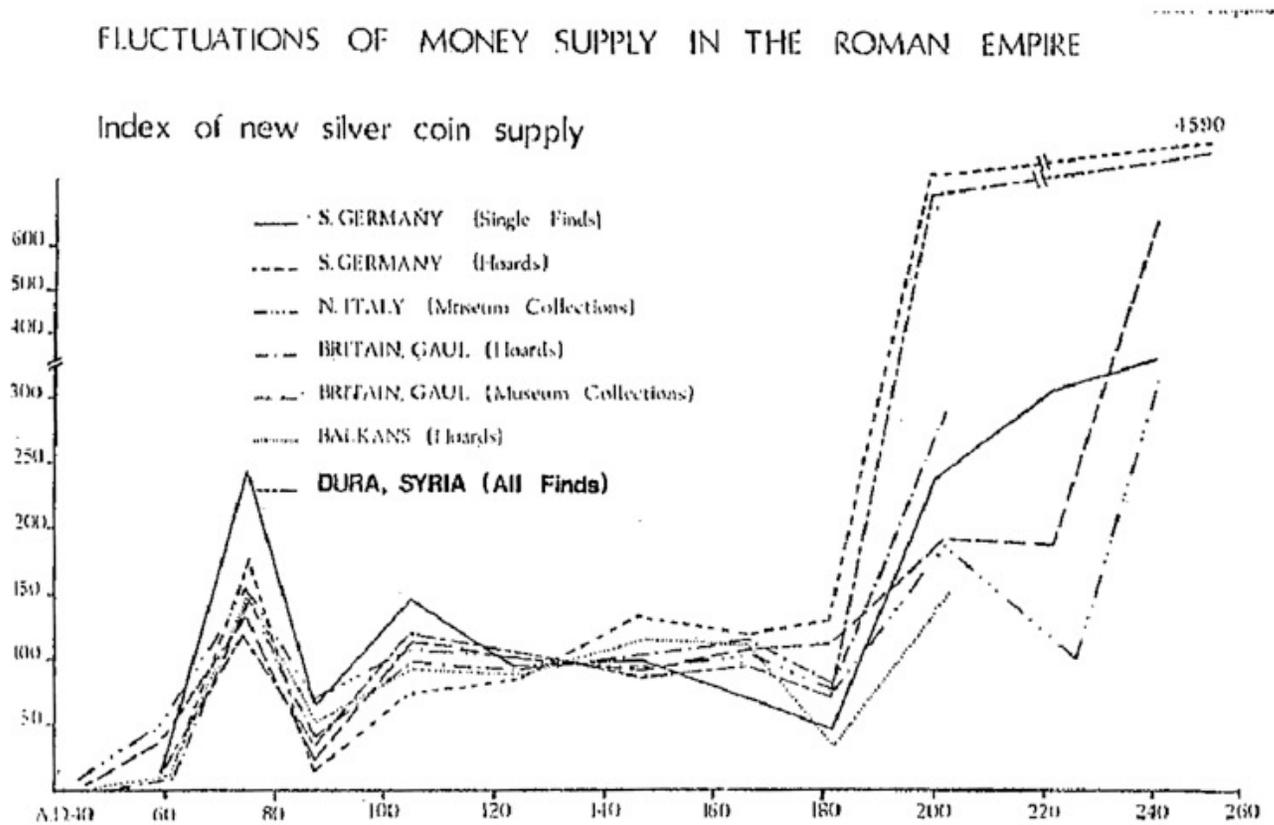- BALKANS (Hoards)
- **DURA, SYRIA (All Finds)**

FIG. 4. FLUCTUATIONS IN THE NUMBERS OF SILVER COINS FOUND, BY DATE OF MINTING AND BY REGION OF FIND.

16

Taxes

- Like in other aspects of Roman rule, the tax system rested on traditional customs and legality. The tax system of local entities were just enforced by the Roman governors.

  - Ex. Egypt; in Sicily, .

- Private wealths had always a large impact on public expenditures (army, buildings game). Julius Caesar had a huge inheritance (around 700M sesterces)

- Extended use of tax farmers during the republic (B.C.), **publicani**. Less so during the empire where governors were in charge.

