VIII. Macro- and Structural Changes in the European Economy, 1500 - 1750

B. Money and Monetary Movements in Early-Modern Europe: during the eras of the Price Revolution and General Crisis of the 17th century

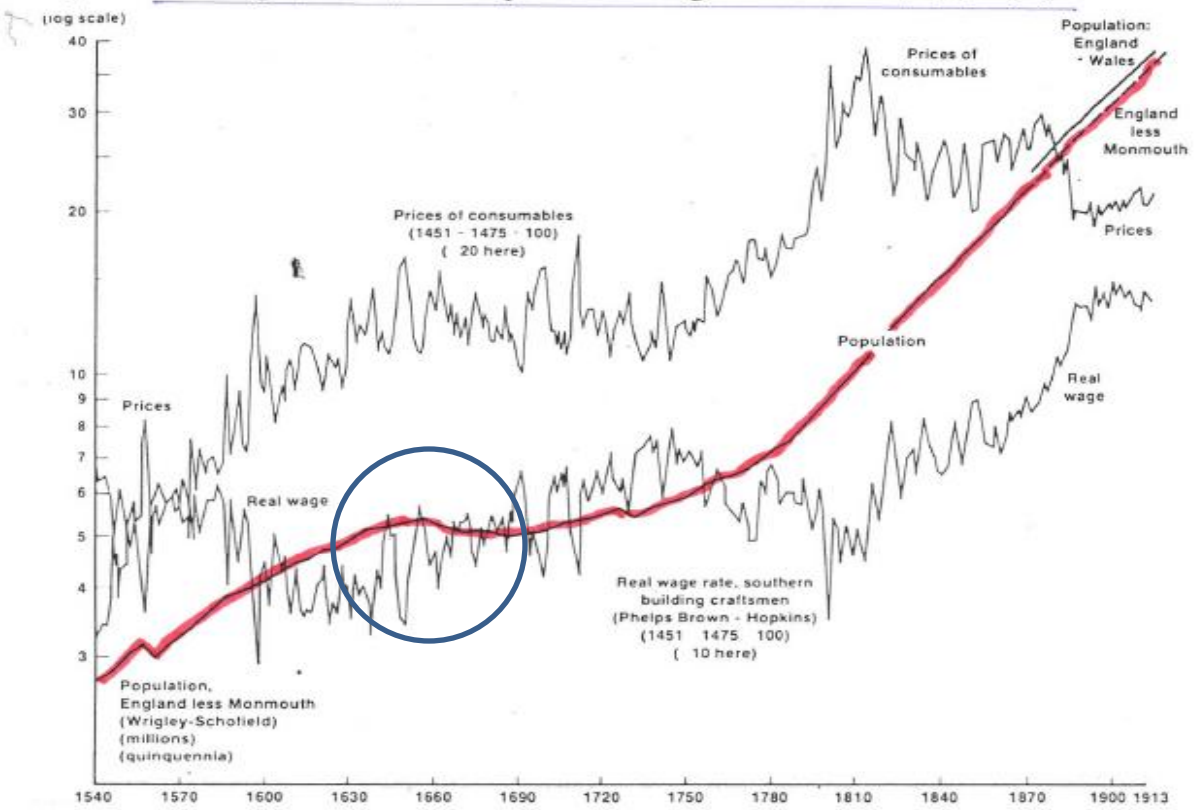
revised 19 January 2012

14. **18 January 2012** **Brady**, ch. 5 (Munro, esp. pp. 172-75); **Davis**, chs. 3-6, 9-11; **Cipolla**, ch. 10 (pp. 234-59) **de Vries**, ch. 1; **ET 7**	**15**	**MONETARY CHANGES:** **South German and American Silver:** the Price Revolution (1520-1640) era; **The era of the 'General Crisis'**: Decline of American Silver Imports; Bullion Outflows to Asia and the Baltic (1640-1750); **Brazilian gold mining from late 17th century;** revival of Mexican and Peruvian silver mining in the 18th century

Population and Money in the early-modern European economy 1

- **Population and money in the Price Revolution era (1520-1640) and General Crisis era (1620-1740):**
- - **last day (in the demography lecture)** we considered (again) the famous **Lindert graph**, which suggests:
- - **a positive correlation between population movements and prices:** during the inflationary Price Revolution and deflationary General Crisis era
- - **a negative correlation between population movements and real wages**: **a vindication of the Malthusian model?**
- - **especially in that English population and prices reached their peak together in the 1640s,**
- - **and with falling real wages, until population ceased to grow, in the 1650s**

Fig. 1 Real Wages, Prices, and Population in England and Wales, 1541–1913



RWI = NWI/CPI

The Real Wage Index = Nominal Wage Index divided by the Consumer Price Index

Peter Lindert, 'English Population, Wages, and Prices: 1541 - 1913', *Journal of Interdisciplinary History*, 15 (Spring 1985), 614.

Population & Money in the early-modern European economy 2

- what role did monetary changes play in these changes?
- - Theme of this and the next lecture: 'money matters' - always, without exceptions
- - While real (demographic) factors can never be neglected, neither can monetary factors
- - neglecting monetary factors is a sign of economic illiteracy!

Monetary Changes in early modern Europe, 1500 – 1640

- (1) **The Age of Gold, ca. 1460- ca. 1520**
- (a) **so-called, because gold coinages had predominated in western Europe (over silver)**
- (2) **The Age of Silver, ca. 1520 – ca. 1660**
- (3) **The Age of Copper and return to Gold**: ca. 1660 – ca. 1730
  (4) **The role of banking and paper credit instruments**: esp. from 1520s, but especially from the 1660s: later topic

ENGLAND: SILVER AND GOLD COINAGE OUTPUTS:

in kg. fine metal and in £ sterling values
in quinquennial means: 1426-30 to 1596-1600

Year	SILVER Total kilograms	SILVER Value £ sterling	GOLD Total kilograms	GOLD Value £ sterling	TOTAL VALUES in £ sterling	Percent Silver	Percent Gold
1426-30	6,858.608	31,785.107	599.478	28,703.069	60,488.176	**52.55%**	**47.45%**
1431-35	8,059.545	37,350.656	220.785	10,571.183	47,921.839	**77.94%**	**22.06%**
1436-40	977.025	4,527.863	132.274	6,333.298	10,861.161	**41.69%**	**58.31%**
1441-45	130.700	605.707	90.778	4,346.467	4,952.174	**12.23%**	**87.77%**
1446-50	517.373	2,397.681	64.336	3,080.422	5,478.103	**43.77%**	**56.23%**
1451-55	1,460.637	6,769.085	63.526	3,041.629	9,810.714	**69.00%**	**31.00%**
1456-60	1,415.094	6,558.024	26.719	1,279.288	7,837.312	**83.68%**	**16.32%**
1461-65	3,432.915	18,067.349	488.118	29,731.331	47,798.679	**37.80%**	**62.20%**
1466-70	5,168.090	29,938.348	1,288.157	83,263.992	113,202.339	**26.45%**	**73.55%**
1471-75	2,422.654	14,034.247	538.669	34,818.552	48,852.799	**28.73%**	**71.27%**
1476-80	834.683	4,835.252	404.477	26,144.624	30,979.875	**15.61%**	**84.39%**
1481-85	995.231	5,765.296	219.449	14,184.753	19,950.049	**28.90%**	**71.10%**
1486-90	926.785	5,368.794	129.749	8,386.730	13,755.524	**39.03%**	**60.97%**
1491-95	1,270.840	7,361.876	268.983	17,386.525	24,748.402	**29.75%**	**70.25%**
1496-00	2,490.940	14,429.823	278.926	18,029.238	32,459.060	**44.46%**	**55.54%**
1501-05	4,313.544	24,988.026	516.604	33,392.271	58,380.297	**42.80%**	**57.20%**
1506-10	3,633.212	21,046.916	1,523.115	98,451.267	119,498.183	**17.61%**	**82.39%**
1511-15	1,089.012	6,308.562	694.599	44,897.564	51,206.126	**12.32%**	**87.68%**
1516-20	79.145	458.481	743.656	48,068.530	48,527.011	**0.94%**	**99.06%**
1521-25	3,148.207	18,237.317	442.136	28,578.780	46,816.096	**38.96%**	**61.04%**

Gold crown of Henry VIII: from 1526

Portugal and the Age of Gold - 1

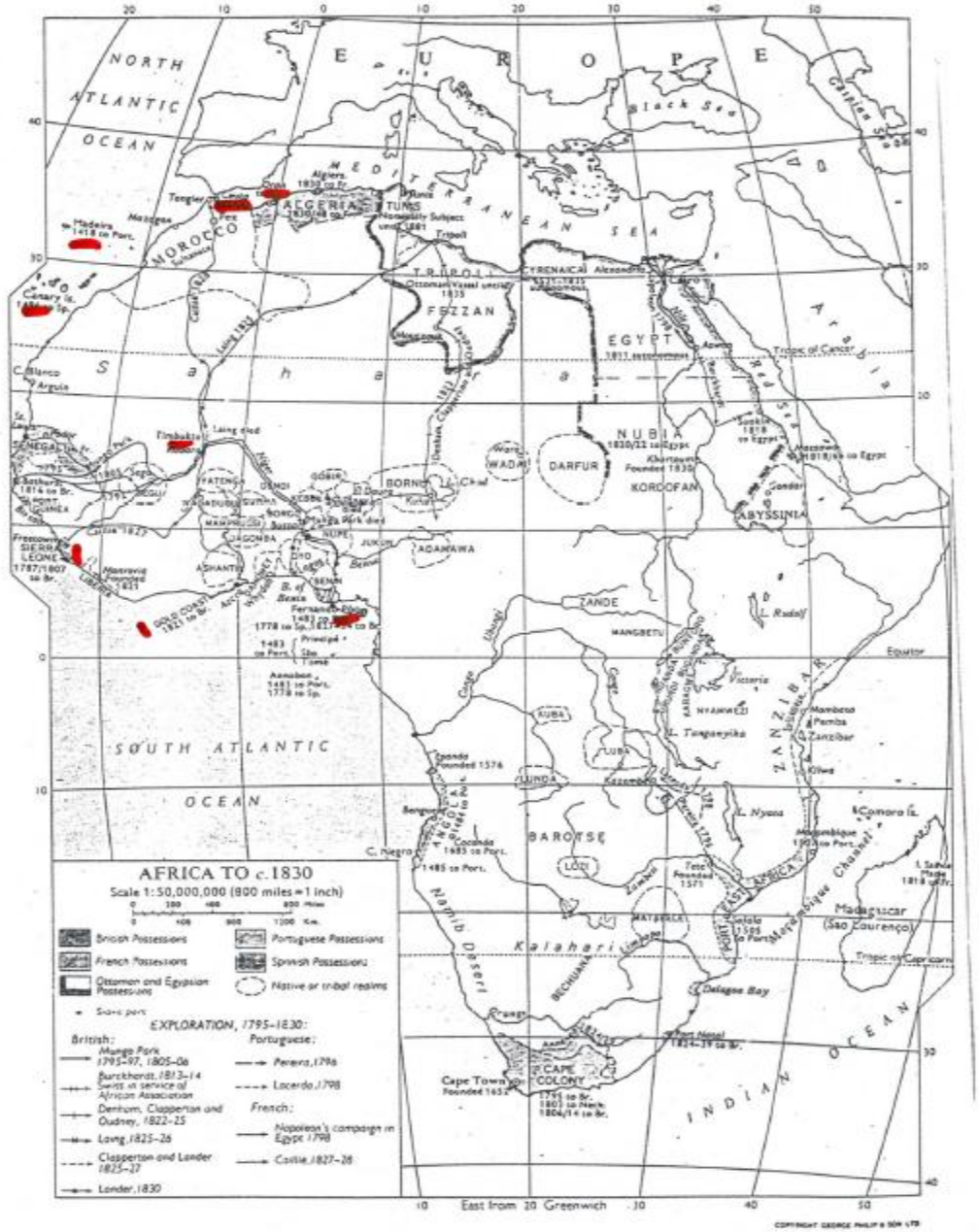
- 1) **Gold may have become relatively scarcer than silver**: by the 1450s
- -(a) **Why?** because bimetallic gold:silver ratio had risen from 9.5:1 in late 14th century, to 10:1 ca. 1400 to 11:5 (or even 12:1) by the 1450s.
- -(b) ➔ **incentives to find new sources of gold:**
- -(c) **Portugal**: first to pursue these objectives -- in West Africa, from 1440s: as seen last semester

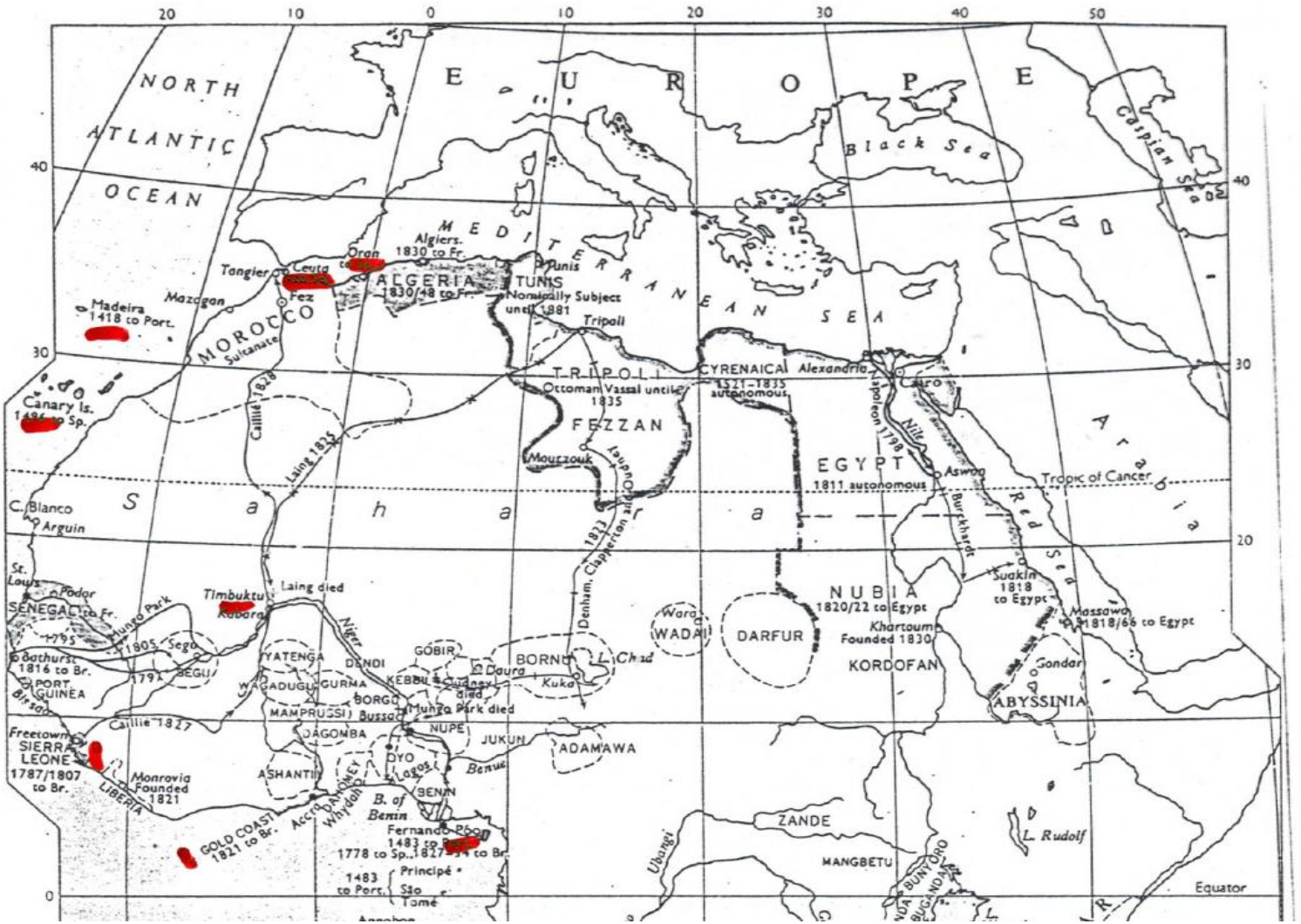
Portugal and the Age of Gold - 2

- 2) **Portugal and West Africa:**
- a) **Portugal's role in inaugurating European overseas explorations, colonization, and imperialism: last term**
- - **initial, principal object:** to re-establish links with the West African gold trade, doing so now by sea (not overland)
- b) **The former, trans-Saharan gold supplies had become seriously diminished, if not totally cut off from 1360s,** after the collapse of the once mighty Mali Empire'
- c) **the successor Songhai Empire was too weak and chaotic** to protect the gold-trade routes across Sahara to North African ports (for trade with the Italians and Spanish)

Portugal and the Age of Gold - 3

- d) **by 1440s, Portuguese reached bulge of West Africa:** Senegal, Gambia, and Guinea, acquiring their first African gold supplies
- -e)**1460s & 1470s: established trading posts along Gold Coast** (modern-day Ghana, Nigeria)
- - f)**1479: Treaty of Alcaçovas with Spain:** giving Portugal monopoly on African trade
- -g) **1481-82: fortress of San Jorge da Mina** on Gold Coast


AFRICA TO c.1830
Scale 1:50,000,000 (800 miles = 1 inch)
British Possessions
French Possessions
Ottoman and Egyptian Possessions
Portuguese Possessions
Spanish Possessions
Native or tribal realms
State port
EXPLORATION, 1795–1830:
British:
Mungo Park, 1795–97, 1805–06
Burckhardt, 1813–14 Swiss in service of African Association
Denham, Clapperton and Oudney, 1822–25
Laing, 1825–26
Clapperton and Lander 1825–27
Lander, 1830
Portuguese:
Pereira, 1796
Lacerda, 1798
French:
Napoleon's campaign in Egypt 1798
Caillie, 1827–28
NORTH ATLANTIC OCEAN
EUROPE
Black Sea
Caspian Sea
MEDITERRANEAN SEA
ALGERIA
TUNIS
TRIPOLI
CYRENAICA
FEZZAN
EGYPT
MOROCCO
Madeira
Canary Is.
Sahara
Arabia
Red Sea
Tropic of Cancer
NUBIA
DARFUR
KORDOFAN
ABYSSINIA
SENEGAL
SIERRA LEONE
LIBERIA
GOLD COAST
ASHANTI
BENIN
BORNU
L. Chad
ADAMAWA
ZANDE
MANGBETU
L. Rudolf
Equator
L. Victoria
L. Tanganyika
ZANZIBAR
Mombasa
Zanzibar
SOUTH ATLANTIC OCEAN
Congo
KUBA
LUBA
LUNDA
Benguela
Angola
L. Nyasa
Comoro Is.
BAROTSE
Zambezi
Mozambique
Madagascar (São Lourenço)
Namib Desert
Kalahari
BECHUANA
Delagoa Bay
Tropic of Capricorn
Cape Town
CAPE COLONY
INDIAN OCEAN
East from 20 Greenwich


NORTH ATLANTIC OCEAN
EUROPE
MEDITERRANEAN SEA
Black Sea
Caspian Sea
Arabia
Sahara
Red Sea
Nile
Algiers. 1830 to Fr.
Oran
Tangier
Ceuta
Fez
ALGERIA 1830/48 to Fr.
TUNIS Nominally Subject until 1881
Tunis
Tripoli
Madeira 1418 to Port.
Mazagan
MOROCCO Sultanate
Canary Is. 1496 to Sp.
Caillie 1828
Laing 1825
TRIPOLI Ottoman Vassal until 1835
CYRENAICA 1521–1835 autonomous
Alexandria
Cairo
Napoleon 1798
FEZZAN
Mourzouk
Denham, Clapperton 1822
EGYPT 1811 autonomous
Aswan
Tropic of Cancer
Burckhardt
C. Blanco
Arguin
St. Louis
Podor
SENEGAL to Fr.
Mungo Park
1795
1805
Timbuktu
Kabara
Laing died
Niger
Bathurst 1816 to Br.
PORT. GUINEA
Bissau
1794
SEGU
YATENGA
DENDI
GOBIR
BORNU
L. Chad
Kuka
Daura
Clapperton died
Munzo Park died
WADAI
Wara
DARFUR
NUBIA 1820/22 to Egypt
Khartoum Founded 1830
KORDOFAN
Suakin 1818 to Egypt
Massawa 1818/66 to Egypt
Gondar
ABYSSINIA
GADUGU
GURMA
KEBBU
BORGU
MAMPRUSSI
Bussa
DAGOMBA
NUPE
JUKUN
ADAMAWA
Caillie 1827
Freetown
SIERRA LEONE 1787/1807 to Br.
Monrovia Founded 1821
LIBERIA
ASHANTI
DYO
Lagos
Benue
SENIN
B. of Benin
Accra
DAHOMEY
Whydah
GOLD COAST 1821 to Br.
Fernando Póo 1483 to Port. 1778 to Sp., 1827–34 to Br.
Principé
São Tomé
1483 to Port.
ZANDE
MANGBETU
L. Rudolf
Ubangi
Equator
40
30
20
10
0
20
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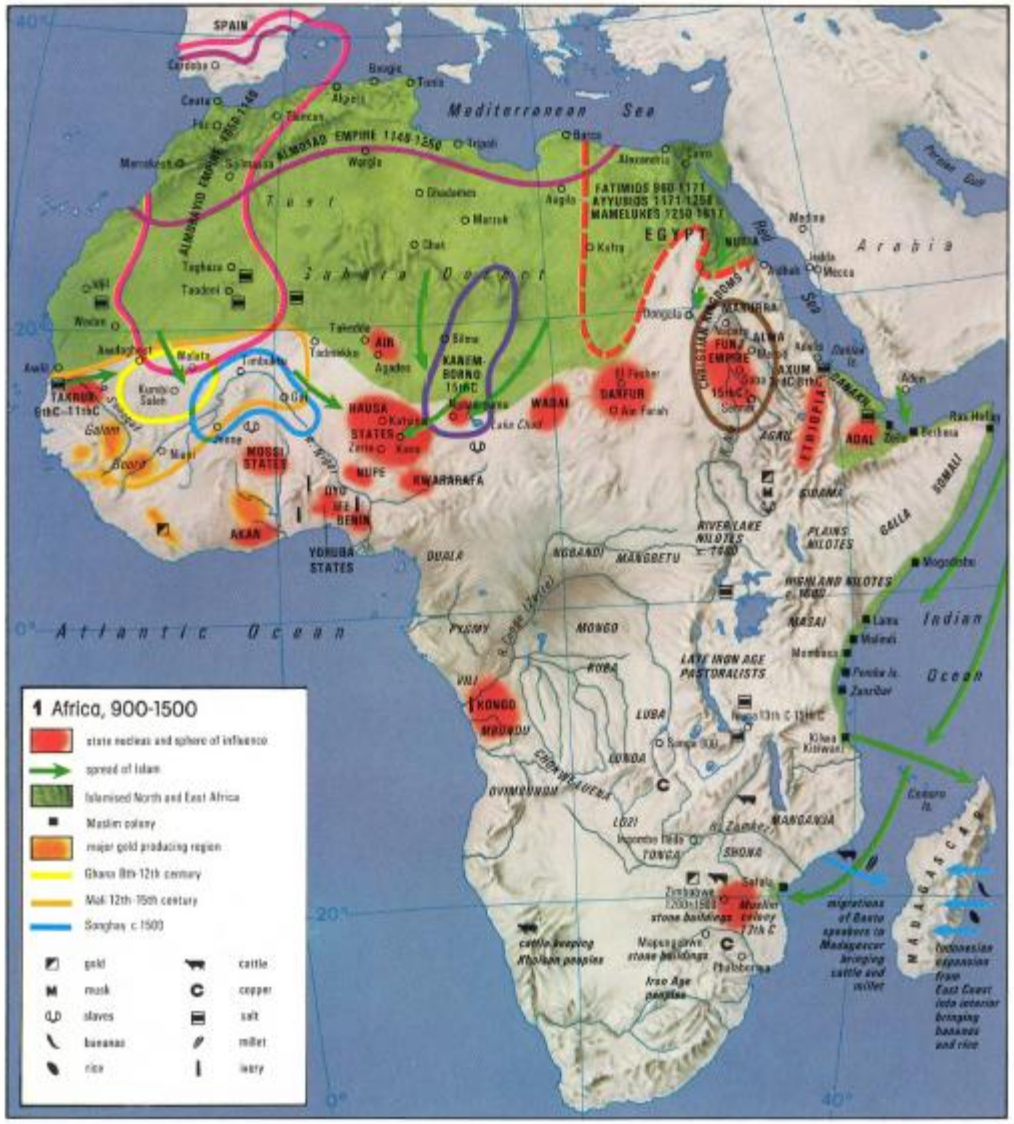

1 Africa, 900-1500
state nucleus and sphere of influence
spread of Islam
Islamised North and East Africa
Muslim colony
major gold producing region
Ghana 8th-12th century
Mali 12th-15th century
Songhay c.1500
gold
musk
slaves
bananas
rice
cattle
copper
salt
millet
ivory
SPAIN
Mediterranean Sea
ALMORAVID EMPIRE 1056-1145
ALMOHAD EMPIRE 1145-1250
FATIMIDS 969-1171
AYYUBIDS 1171-1250
MAMELUKES 1250-1517
EGYPT
Sahara Desert
Arabia
Red Sea
Atlantic Ocean
Indian Ocean
TAKRUR 6thC-11thC
GHANA
MALI
AIR
Agadez
KANEM-BORNO 15thC
WADAI
DARFUR
HAUSA STATES
MOSSI STATES
NUPE
KWARARAFA
OYO
BENIN
AKAN
YORUBA STATES
FUNJ EMPIRE 15thC
CHRISTIAN KINGDOMS
ALWA
MAKURRA
DONGOLA
AXUM 4thC BthC
ETHIOPIA
ADAL
AGAU
SOMALI
GALLA
RIVER/LAKE NILOTES c.1500
PLAINS NILOTES
HIGHLAND NILOTES c.1600
MASAI
LATE IRON AGE PASTORALISTS
KONGO
MONOMOTAPA
ZIMBABWE
MANGANJA
SHONA
LOZI
TONGA
LUBA
LUNDA
MONGO
NGBANDI
MANGBETU
DUALA
FULANI (Fulbe)
migrations of Bantu speakers to Madagascar bringing cattle and millet
Indonesian expansion from East Coast into interior bringing bananas and rice

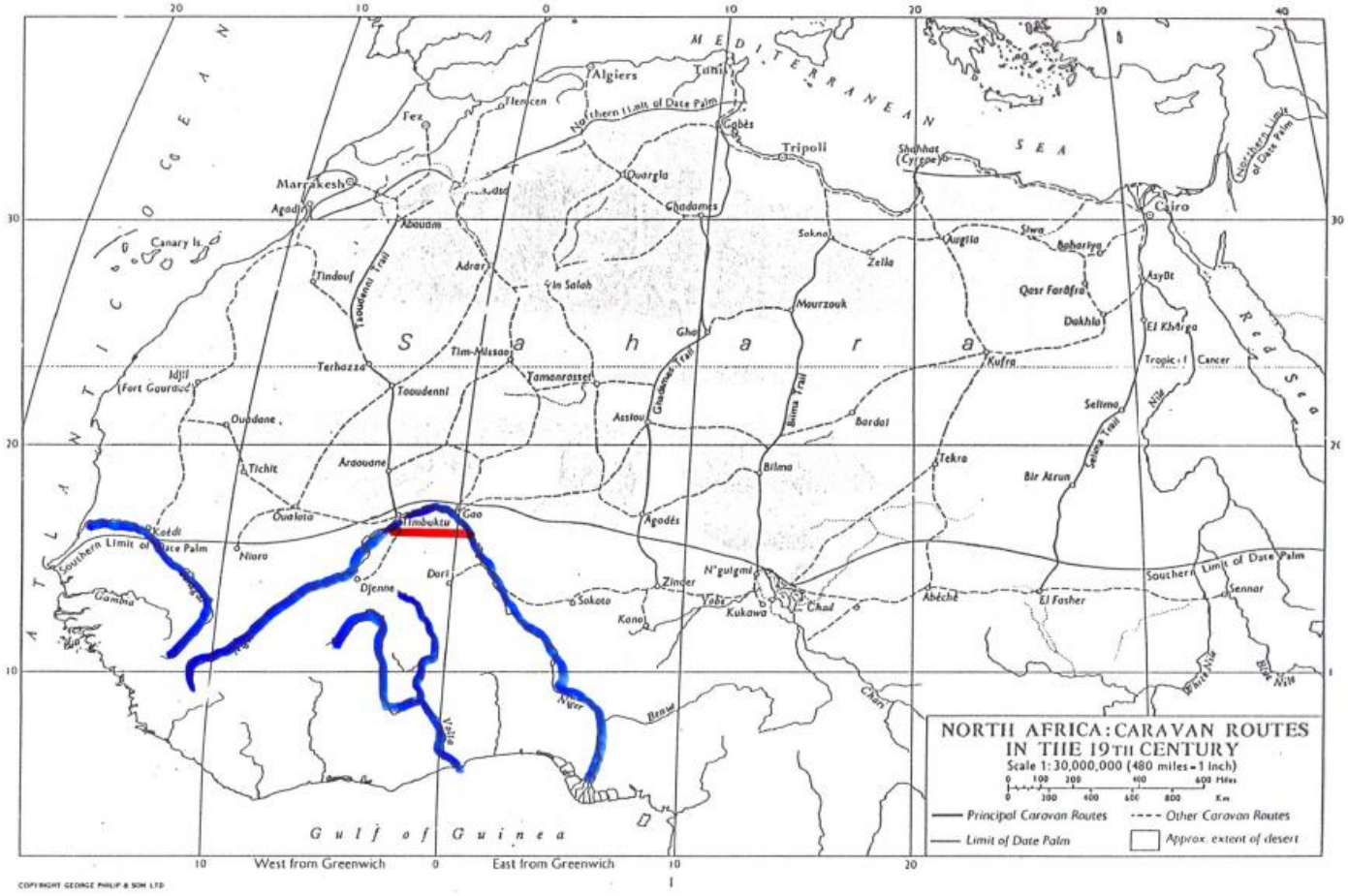
Portugal and the Age of Gold - 4

- 3) **Economics of the Portuguese Gold Trade with Africa**
- a) **Portugal succeeded in restoring the African gold supplies to Europe,**
- b) **Major sources of West African gold:**
- - **Bambuk**: on Upper Senegal River
- - **Mali:** on Upper Niger River
- - **Lobi:** on Upper Volta

Portugal and the Age of Gold - 5

- c) **Portuguese forced to trade with West African states**: which denied Europeans any direct access to gold mines
- - **Jolofs and Mandinga:** in Senegambia
- - **Ardra and Yoruba**: in Lower Guinea
- - **Benin and Warri**: in Niger river delta
- d) **West Africans kept an advantage in bargaining for the gold trade**:
- -**keeping a balance between traditional Arab traders (to Mamluk Egypt) and Portuguese:**
- e) **but by end of 15th century, barter terms of trade turned against Portuguese-**
- - **1470 to 1500: Portuguese exported 17 metric tonnes of gold**;
- - **1500 to 1550:** exported another 19 tonnes (less per year on average)

Gold Mines in West Africa: Senegal, Niger, Volta Rivers



The Portuguese Gold Trade in West Africa (the Gold Coast)

in the 15th and 16th Centuries

Portuguese Gold Exports from West Africa, 1480 – 1560

From Sao Jorge da Mina: Official Gold Exports

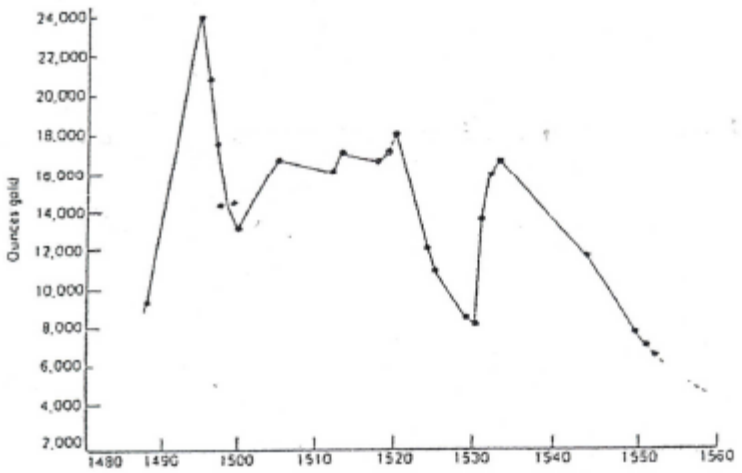


Figure 1: São Jorge da Mina: Official Gold Exports, 1480–1560

Portugal and the Age of Gold - 6

- 4) **Portugal: new sources of gold after 1530**
- - **Southern Africa:** Angola (west) and Mozambique (east)
- - **South America**: Brazil
- - **note: Papal treaty of Tordesillas 1494**: carving up the non-European world between Spain and Portugal: dividing line gave Brazil to Portugal (rest of the Americas to Spain)
- - **Brazil would come to be chief source of gold** for European economy from 1690s to the late 18th century

Gold and Silver in the Early Modern Economy

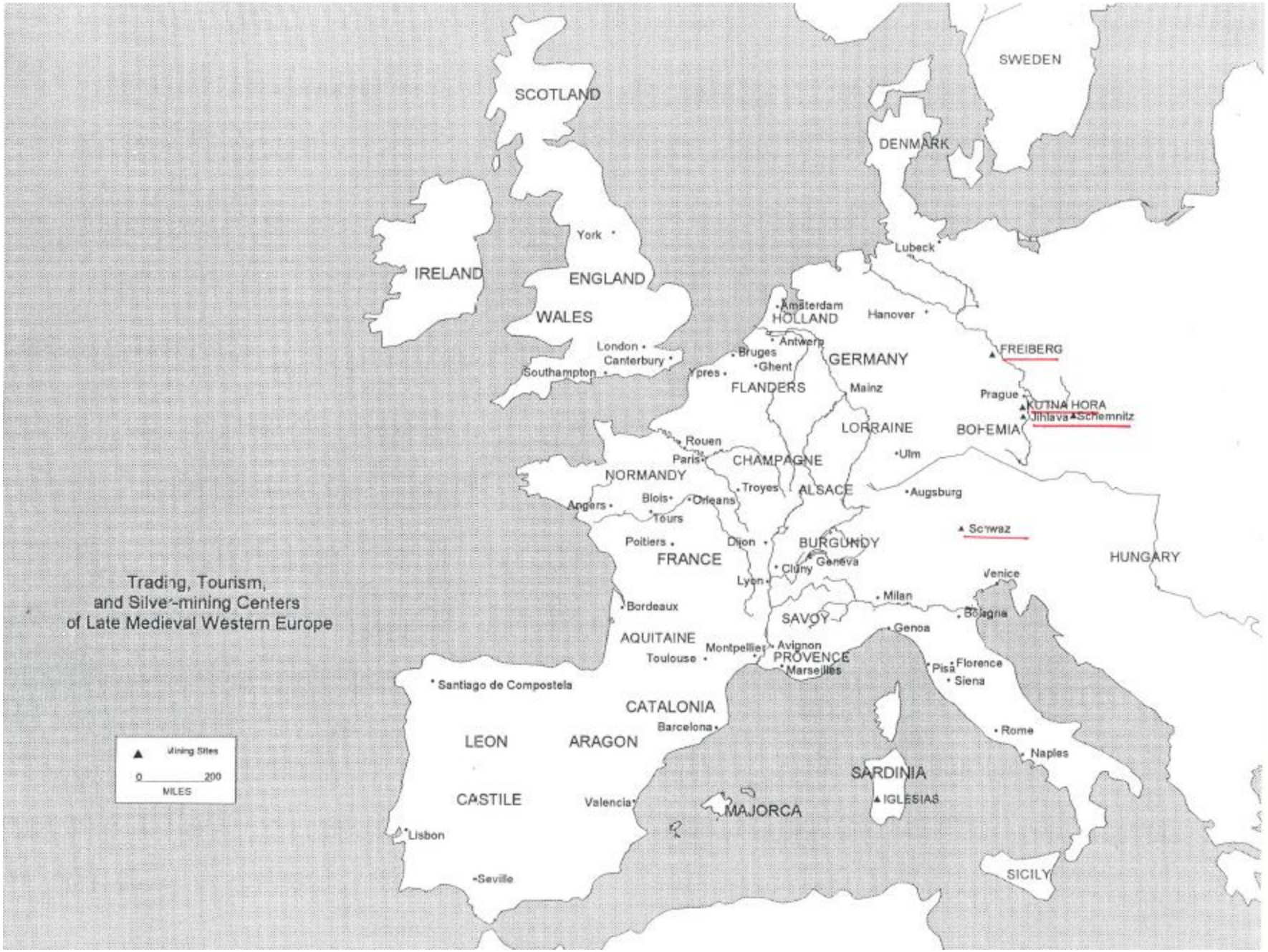
- 1) **Gold Problem and Its Importance:**
- a) **If SILVER was major monetary metal for domestic trade** and the **basis for almost all money-of-account pricing systems,** what impact did increased gold supplies have?
- b) **More gold meant less silver had to be used in foreign trade (especially within Europe itself):** i.e., Δ gold liberated more silver to be used in the domestic economy
- ➔ inflationary effects of Δ gold were indirect and secondary
- 2) **For global expansion of European trade** – with Asia, Levant, Baltic & Russia – **silver and not gold was the major metal** exported (to resolve balance of payments
- 3) **Hence importance of following AGE OF SILVER:**