- Reform of Augustus:

  - wealth tax

  - poll tax   both rates were low

  - harbor tax (5 percent) *long tradition...*

- very rigid system - no debt yet (not much of a capital market), but tax farmers could be bankers and finance commercial enterprises.

- Sudden requirements met by sales of (real estate) assets, confiscations and seignorage.

Computing the size of the overall budget (and tax burden)

- 1 soldier = (about) 1 worker

- Total population about 50 M

- Evaluating the size of the army

  – Legion (infantry) about 5 500 soldiers
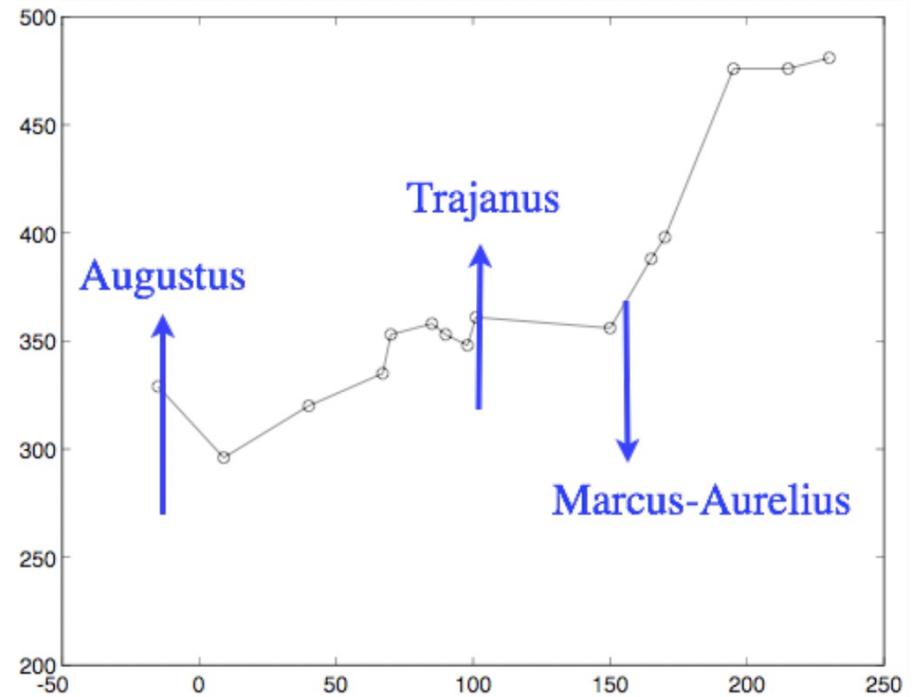
  – Auxiliaries

  – Cavalry

  – Officers

  – Navy

The military

Legion about 5,500
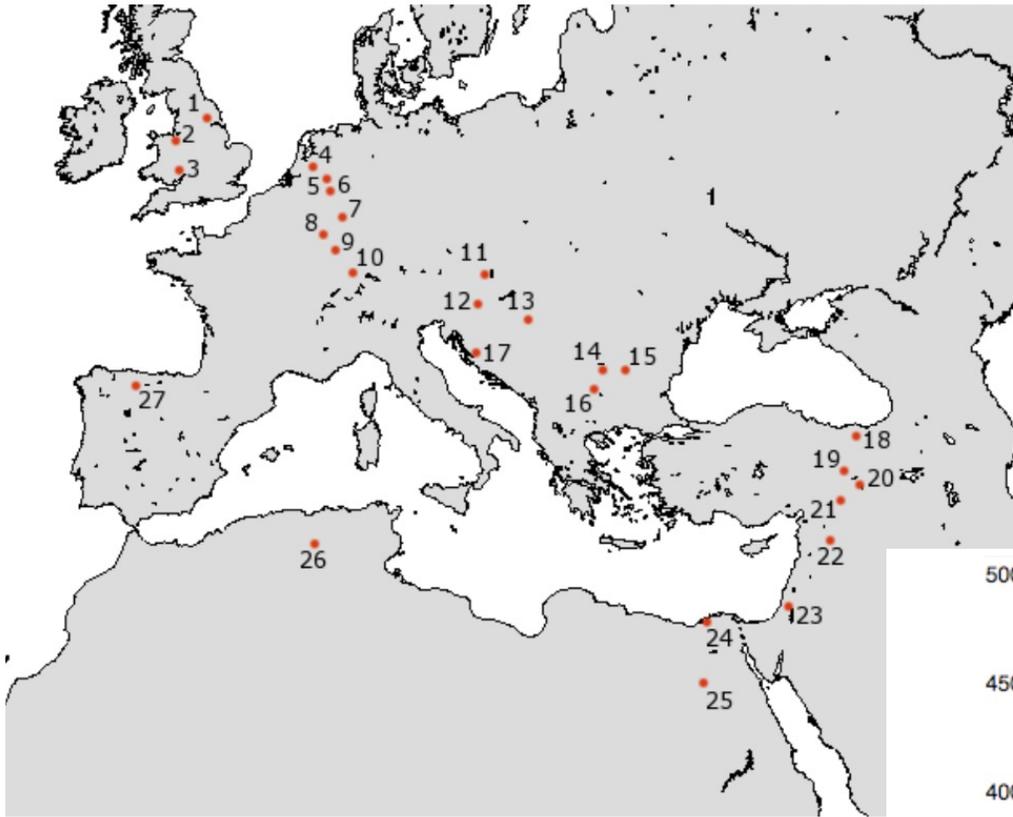
: Tacitus (Annals, Book IV, 4-5)