Monetary Changes: Age of Silver 1

- (1) **The Central European Mining Boom: Origins**
- a) **as previously seen: deflation (low prices) of 1450s,** raising purchasing power of silver ➔ thus providing the key incentives for:
- b) **technological changes in mining & smelting**
- (i) **In mechanical engineering**: - **drainage pumps** (water- and horse-powered) to permit much deeper mining shafts and drainage adits
- (ii) **In chemical engineering: the *Saigerhütten* process to separate silver from copper** in **argentiferous-cupric ores: using lead** in smelting the ores (lead combines with silver): with water-powered blast furnaces

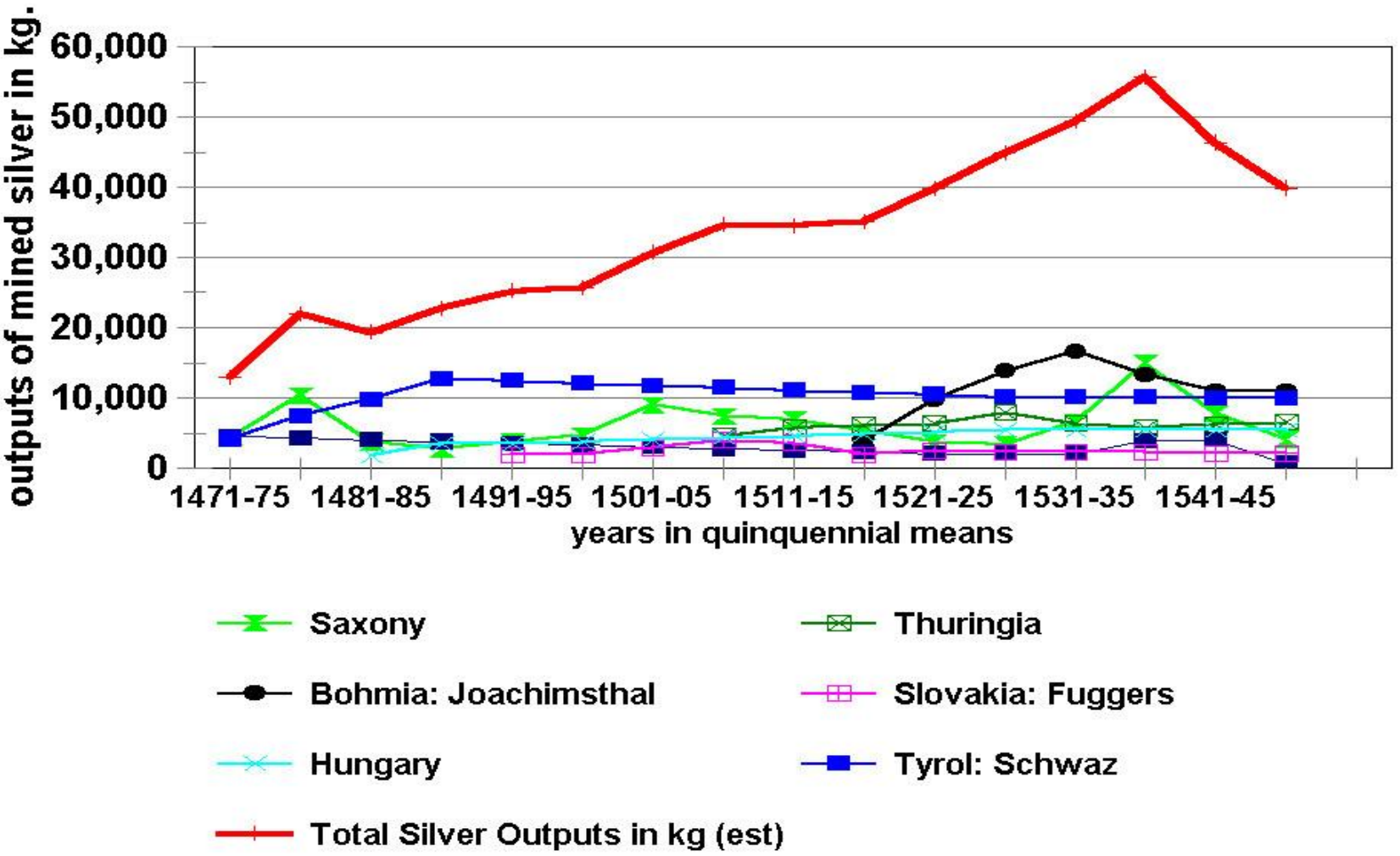
Monetary Changes: Age of Silver 2

- (2) **Central European Mining Boom: Expansion to Peak**
- a) **These ores were always the main source of silver in South Germany, and Central Europe:**
- but there had been no known means of separating the two metals, nor of reaching deeper ores
- b) **Increased output of European mined silver five-fold** from the 1460s to the 1540s: to a peak output of almost 56,000 kg in late 1530s.
- c) **Importance**: **this mining boom was, in my view, the initial monetary cause of the ensuing inflationary Price Revolution** from 1520s – but not the only cause


Trading, Tourism,
and Silver-mining Centers
of Late Medieval Western Europe
Mining Sites
0
200
MILES
SCOTLAND
IRELAND
ENGLAND
WALES
SWEDEN
DENMARK
York
Lubeck
Amsterdam
HOLLAND
Hanover
London
Canterbury
Southampton
Antwerp
Bruges
Ghent
Ypres
FLANDERS
GERMANY
FREIBERG
Mainz
Prague
KUTNA HORA
Jihlava
Schemnitz
LORRAINE
BOHEMIA
Rouen
Paris
CHAMPAGNE
Ulm
NORMANDY
Troyes
ALSACE
Augsburg
Angers
Blois
Orleans
Tours
Schwaz
Poitiers
Dijon
BURGUNDY
FRANCE
Geneva
HUNGARY
Cluny
Lyon
Venice
Milan
Bordeaux
Bologna
SAVOY
Genoa
AQUITAINE
Montpellier
Avignon
PROVENCE
Toulouse
Marseilles
Pisa
Florence
Siena
Santiago de Compostela
CATALONIA
Barcelona
Rome
LEON
ARAGON
Naples
SARDINIA
CASTILE
Valencia
IGLESIAS
MAJORCA
Lisbon
Seville
SICILY

German-Central European Silver Mining

silver outputs in kg: 1471/5 - 1546/50



Silver Outputs from the Major South German-Central European Mines
in kilograms of fine metal, in quinquennial means: 1471-75 to 1546-50

Years	SAXONY Est. Total in kg.	THURINGIA Est. Total in kg.	BOHEMIA Joachimsthal in kg.	BOHEMIA Kutna Hora Kasperska Hora in kg.	SLOVAKIA Fugger-Thurzo kg in kg.	HUNGARY Nagybanya Körmocbanya in kg.	TYROL: Schwaz in kg.	TOTAL Estimated in kg.
1471-75	4,360.94			4,500.0			4,112.50	**12,973.44**
1476-80	10,317.46			4,250.0			7,354.00	**21,921.46**
1481-85	3,743.30			4,000.0		1,800.0	9,745.80	**19,289.10**
1486-90	2,770.04			3,750.0		3,523.0	12,751.00	**22,794.04**
1491-95	3,757.33			3,500.0	1,957.12	3,523.0	12,422.75	**25,160.21**
1496-1500	4,641.69			3,250.0	1,957.12	3,795.9	12,094.50	**25,739.17**
1501-05	8,979.23			3,000.0	2,870.47	4,068.7	11,766.25	**30,684.65**
1506-10	7,416.41	4,626.19		2,750.0	3,990.76	4,341.6	11,438.00	**34,562.92**
1511-15	6,925.10	5,713.42		2,500.0	3,632.11	4,614.4	11,109.75	**34,494.81**
1516-20	5,189.14	6,079.43	3,970.00	2,250.0	1,983.07	4,887.3	10,781.50	**35,140.43**
1521-25	3,701.18	6,301.73	9,703.24	2,000.0	2,486.46	5,160.1	10,453.25	**39,806.00**
1526-30	3,425.12	7,889.16	13,795.32	2,000.0	2,269.15	5,433.0	10,125.00	**44,936.74**
1531-35	6,663.07	6,300.90	16,554.81	2,000.0	2,269.15	5,433.0	10,125.00	**49,345.92**
1536-40	14,973.18	5,734.07	13,248.01	3,947.0	2,243.58	5,433.0	10,125.00	**55,703.84**
1541-45	7,739.26	6,144.00	10,936.85	3,997.0	2,141.55	5,433.0	9,963.49	**46,355.16**
1546-50	4,131.66	6,576.20	10,936.85	700.0	2,141.55	5,433.0	9,963.49	**39,882.76**

Estimates of Aggregate Silver Production from Central European Mines in the Sixteenth Century
Annual Estimates in Kilograms of Fine Silver

Years	Germany	Austria-Hungary	TOTAL
According to Soetbeer (1879):			
1493 - 1520	11,000 kg.	24,000 kg.	35,000 kg.
1521 - 1544	15,000 kg.	32,000 kg.	47,000 kg.
1545 - 1560	19,400 kg.	30,000 kg.	49,400 kg.
1561 - 1580	15,000 kg.	23,500 kg.	38,500 kg.
According to Nef (1941)			
1526-1535	35,100 kg.	49,100 kg.	84,200 kg. (minimum)
		56,100 kg.	91,200 kg. (maximum)

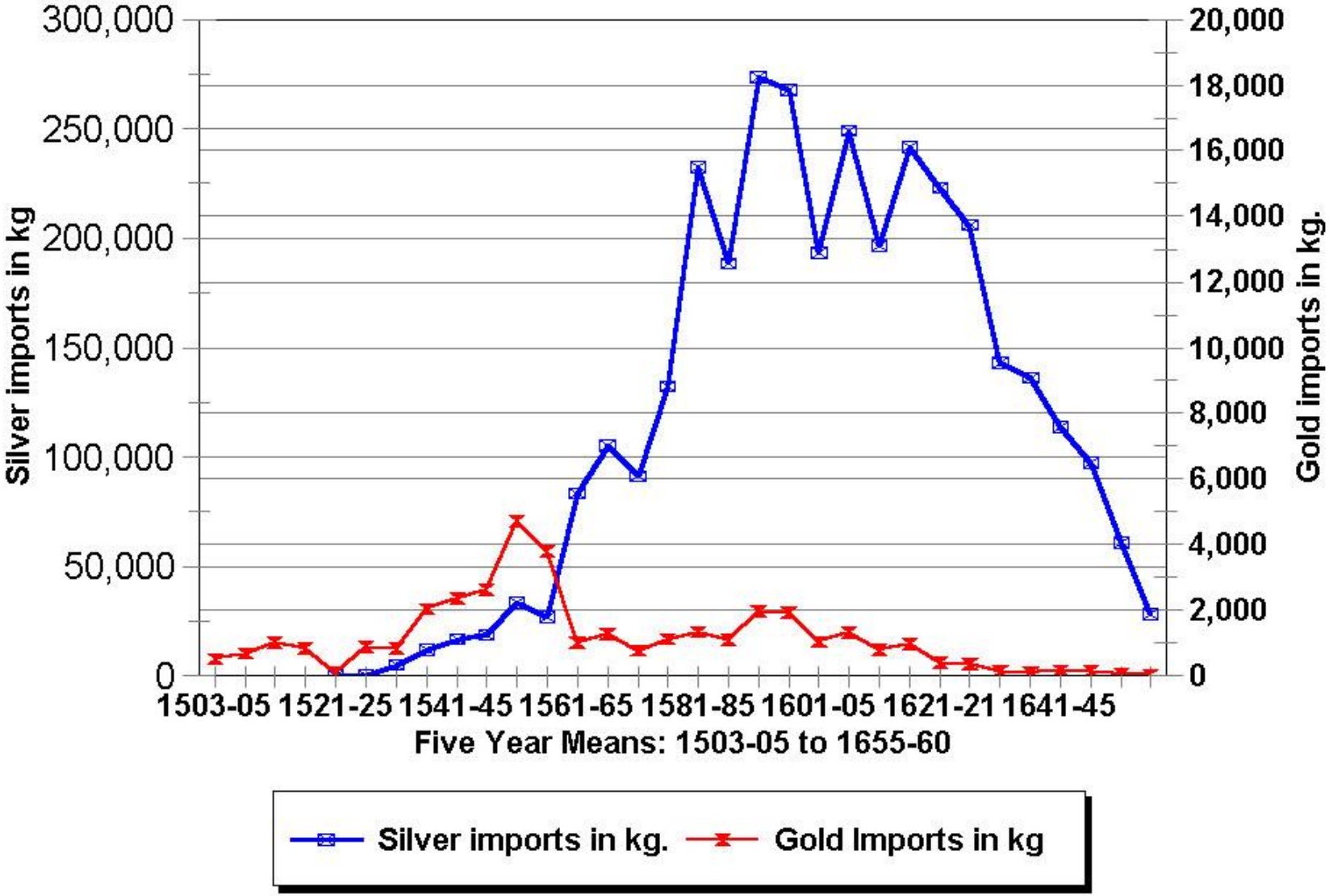
Monetary Changes: Age of Silver 3

- - 3) **Central European Mining Boom: Peak and Decline**
- a) **by 1530s, the mining boom had reached its peak**,
- - also: much less silver was being diverted via Venice to the Levant and Asia – though some was exported from Antwerp, in Portuguese ships: going to Asia for the spice trades
- b) **Rapid decline of mining boom from 1540s**
- - **victim of depletion,** diminishing returns (rising costs)
- - **civil wars in South Germany:** Catholics vs Protestants
- - **most important reason: cheaper supplies of silver** were now arriving from the Spanish Americas

Monetary Changes: Age of Silver 4

- - 4) **Silver from the Spanish Americas: 1520 – 1660**
- a) **Portuguese in Brazil**: found important new sources of gold here; but no silver
- b) **Spanish in Peru (Bolivia) and Mexico**
- **- initially found only gold, but then far more silver**, in both Central and South America
- - **but Spanish silver imports did not surpass those of Central European mines until the 1560s**:
  - see graph and tables

American Bullion Imports into Seville
Gold & Silver in kg: 1503-5 to 1655-60



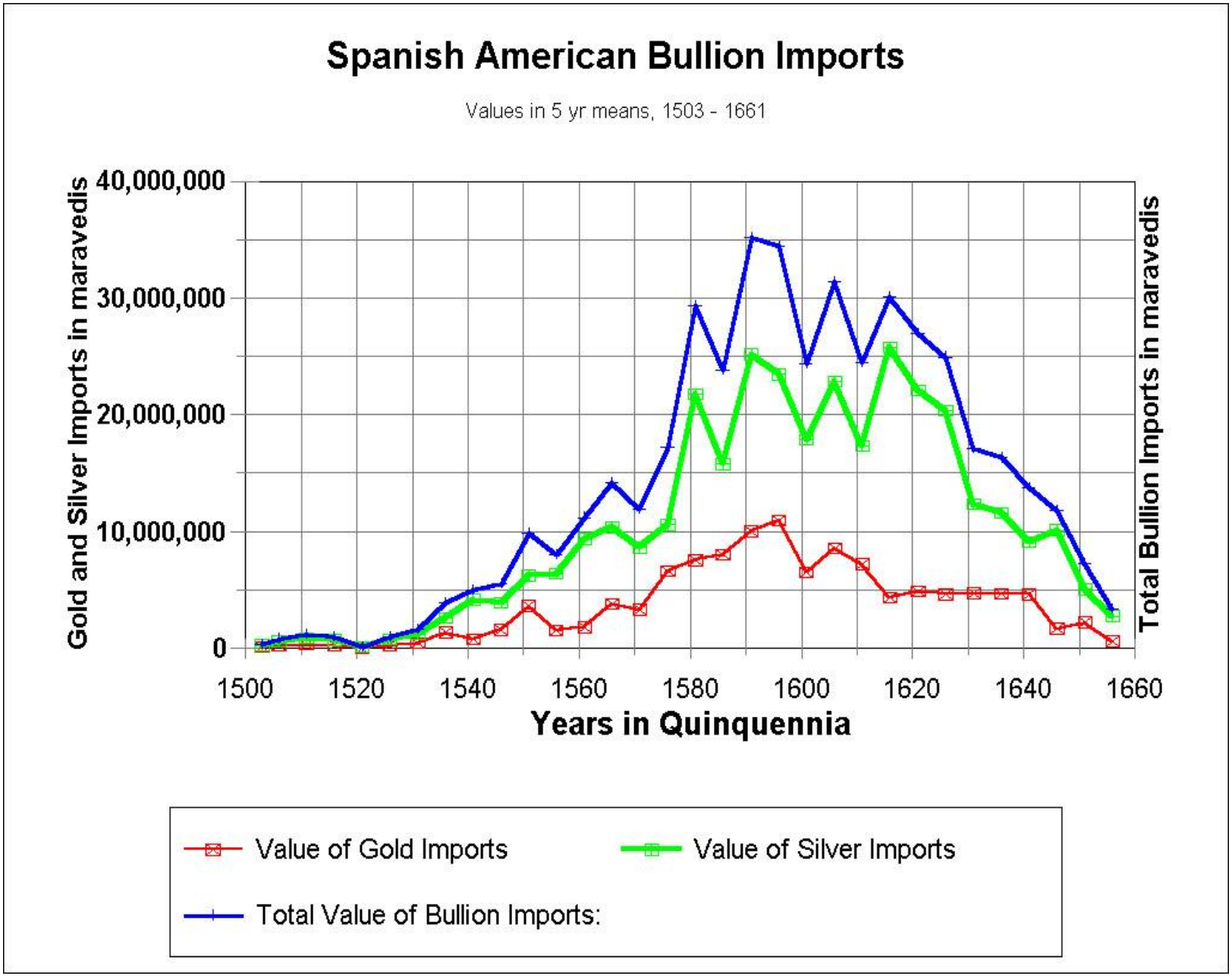

Spanish American Bullion Imports
Values in 5 yr means, 1503 - 1661
Gold and Silver Imports in maravedis
Total Bullion Imports in maravedis
40,000,000
30,000,000
20,000,000
10,000,000
0
1500
1520
1540
1560
1580
1600
1620
1640
1660
Years in Quinquennia
Value of Gold Imports
Value of Silver Imports
Total Value of Bullion Imports:

Table 1. **Imports into Seville of Spanish American Gold and Silver Bullion in pesos of 450 maravedis and in kilograms of fine metals: in quinquennial means, 1501-05 to 1656-61**

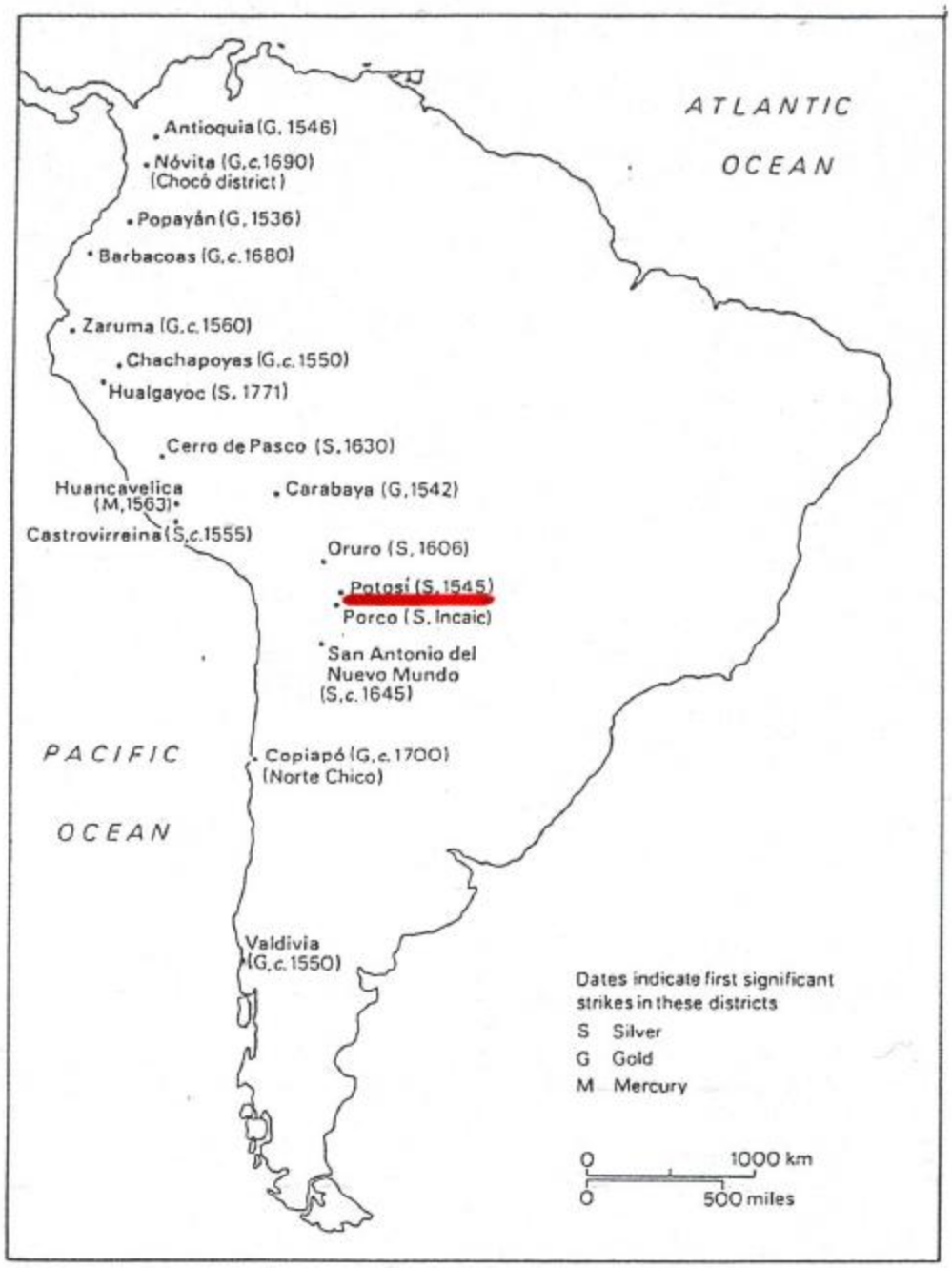
Year: Begin	Year: End	Public Bullion: Means in pesos of 450 maravedis	Private Bullion: Means in pesos of 450 maravedis	TOTAL Bullion: Means in pesos of 450 maravedis	Mean Silver Imports in kg	Mean Gold Imports in kg
1503	1505	32,405.50	91,279.60	123,685.10		517.24
1506	1510	42,770.80	120,476.50	163,247.30		682.69
1511	1515	62,647.00	176,463.70	239,110.70		999.95
1516	1520	52,043.50	146,595.80	198,639.30		830.70
1521	1525	7,030.50	19,803.50	26,834.00	3.40	111.88
1526	1530	54,414.10	153,273.30	207,687.40	26.34	865.93
1531	1535	86,472.10	243,574.10	330,046.20	5,090.79	854.41
1536	1540	270,177.00	517,401.40	787,578.40	12,147.99	2,038.86
1541	1545	151,557.70	839,243.30	990,801.00	16,815.87	2,363.40
1546	1550	318,534.30	783,207.90	1,101,742.20	18,698.76	2,628.03
1551	1555	725,701.30	1,247,404.90	1,973,106.20	33,479.21	4,707.31
1556	1560	313,699.10	1,286,100.60	1,599,799.70	27,145.03	3,816.70
1561	1565	363,906.60	1,877,600.50	2,241,507.10	83,373.92	1,019.64
1566	1570	756,948.60	2,071,294.50	2,828,243.10	105,197.84	1,286.54
1571	1575	659,732.10	1,721,589.70	2,381,321.80	91,353.22	770.06
1576	1580	1,329,935.70	2,120,452.50	3,450,388.20	132,365.17	1,115.77
1581	1585	1,510,120.80	4,364,801.60	5,874,922.40	232,207.57	1,336.21
1586	1590	1,608,642.50	3,157,883.60	4,766,526.10	188,397.97	1,084.12
1591	1595	2,004,669.70	5,032,302.80	7,036,972.50	273,704.54	1,966.28
1596	1600	2,194,863.60	4,690,836.50	6,885,700.10	267,820.77	1,924.01
1601	1605	1,303,977.10	3,576,688.50	4,880,665.60	193,590.35	1,028.81
1606	1610	1,709,935.80	4,571,105.60	6,281,041.40	249,135.90	1,324.00

Monetary Changes: Age of Silver 5

- 5) **Spanish Mining & Technological Innovations:**
- a) **Mercury Amalgamation Process**: major technological innovation
- - **possibly devised in Germany**: late 15th century
- - **Liquid mercury (from Spain & Americas)** added to the crushed silver ores: combined with silver to separate from ores
- - **mercury (low melting point) boiled off** ➔leaving pure silver as residue
- - large savings on both fuel and labour
- b) **permitted major break-through in Spanish-American mining**: especially from the 1570s

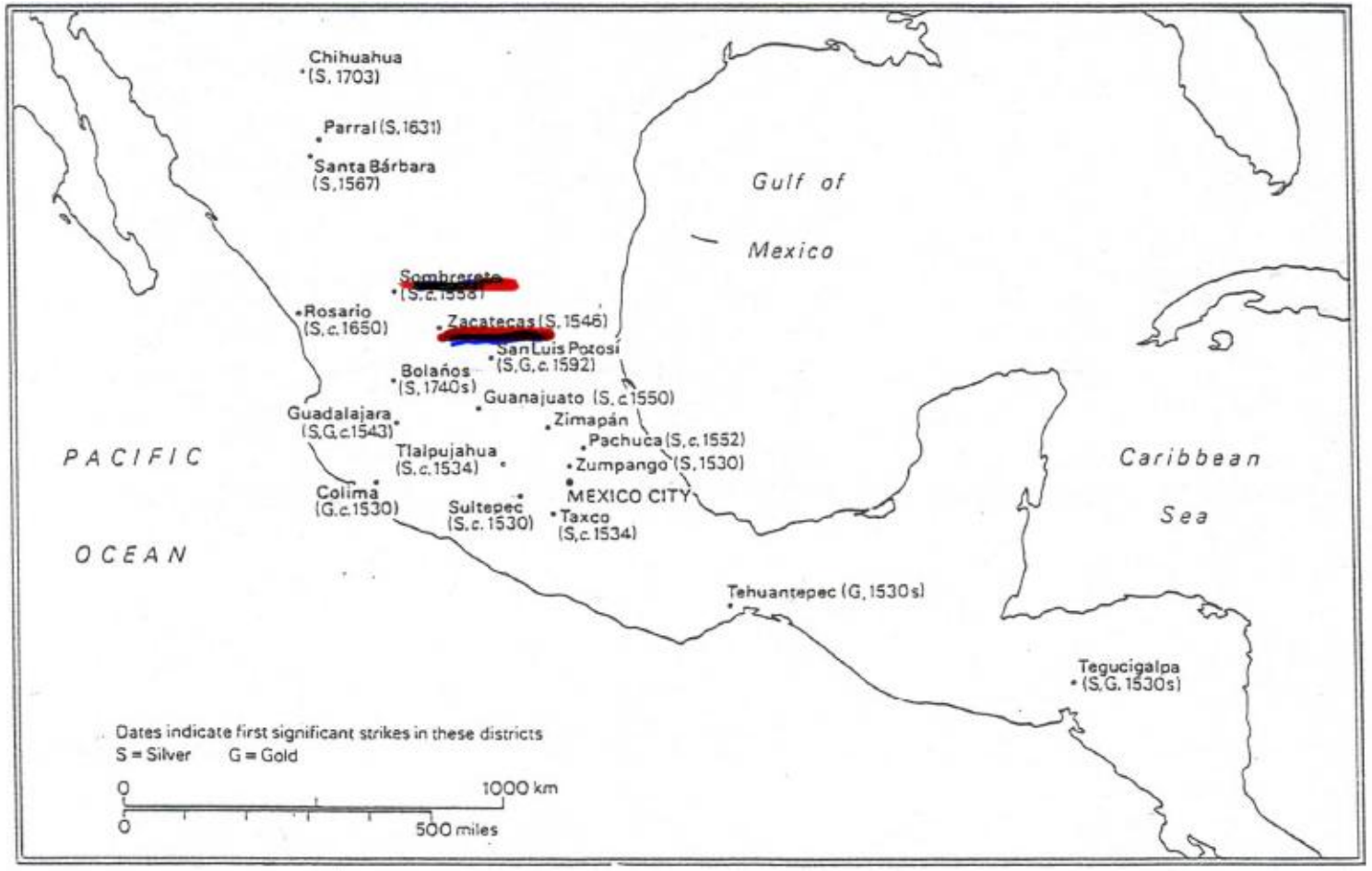
Monetary Changes: Age of Silver 5

- c) **New mines opened in Americas:**
- (1) **1545: Potosi in Spanish Generality of 'Peru'** (modern day Bolivia): most important
- (2) **1546: Zacatecas in New Spain (Mexico):** – much smaller (but peaked later)
- (3) **1680: Sombrerete in Mexico** (well after peak of mining boom)
- d) **Peak Outputs in Spanish American silver mining:**
- - **Potosi (Peru-Bolivia)**: **output peaked in 1590s**, coinciding with peak silver imports
- - **Zacatecas (Mexico)**: **output peaked in 1620s**: followed by slump, and new peak in 1670s



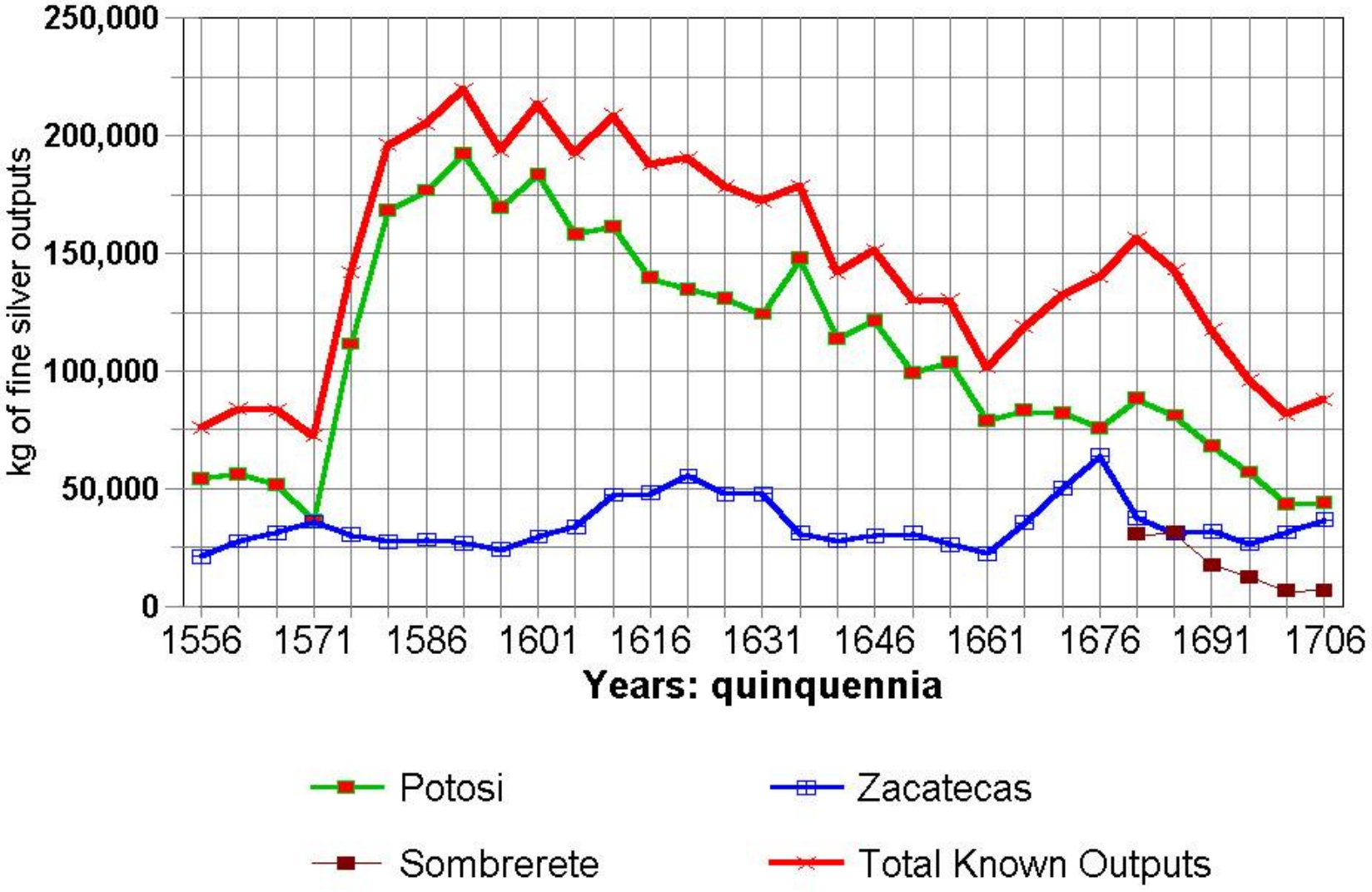
Centres of major mining districts in Spanish South America

Silver Mining in New Spain (Mexico)



Spanish-American Silver Mining Outputs

kg fine silver - 5 yr means: 1556-1711



Mined Outputs of Gold and Silver from Spanish America; and Exports of Gold and Silver Bullion from Spanish America to Seville in quinquennial means, 1501-1505 to 1656-61