Figure 4.4: Placement of the legions in 23 CE

Source: Harl, (Table 9.2, p.218).

Figure 4.5: Evolution of the size of the army

Budget of the Empire

Category	150 CE Low	150 CE High	215 CE Low	215 CE High
1. Army	643	701	1,115	1,175
2. Civilian employees	75	75	75	75
3. Handouts	44	44	140	140
4. Buildings	20	60	20	60
5. Others	50	100	100	150
TOTAL	830	980	1,450	1600

Source: adapted from Duncan-Jones (1994). Figures are in millions of sesterces.

Table 4.2: Estimated public expenditures

Tax burden

- Method: size of the army in men equivalent / number of households in population
- Population 50M, army 0.6M.
- Ratio: 0.6/(50/4)= 5 percent.
- With other costs (and spending, like free grain in Rome), may be 8 percent (max):
- No serious public work financed in addition
  - Roads: work of legionnaires
  - Many public works : private donations
  - Some local public works and taxation however: (Plinus)

Estimating the mean wealth of senators

The Pareto distribution

Property:

- Fraction of pop. with income greater than y decreases like a power: $A\frac{1}{y^{\alpha}}$.
- Example, if income threshold y doubles, the fraction is reduced by more

Two levels of income $y_1 < y_2$, equestrian, senators.

$$\frac{P(y_1)}{P(y_2)} = (\frac{y_2}{y_1})^{\alpha}.$$

N_1, N_2 are the number of equestrians and senators: $\frac{N_1 + N_2}{N_2} = (\frac{y_2}{y_1})^{\alpha}.$

Take $N_1 = 20,000,\quad N_2 = 600,\quad y_2 = 1, y_1 = 0.4$.

$$\alpha = Log(\frac{20}{0.6})/Log(\frac{10}{4}) \sim 1.3.$$

With $N_1 = 25,000$, $\alpha \sim 1.56$.

Mean wealth of a senator: $N_2 = 1 - F(y_2) = (\frac{m}{y_2})^{\alpha}$;

Example, $\alpha = 1.5 \Rightarrow$ mean wealth ~ 3 million HS. t

The financial crisis of 33

Hence followed a scarcity of money, a great shock being given to all credit, the current coin too, in consequence of the conviction of so many persons and the sale of their property, being locked up in the imperial treasury or the public exchequer. To meet this, the Senate had directed that every creditor should have two-thirds his capital secured on estates in Italy. Creditors however were suing for payment in full, and it was not respectable for persons when sued to break faith. So, at first, there were clamorous meetings and importunate entreaties; then noisy applications to the praetor's court. And the very device intended as a remedy, the sale and purchase of estates, proved the contrary, as the usurers had hoarded up all their money for buying land. The facilities for selling were followed by a fall of prices, and the deeper a man was in debt, the more reluctantly did he part with his property, and many were utterly ruined. The destruction of private wealth precipitated the fall of rank and reputation, till at last the emperor interposed his aid by distributing throughout the banks a hundred million sesterces, and allowing freedom to borrow without interest for three years, provided the borrower gave security to the State in land to double the amount. Credit was thus restored, and gradually private lenders were found. The purchase too of estates was not carried out according to the letter of the Senate's decree, rigour at the outset, as usual with such matters, becoming negligence in the end.