Year	Potosi: Silver Outputs in kg.	Zacatecas: Silver Outputs in kg.	Sombrerete Silver Outputs in kg.	Total Known Silver Mining Outputs in kg	Mean Value of Bullion Imports in 450 maravedis	Mean Gold Imports in kg	Mean Silver Imports in kg	Index Imports: 1591-1600=100	Index of Mined Outputs 1591-1600=100
1501-05					123,685.10	517.24	0.00	0.00	
1506-10					163,247.30	682.69	0.00	0.00	
1511-15					239,110.70	999.95	0.00	0.00	
1516-20					198,639.30	830.70	0.00	0.00	
1521-25					26,834.00	111.88	3.40	0.00	
1526-30					207,687.40	865.93	26.34	0.01	
1531-35					330,046.20	854.41	5,090.79	1.88	
1536-40					787,578.40	2,038.86	12,147.99	4.49	
1541-45					990,801.00	2,363.40	16,815.87	6.21	
1546-50					1,101,742.20	2,628.03	18,698.76	6.91	
1551-55	64,848.88			**64,848.88**	1,973,106.20	4,707.31	33,479.21	12.36	31.39
1556-60	54,335.74	21,294.68		**75,630.42**	1,599,799.70	3,816.70	27,145.03	10.03	36.61
1561-65	56,080.38	27,761.40		**83,841.77**	2,241,507.10	1,019.64	83,373.92	30.79	40.59
1566-70	51,717.86	31,498.08		**83,215.94**	2,828,243.10	1,286.54	105,197.84	38.85	40.29
1571-75	36,439.01	35,925.21		**72,364.22**	2,381,321.80	770.06	91,353.22	33.74	35.03
1576-80	111,607.53	30,389.38		**141,996.90**	3,450,388.20	1,115.77	132,365.17	48.89	68.74
1581-85	168,398.46	27,613.05		**196,011.51**	5,874,922.40	1,336.21	232,207.57	85.76	94.89
1586-90	176,839.51	28,413.40		**205,252.91**	4,766,526.10	1,084.12	188,397.97	69.58	99.36

Monetary Changes: Age of Silver 6

- 6) **Distribution of Spanish Silver in Europe**
- -* **Note: by government monopoly, all Spanish-American silver** – public & private – had to be shipped to and imported via Seville
- - records cease in 1660: because the silver-import tax had ended
- (a) **By Warfare and Spanish military expenditures:**
- - **Spanish domains in Europe: were vast & farflung**
- **- subject to both foreign invasions** (French) and civil wars (Low Countries, Portugal)
- - **military expenditures (pay, muntions, food, etc) usually outran silver supplies** → borrowing from Germans and Italians, on security of bullion deliveries

Monetary Changes: Age of Silver 7

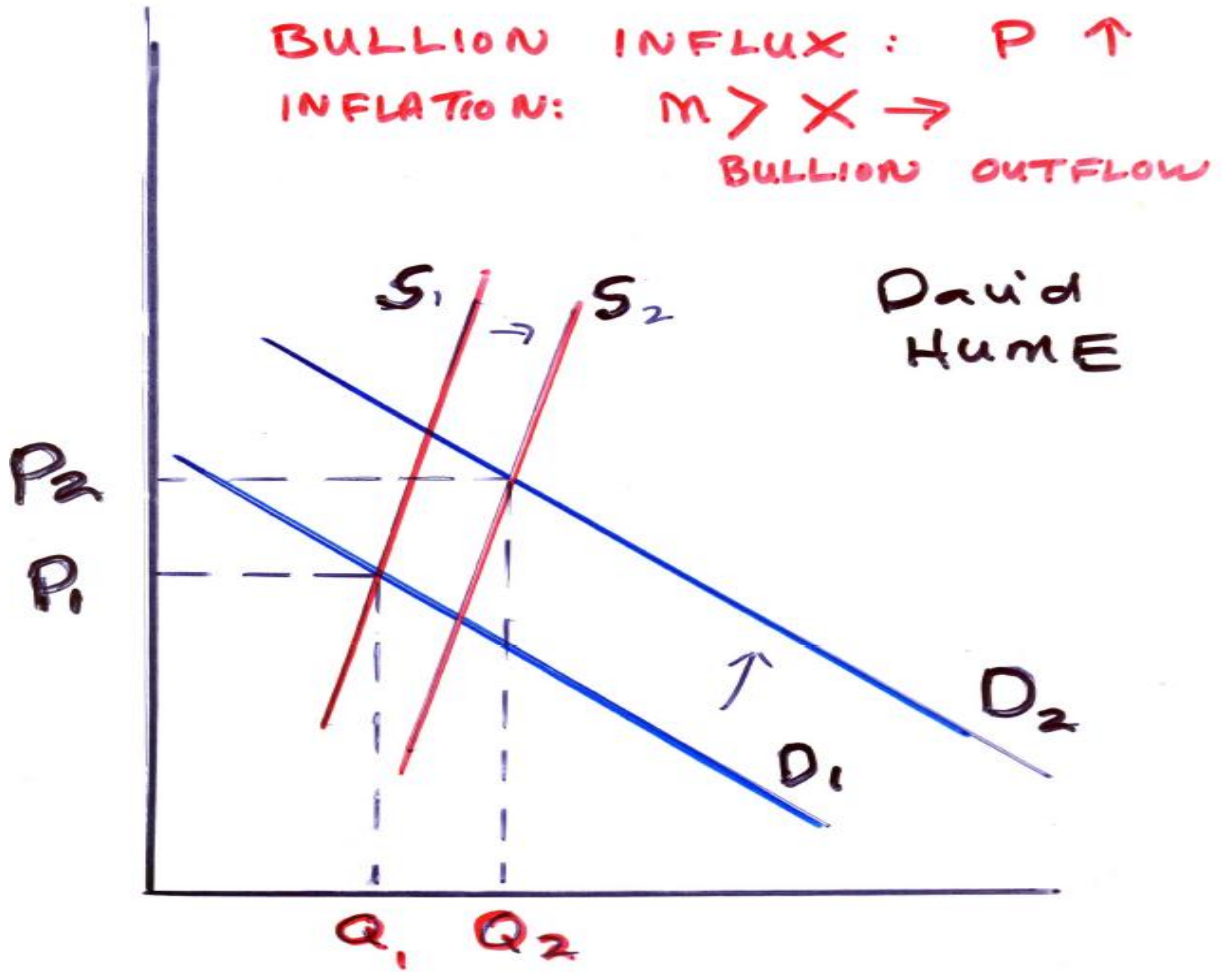
- 6) **Distribution of Spanish Silver in Europe:**
- (b) **Imports: and Hume Price-Specie Flow theorem**
- - **influx of silver into Spain (German & American) led to internal inflation** (with primitive industries & inelastic supplies of goods)
- ➔ increasing imports of relatively cheaper foreign goods → silver outflows to countries exporting goods to Spain –
- - **Problem: 'Monetary approach to balance of payments' theorem:** read lecture notes

PRICE → SPECIE FLOW MECHANISM

BULLION INFLUX : P ↑

INFLATION: M > X →

BULLION OUTFLOW



Monetary Changes: Age of Silver 8

- 6) **Distribution of Spanish Silver in Europe:**
- (c) **illegal direct trade with Spanish colonies**: in Caribbean and Americas: French, Dutch, English merchants in particular
- (d) **Piracy**: hijacking Spanish treasure fleets
- (e) **Bimetallic flows**: **silver flowed from regions where it was undervalued to those where it was higher valued** – in relation to gold & goods: from A: with 12:1 to B: with 11:1

Monetary Changes: Age of Silver 9

- 7) **Did Spanish silver reach England?**:
- a) **published views that it did not are nonsense:** see table
- b) **Rise in bimetallic ratio in England:**
- from 11.5:1 in 1460s to 15:1 in the 1660s:
- proof of greater relative abundance of silver –
- despite the increases in silver shipments to Asia (next topic)

The Role of Spanish Silver in English Silver Mint Outputs:

From the Tower Mint's 'Melting Books', in Troy Pounds Weight.

Period Covered Tower Mint's Melting Books		Spanish Silver Coins: in Troy lb.*	Percent of Total Bullion	Total Silver Bullion in Troy lb.*
Oct. 1561 to Dec. 1562		60,993.8	75.0%	81,325.0
Sept 1569 to Feb. 1570		21,321.1	81.4 %	26,193.0
Feb. 1583 to Nov. 1583		40,469.2	78.1 %	51,817.2
June 1584 to Feb. 1585		40,905.8	86.3%	47,394.0
Feb. 1598 to Jan. 1599		6,726.4	62.0%	10,849.0

* 1 Troy pound = 12 Troy ounces = 373.242 grams.

Source:

Christopher Challis, 'Spanish Bullion and Monetary Inflation in England in the Later Sixteenth Century', *Journal of European Economic History*, 4 (1975), 381-92.

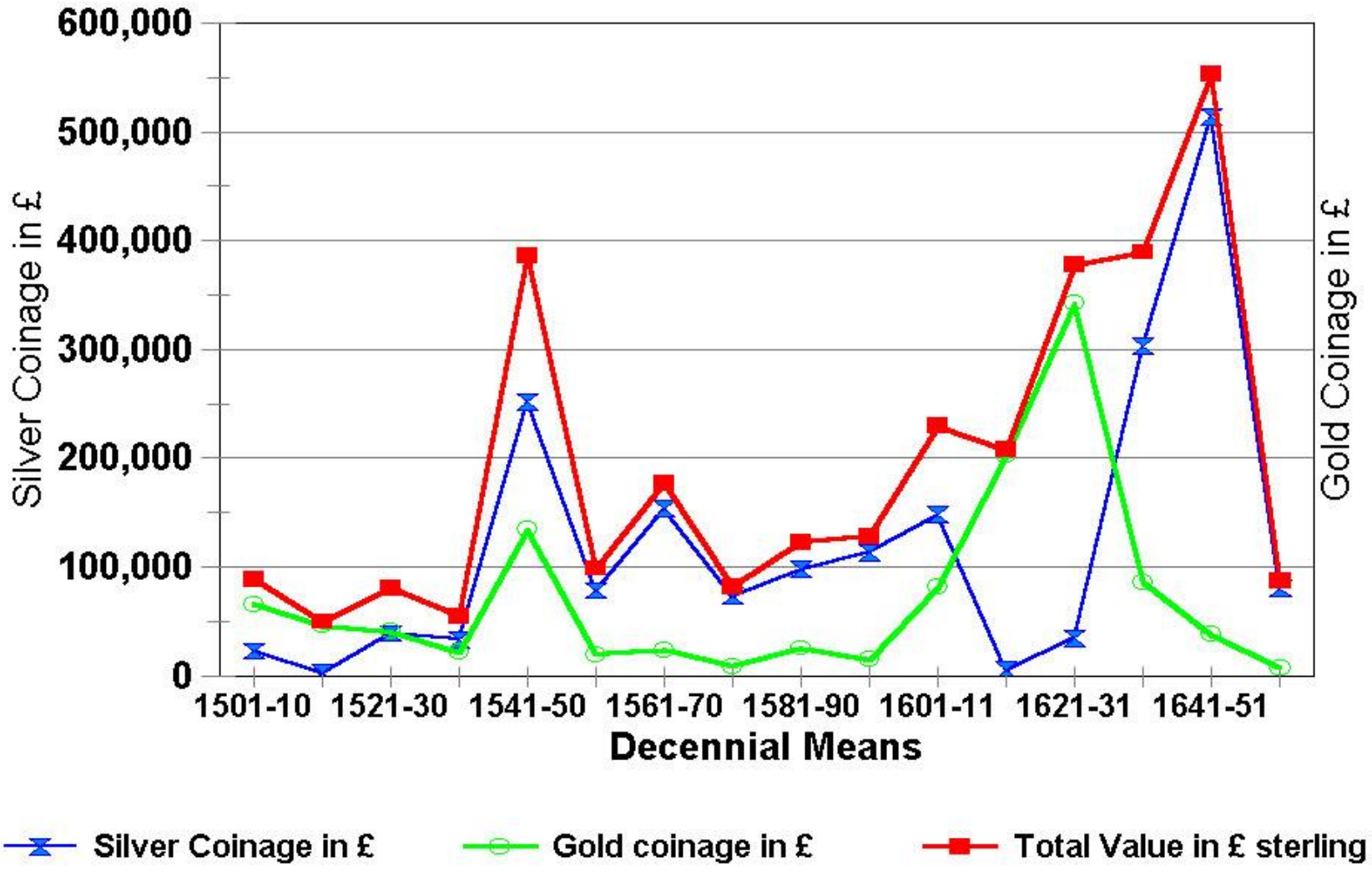
ENGLAND: SILVER AND GOLD COINAGE OUTPUTS:

in kg. fine metal and in £ sterling values
in quinquennial means: 1501-05 to 1596-1600

Year	SILVER Total kilograms	SILVER Value £ sterling	GOLD Total kilograms	GOLD Value £ sterling	TOTAL VALUES in £ sterling	Percent Silver	Percent Gold
1501-05	4,313.544	24,988.026	516.604	33,392.271	58,380.297	**42.80%**	**57.20%**
1506-10	3,633.212	21,046.916	1,523.115	98,451.267	119,498.183	**17.61%**	**82.39%**
1511-15	1,089.012	6,308.562	694.599	44,897.564	51,206.126	**12.32%**	**87.68%**
1516-20	79.145	458.481	743.656	48,068.530	48,527.011	**0.94%**	**99.06%**
1521-25	3,148.207	18,237.317	442.136	28,578.780	46,816.096	**38.96%**	**61.04%**
1526-30	9,244.701	60,248.025	736.422	54,079.255	114,327.280	**52.70%**	**47.30%**
1531-35	4,616.832	30,088.071	189.160	13,890.972	43,979.043	**68.41%**	**31.59%**
1536-40	5,684.094	37,043.459	406.719	29,826.052	66,869.511	**55.40%**	**44.60%**
1541-45	5,707.032	100,776.324	963.792	79,997.508	180,773.832	**55.75%**	**44.25%**
1546-50	22,029.731	402,892.436	1,992.083	188,860.922	591,753.358	**68.08%**	**31.92%**
1551-55	9,428.855	121,874.569	136.583	16,023.336	137,897.905	**88.38%**	**11.62%**
1556-60	4,152.477	36,023.662	137.533	23,955.867	59,979.529	**60.06%**	**39.94%**
1561-65	24,263.303	210,873.247	255.828	24,682.712	235,555.960	**89.52%**	**10.48%**
1566-70	11,097.432	96,429.852	236.160	22,790.897	119,220.749	**80.88%**	**19.12%**
1571-75	8,806.166	76,520.164	102.633	9,934.572	86,454.736	**88.51%**	**11.49%**
1576-80	8,071.535	70,489.334	76.197	7,416.226	77,905.560	**90.48%**	**9.52%**
1581-85	16,056.314	139,852.039	337.318	32,770.995	172,623.034	**81.02%**	**18.98%**
1586-90	6,405.349	55,658.544	185.206	17,957.031	73,615.575	**75.61%**	**24.39%**
1591-95	18,653.363	162,086.240	178.498	17,306.684	179,392.924	**90.35%**	**9.65%**
1596-00	7,461.690	64,837.491	131.637	12,736.568	77,574.058	**83.58%**	**16.42%**

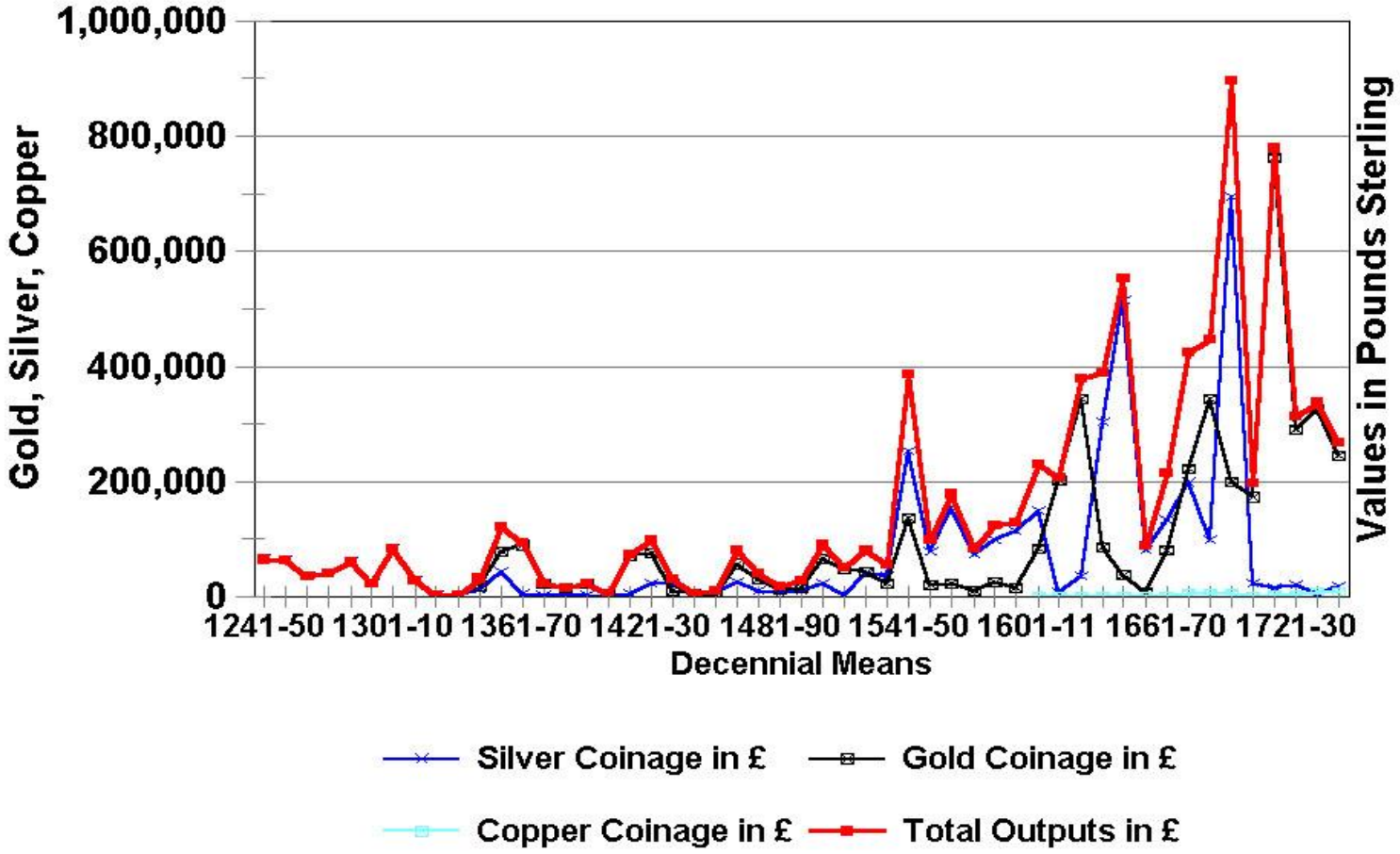
English Mint Outputs in £ sterling

Silver and Gold: 1500 - 1650



English Mint Outputs in £ Sterling

Gold, Silver, Copper, 1240-1750



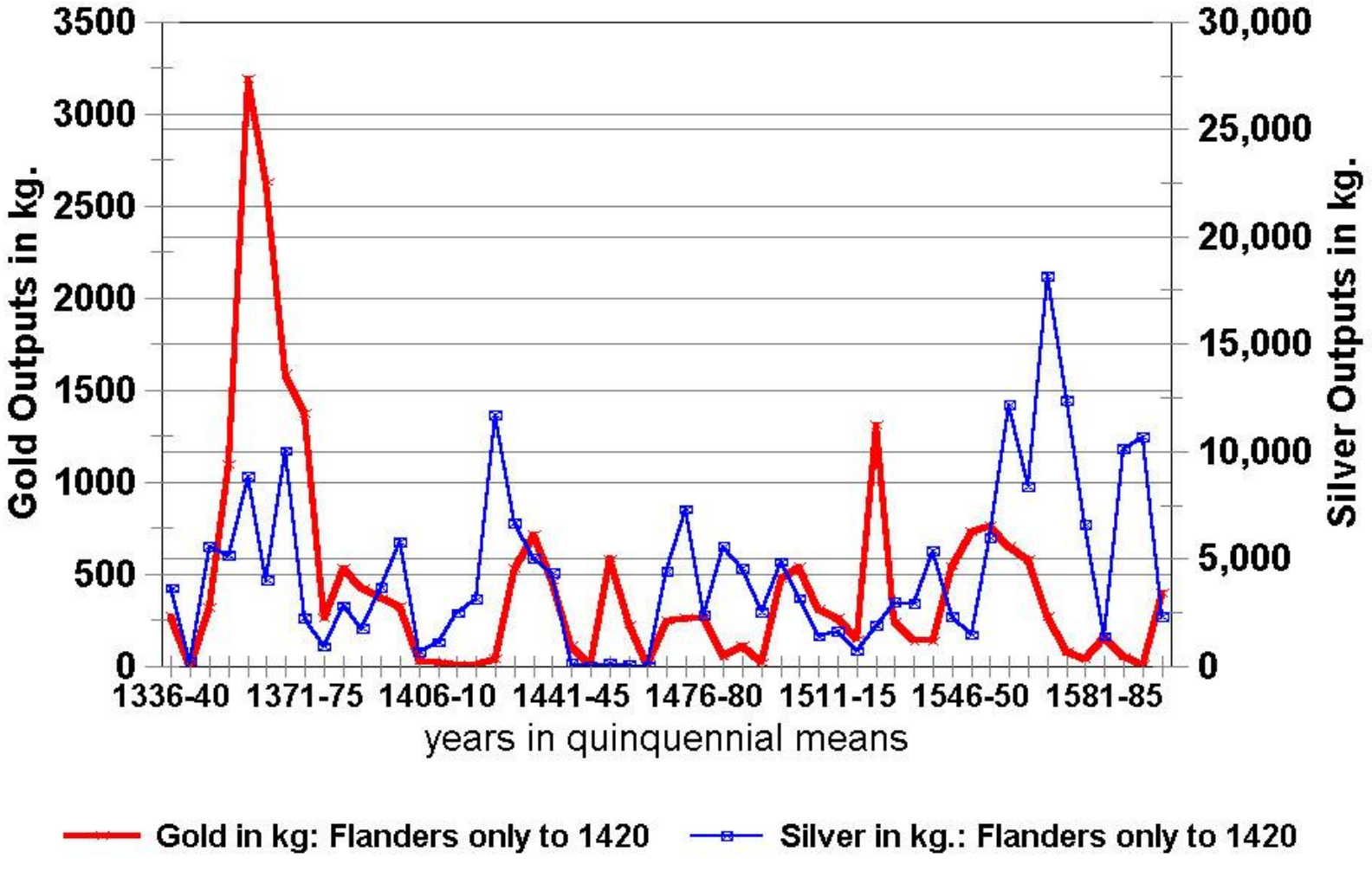
Mayhew's Estimates of Money Supplies, Velocity, Prices, and National Income in England, 1300 - 1670

Date	1300	1470	1526	1546	1561	1600	1643	1670
Money Supply in millions of £ sterling	0.900	0.900	1.400	1.450	1.450	3.500	10.000	12.000
Velocity (Income V)	5.178	3.889	3.571	5.517	9.310	6.286	3.500	3.407
Price Level: PBH Index	104.800	104.600	135.100	172.300	289.300	478.300	597.800	635.700
National Income Y in millions £ st.	4.660	3.500	5.000	8.000	13.500	22.000	35.000	40.880
Population in millions	6.000	2.300	2.300	2.900	3.000	4.100	5.100	5.000

Source: Nicholas J. Mayhew, 'Population, Money Supply, and the Velocity of Circulation in England, 1300-1700', *Economic History Review*, 2nd ser. 48:2 (May 1995), p. 244.

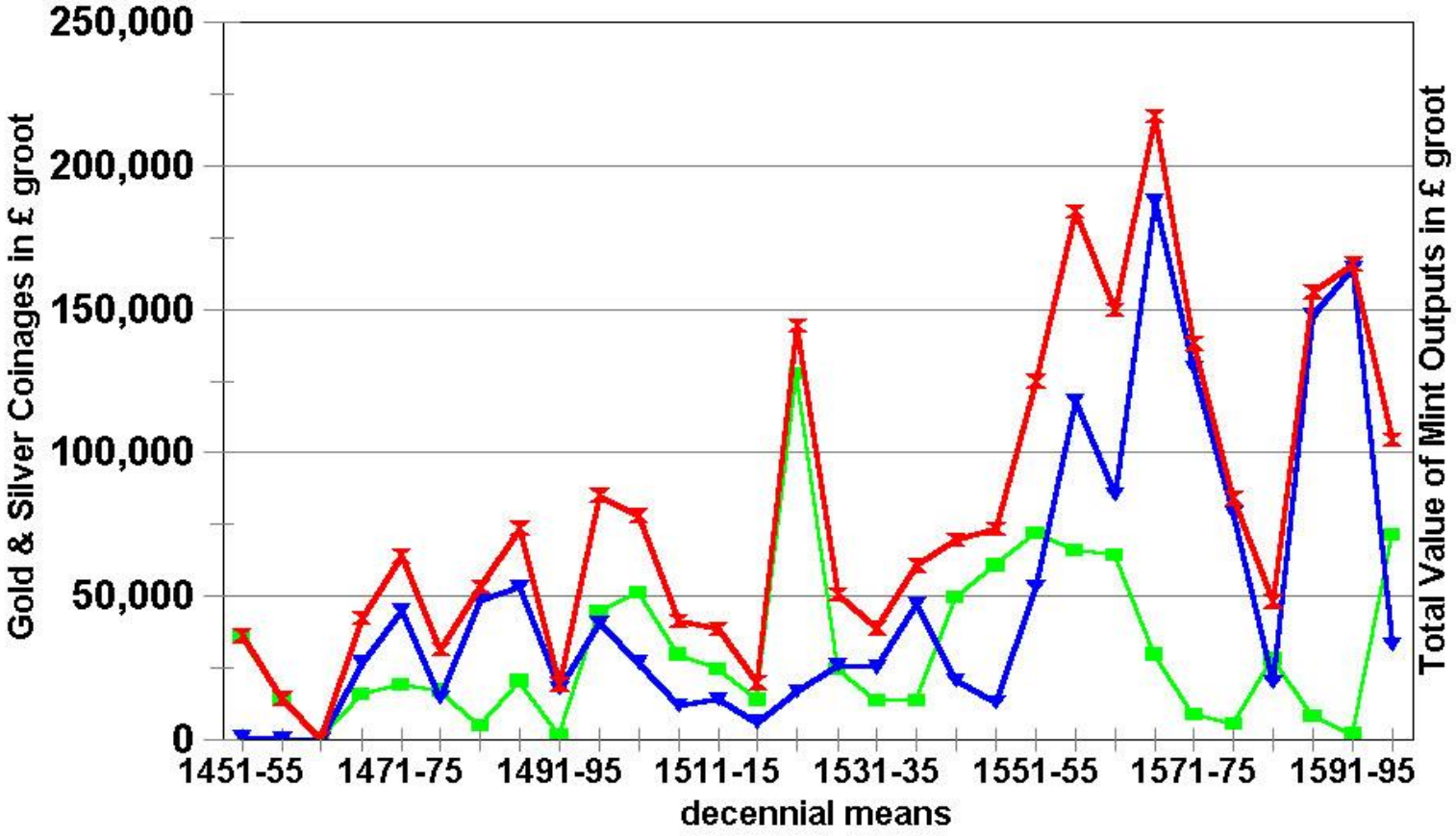
Mint Outputs of Flanders & Brabant

in kg of pure gold & silver: 1336-1600



Flanders & Brabant: Mint Outputs

Means in £ groot, 1451 - 1600

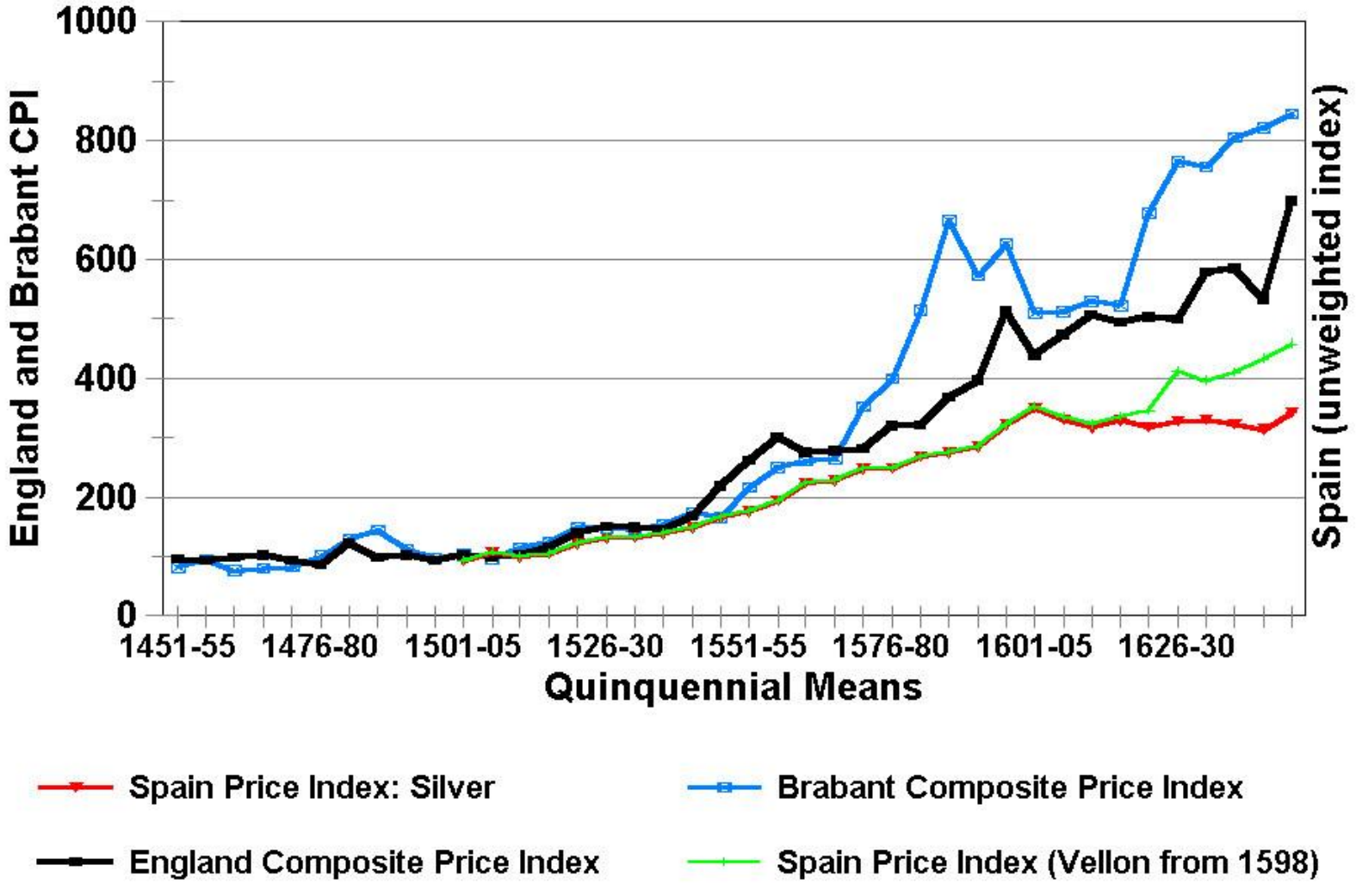


Monetary Expansion in Europe, 1520 to ca. 1640: Other Sources 1

- 1) **Coinage debasements:**
- a) **the Bodin-Malestroit debate of 1566-68** on causes of inflation
- - **Bodin**: correct that primary cause of **current inflation** was influx of Spanish silver (but not previous inflations)
- - **Malestroit**: partly correct in insisting on relative importance of coinage debasements (but far less important than in 14th-15th centuries):
- b) **Spain experienced no coinage debasements** in Price Revolution era, and **had lowest level of inflation**, compared to England and Low Countries
- -c) **Habsburg Low Countries: had highest level of inflation** with more extensive coinage debasements

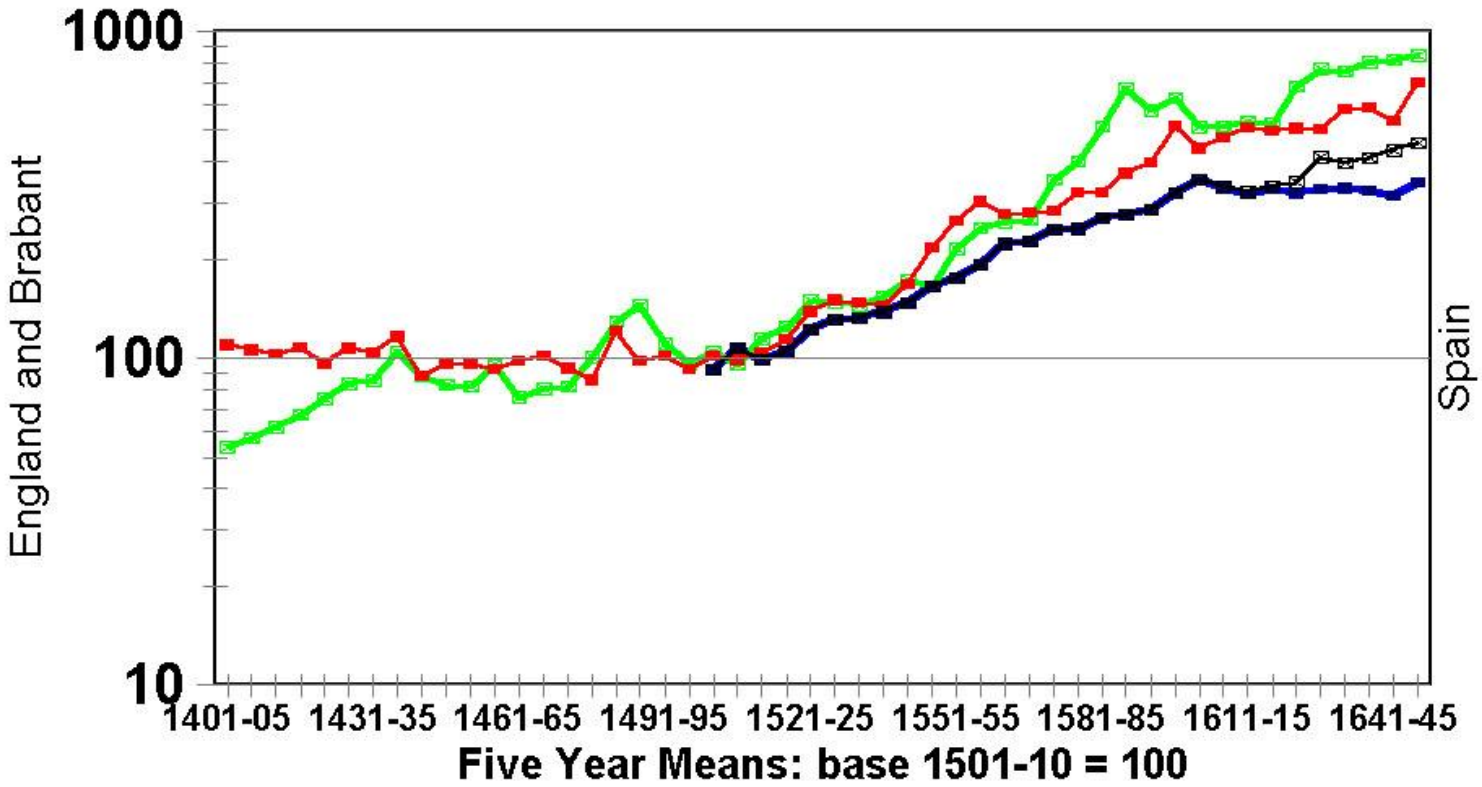
Price Indexes: England, Brabant, Spain

1451 - 1650: 5 yr means (1501-10 =100)



Price Indices: England, Brabant, Spain

5 yr means: 1401- 1650 (1501-10 = 100)



The London Tower Mint under the Tudors

Average Annual Outputs of Silver and of Total Gold and Silver Coinage in Pounds Sterling Values for Various Periods, 1485 to 1603

Period of the Annual Mean	Silver Coin in £ sterling	Total Coinage in £ sterling	Silver as % of Total
1485 - 1525	9,633.0	40,657.1	23.7 %
1526[a]- 1543	33,521.2	53,534.7	62.6 %
1544[b]- 1550*	389,211.3	576,952.4	67.5 %
1551[c]- 1560	22,850.0	31,670.1	72.2 %
1561[d]-1603	106,840.2	124,735.6	85.7 %

[a] Minor debasement of Nov. 1526.