The financial crisis of 2009
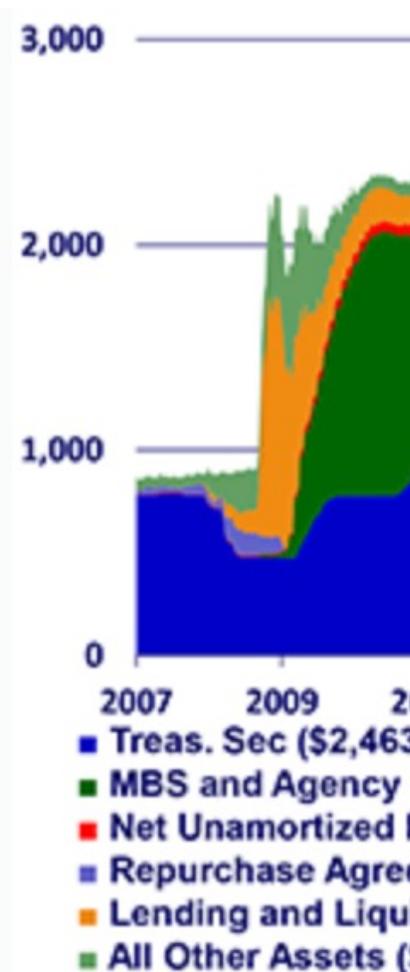
The Central Bank (the Fed)

Assets

Liabilities

Before 2009

ASSETS	LIABILITIES
Treasury securities	Federal reserve notes

After 2009

ASSETS	LIABILITIES
Treasury securities	Federal reserve notes
MBS	**Deposits**

Assets chart:
- 3,000 / 2,000 / 1,000 / 0
- 2007 2009 20
- Treas. Sec ($2,463
- MBS and Agency
- Net Unamortized F
- Repurchase Agree
- Lending and Liqui
- All Other Assets ($

Liabilities chart:
- 3,000 / 2,000 / 1,000 / 0
- 2007 2009 2(
- Federal Reserve
- Repurchase Agre
- Deposits by Dep
- All Other Deposit
- Other Liabilities
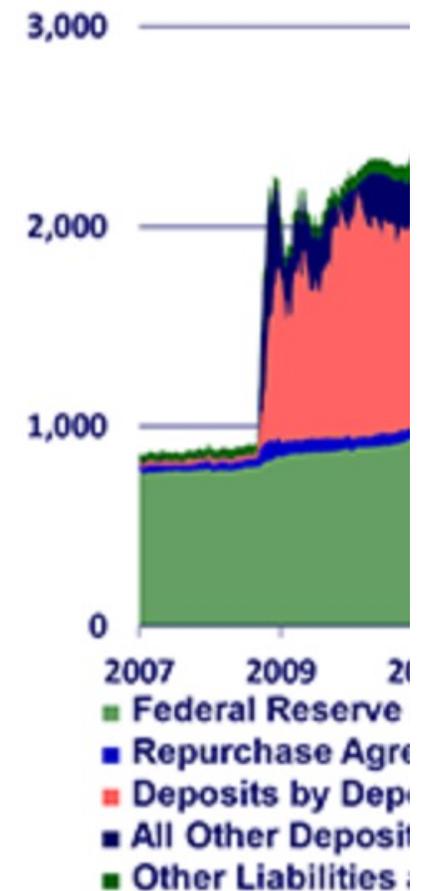
The decline and crisis of the 3d century

Fineness of early Roman imperial silver coins

Silver fineness (% weight)

Era
- Julio–Claudians
- Civil war (AD 69)
- Flavians
- Antonines
- Civil war (AD 193)
- Severans
- Third century crisis

Roman Silver Coin Fineness in the 3rd Century CE (Approximate)

— Denarius (Ag %)
-- Antoninianus (Ag %)

Silver Fineness (Ag %, by mass)

5