[b] Henry VIII's drastic debasements, 1544-49.

[c] 1551: Coinage revaluation.

[d] 1561: Recoinage.

Changes in the English Silver Penny During Henry VIII's Great Debasement

Date	Fineness: percentage	No. of Pence to the Troy Pound 373.242 grams 5760 Troy grains	Grams of Pure Silver in penny	Grams of Pure Silver in the pound sterling (240d)	Nominal Value of a Tower lb of Silver 0.925 fine £ sterling	Nominal Value of kg. Pure Silver in £ sterling	Index: 1351= 100	Percentage change in silver content of penny
1526 Nov	92.500%	540.00	0.639	153.444	2.2500	6.517	177.00	
1542 May	75.833%	576.00	0.491	117.934	2.9275	8.479	230.29	-23.14%
1544 May	75.000%	576.00	0.486	116.638	2.9600	8.574	232.85	-1.10%
1545 March	50.000%	576.00	0.324	77.759	4.4400	12.860	349.27	-33.33%
1546 Apr	33.333%	576.00	0.216	51.839	6.6600	19.290	523.91	-33.33%
1549 Jan	66.667%	1152.00	0.216	51.839	6.6600	19.290	523.91	0.00%
1549 Apr	50.000%	864.00	0.216	51.839	6.6600	19.290	523.91	0.00%
1551 Apr	25.000%	864.00	0.108	25.920	13.3200	38.581	1047.82	-50.00%
1551 Oct	92.083%	720.00	0.477	114.565	3.0136	8.729	237.06	342.00%
1551 Dec	33.333%	576.00	0.216	51.839	6.6600	19.290	523.91	-54.75%
1553 June	33.333%	480.00	0.259	62.207	5.5500	16.075	436.59	20.00%
1553 Aug	91.667%	720.00	0.475	114.046	3.0273	8.768	238.14	120.00%
1557 June	91.667%	720.00	0.475	114.046	3.0273	8.768	238.14	0.00%
1560 Nov	92.500%	720.00	0.480	115.083	3.0000	8.689	236.00	0.91%

Monetary Expansion in Europe, 1520 to ca. 1640: Other Sources 2

- 2) **Dishoarding:**
- - melting down old, hoarded coin, plate, goblets, jewellry ➔ converting them into new coin:
- from fiscal pressures of **war-induced taxation**
- 3) **expansion in use of paper credit:**
- a) **especially a financial revolution: with full negotiability and discounting:** from 1520s:
- b) **to be discussed in later topic on Banking** & Finance: but with major changes from 1660s

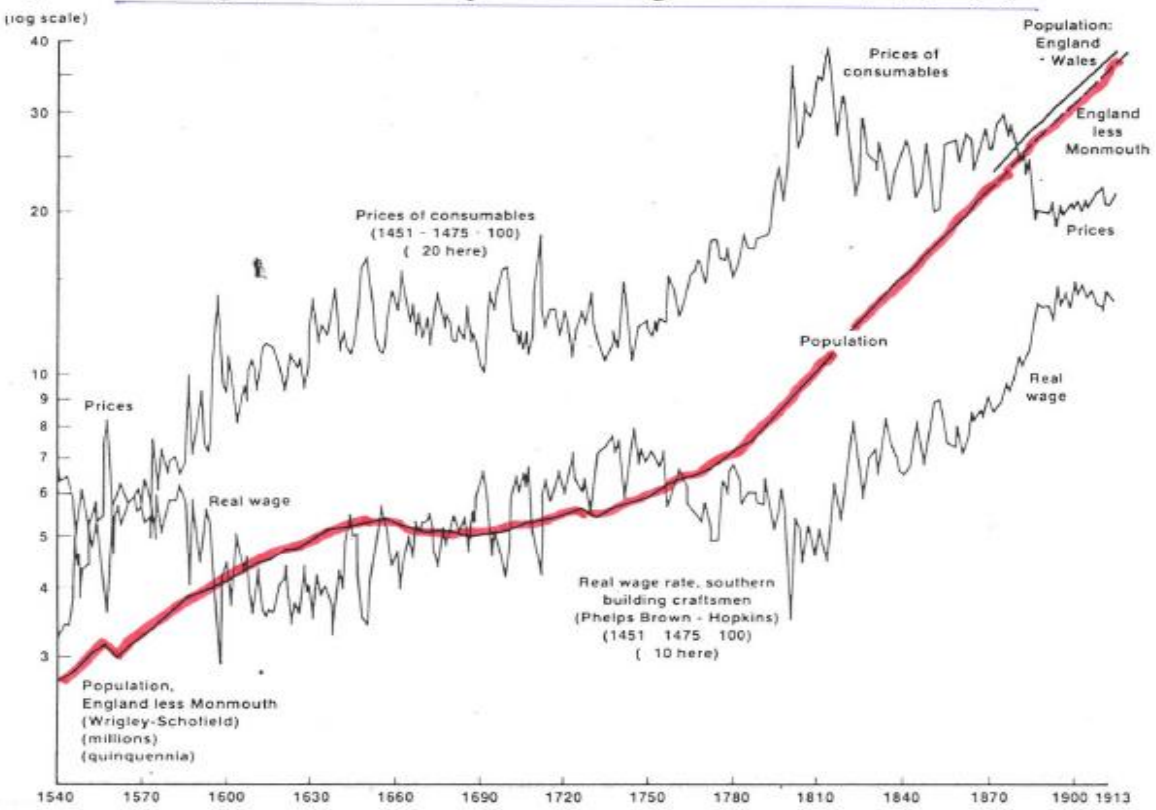
Monetary Expansion in Europe, 1520 to ca. 1640: Other Sources 2

- 4) **innovations in and expansion in public credit instruments:** *rentes* or annuities: see last term
- - **establishment of the Antwerp Bourse 1531**: also to be analysed later in section on Banking & Finance:
- - **e.g. Spain: increase in public annuities (*juros*)**: from 5 million ducats in 1515 to 83 million ducats in 1600 (money-of-account: 375 marevedis per ducat: see lecture notes): a 16.6 fold increase!
- 5) **the inflationary role of credit expansion**: never given its proper due in Price Revolution

Monetary Changes, 1640 – 1740: monetary contractions 1

- (1) **Era of the 'General Crisis': following the Price Revolution era**
- - a) **demographic expansion, monetary expansion, and inflation** had come to an end, after 120 years, by the 1640s
- -b) **following century: the obverse combination of: demographic stagnation or contraction, monetary contraction, and deflation** (except in times of major wars: always inflationary)**-**
- c) **causes? Some combination of real and monetary forces:** endogenous or exogenous?

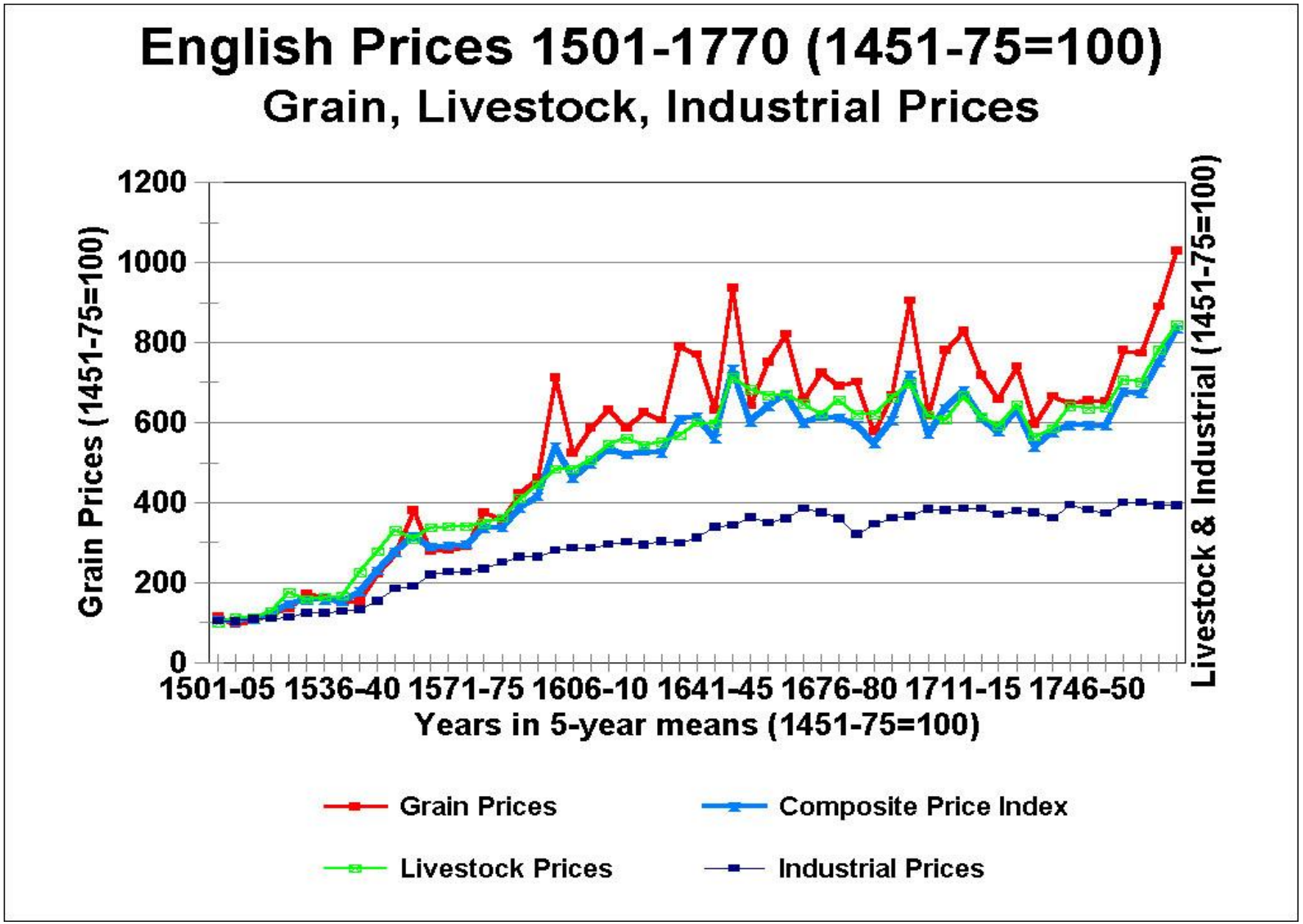
Fig. 1 Real Wages, Prices, and Population in England and Wales, 1541–1913

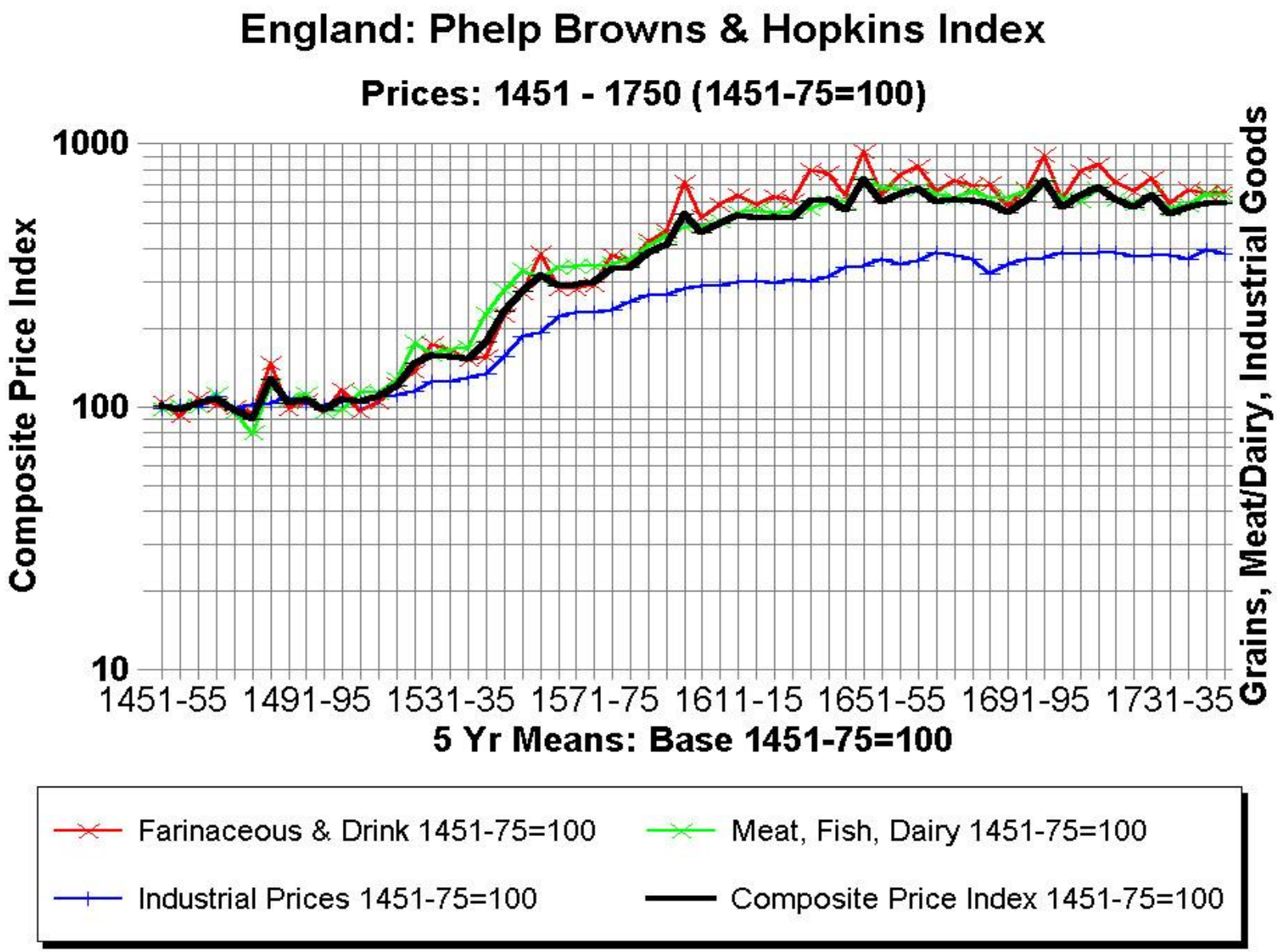


RWI = NWI/CPI

The Real Wage Index = Nominal Wage Index divided by the Consumer Price Index

Peter Lindert, 'English Population, Wages, and Prices: 1541 - 1913', *Journal of Interdisciplinary History*, 15 (Spring 1985), 614.

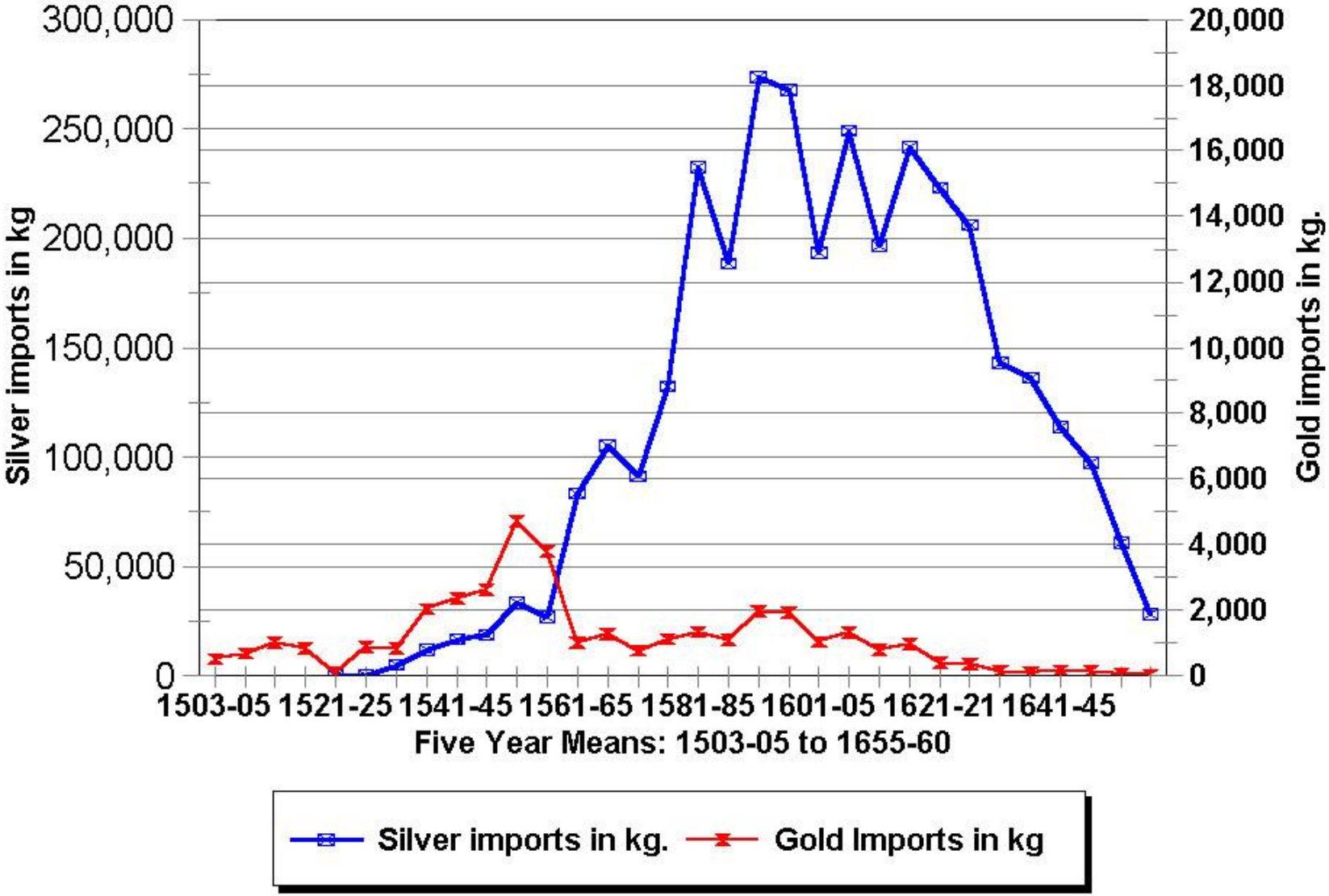

English Prices 1501-1770 (1451-75=100)
Grain, Livestock, Industrial Prices
Grain Prices (1451-75=100)
Livestock & Industrial (1451-75=100)
0
200
400
600
800
1000
1200
1501-05
1536-40
1571-75
1606-10
1641-45
1676-80
1711-15
1746-50
Years in 5-year means (1451-75=100)
Grain Prices
Composite Price Index
Livestock Prices
Industrial Prices


England: Phelp Browns & Hopkins Index
Prices: 1451 - 1750 (1451-75=100)
Composite Price Index
Grains, Meat/Dairy, Industrial Goods
1000
100
10
1451-55
1491-95
1531-35
1571-75
1611-15
1651-55
1691-95
1731-35
5 Yr Means: Base 1451-75=100
Farinaceous & Drink 1451-75=100
Meat, Fish, Dairy 1451-75=100
Industrial Prices 1451-75=100
Composite Price Index 1451-75=100

Monetary Changes, 1640 – 1740: monetary contractions 1

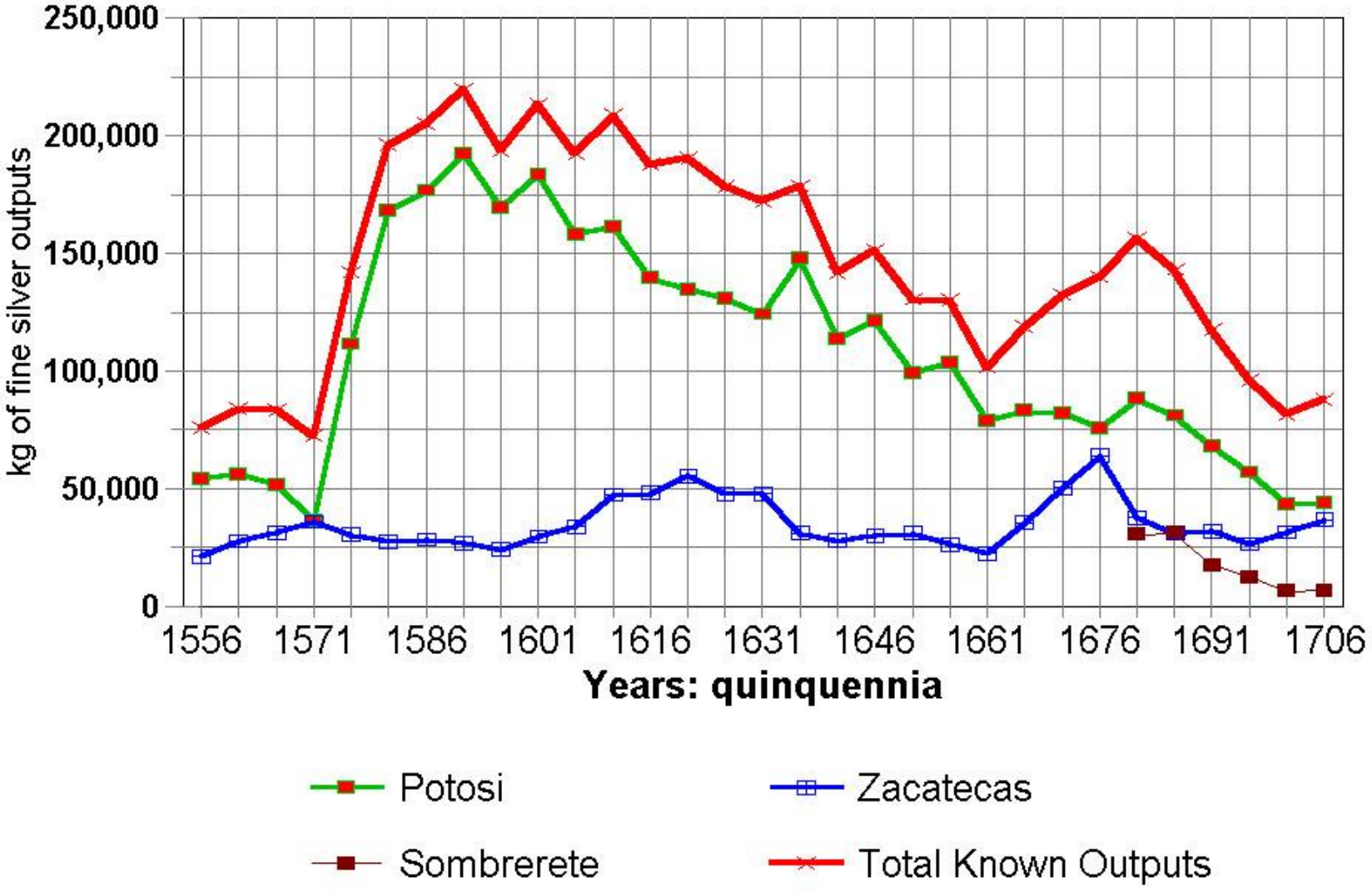
- (2) **Possible causes of monetary contraction:**
- a) **reduction in Spanish-American silver imports into Europe:** for several reasons:
- i) **reduction in Spanish silver mined outputs**
- ii) **greater retention of silver supplies for Spanish colonial economic development:**
- - **in Peru**: 90% retained by 1660s: **in Mexico**: 75% retained by the 1680s
- iii) **increased Pacific exports of silver from Mexico:** to Philippines and China (silk trade)

American Bullion Imports into Seville
Gold & Silver in kg: 1503-5 to 1655-60



Spanish-American Silver Mining Outputs

kg fine silver - 5 yr means: 1556-1711



Disposition of Public Revenues from the Viceroyalty of Peru and Mexico in equivalent kilograms of fine silver, in decennial means, 1581-90 to 1791-1800

Decade	Peru: Total Revenues in Lima Treasury in kg. Decennial Means	Peru: Share Retained	Peru: Remittances to Castile in equiv. kgs of fine silver Decennial Means	Peru: Percent of Total to Castile	Mexico: Remittances to Castile in equiv. kgs. of fine silver Decennial Means	Mexico: Percent of Total to Castile	TOTAL to Castile from Peru/Mexico in kg. silver Decennial Mean	Mexico to Philippines in kg. fine silver: Decen. Means	Percent of Mexican Total to Phillipines	Mexico: Total Remittances in kg silver Decennial Mean
1581-90					23,107.5			3,219.8	12.2%	26,327.3
1591-00	86,097.9	40.8%	51,013.3	68.1%	23,856.3	31.9%	74,869.6	1,191.2	4.8%	25,047.5
1601-10	97,147.4	54.6%	44,091.2	61.7%	27,379.3	38.3%	71,470.5	3,003.0	9.9%	30,382.3
1611-20	88,604.9	66.2%	29,936.2	65.7%	15,604.2	34.3%	45,540.4	6,496.7	29.4%	22,100.9
1621-30	85,168.7	65.3%	29,531.5	63.6%	16,887.3	36.4%	46,418.8	9,254.5	35.4%	26,141.8
1631-40	96,329.6	53.6%	44,692.7	66.7%	22,321.1	33.3%	67,013.8	9,388.2	29.6%	31,709.3
1641-50	112,884.8	66.1%	38,230.2	83.4%	7,620.8	16.6%	45,851.0	5,640.8	42.5%	13,261.6
1651-60	81,994.4	73.2%	21,970.6	66.6%	11,035.0	33.4%	33,005.6	3,855.6	25.9%	14,890.6
1661-70	78,358.0	88.4%	9,121.4	47.2%	10,202.0	52.8%	19,323.4	3,526.2	25.7%	13,728.2
1671-80	69,653.4	92.3%	5,340.0	17.3%	25,477.0	82.7%	30,817.0	4,162.5	14.0%	29,639.5
1681-90	69,439.6	98.9%	785.7	6.1%	12,195.1	93.9%	12,980.8	4,990.0	29.0%	17,185.1
1691-00	50,117.4	95.7%	2,152.5	24.6%	6,595.8	75.4%	8,748.3	4,246.7	39.2%	10,842.5
1701-10	44,318.4	90.4%	4,238.1	24.0%	13,395.1	76.0%	17,633.2	3,192.2	19.2%	16,587.3
1711-20	24,447.0	99.2%	197.8	1.1%	18,370.0	98.9%	18,567.8	2,583.9	12.3%	20,953.9

Monetary Changes, 1640 – 1740: monetary contractions 3

- (2) **Possible causes of monetary contraction, cont'd**
- (b) **Increased Outflows of Bullion to Asia:**
- i) **chief economic importance of Spanish-American silver was to finance Europe's** vastly increased global trade: especially to Asia:
- ii) **but from 1660s, bullion outflows to Asia surpassed influx of bullion from Americas**:
- - outflows to finance trade with Asia: the Levant (Med), Persia, India& South Asia, China, East Indies
- iii) **Europeans unable to sell sufficient merchandise in buying goods from these eastern regions:** thus had to make up the difference in bullion shipments (silver)

Monetary Changes, 1640 – 1740: monetary contractions 4

- iv) **Trade with Asia: WHY a European deficit (balance of payments)?**
- - **Asians had little demand for western goods:** except arms, munitions, copper and brass goods
- - **but had high demand for silver:** whose relative value greater (in terms of gold and goods) than in Europe
- - **high costs of shipping merchandise** over 10,000 – 15,000 km of dangerous seas

Monetary Changes, 1640 – 1740: monetary contractions 5

- c) **Increased Outflows of Bullion to the Baltic & Russia**
- **WHY it created a balance of payments deficit for West**
- -i) **Scandinavia & Russia**: sparsely settled regions, with inadequate aggregate demand for western goods
- -ii) **East Elbia (Prussia, Poland, Lithuania)**: 'Second Serfdom' and urban decline: removed a greater share of population from the market economy
- -iii) **Western Europe's growing and voracious demand, from 1640s**: for Baltic grain, lumber, naval stores, iron, copper > eastern demand for western goods
- iv) **later 17th century: total value of Baltic trade**: 70% imports, 30% exports

Exports of 'Treasure' and Merchandise to India By the English East India Company, in Pounds Sterling, Decennial Means, 1660-69 to 1710-19

Decade	Treasure: in Gold & Silver	Percent	Merchandise	Percent	Total in £ sterling
1660-69	74,022.4	64.3%	41,085.2	35.7%	115,107.6
1670-79	234,091.4	72.2%	89,990.8	27.8%	324,082.2
1680-89	383,707.7	87.2%	56,170.2	12.8%	439,877.9
1690-99	166,561.4	69.8%	72,065.2	30.2%	238,626.6
1700-09	337,008.9	84.7%	60,876.5	15.3%	397,885.4
1710-19	371,418.1	79.2%	97,771.3	20.8%	469,189.4

Source: Calculated from K. N. Chaudhuri, 'Treasure and Trade Balances: the East India Company's Export Trade, 1660-1720', *Economic History Review*, 2nd ser. 21 (Dec. 1968), Table 1, pp. 497-98.

Exports of Gold and Silver to India by the English East India Company: Decennial Means in Kilograms of Pure Metal and Pounds Sterling Values, 1660-69 to 1710-19

Decade	Total Treasure in £ sterling	SILVER kg.	Percent by Value in £ st.	GOLD kg.	Percent by Value in £ st.
1660-69	74,022.40	5,729.60	69.5%	175.14	30.5%
1670-79	234,091.40	11,364.00	43.6%	1,015.30	56.4%
1680-89	383,707.70	29,276.00	68.5%	929.07	31.5%
1690-99	166,561.40	18,179.00	98.0%	24.69	2.0%
1700-09	337,008.90	36,294.30	96.7%	79.54	3.3%
1710-19	371,418.10	41,133.60	99.4%	14.97	0.6%

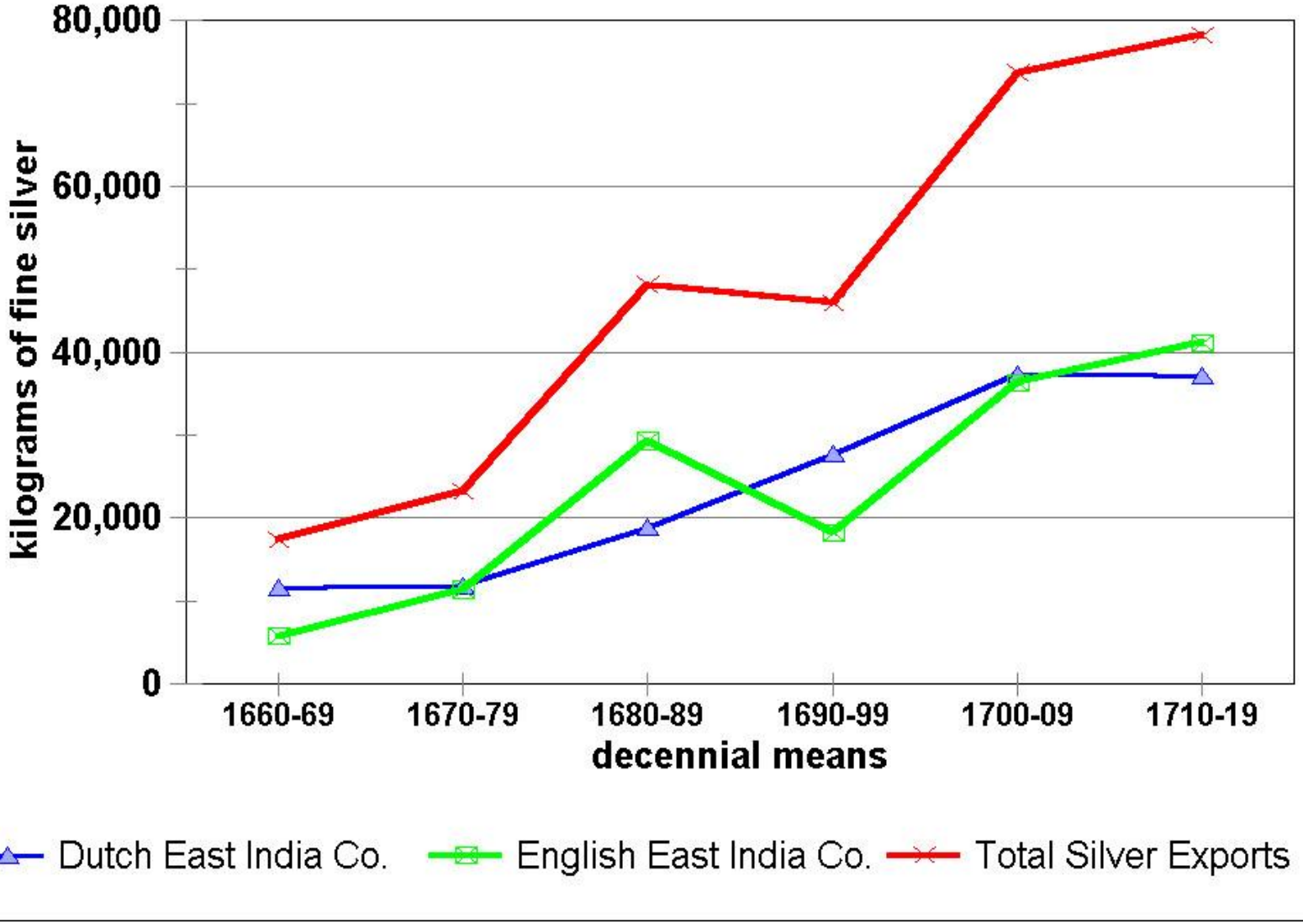
Source:

Calculated from K. N. Chaudhuri, 'Treasure and Trade Balances: the East India Company's Export Trade, 1660-1720', *Economic History Review*, 2nd ser. 21 (Dec. 1968), Table 1, pp. 497-98.

Exports of Silver to India and East Asia
by the Dutch and English East India Companies,
in kilograms of pure metal
Decennial Means, 1660-9 to 1710-19

Decade	By the Dutch East India Co.	By the English East India Co.	Total Silver Shipments in kg.
1660-69	11,563.10	5,729.60	17,292.70
1670-79	11,854.60	11,364.00	23,218.60
1680-89	18,847.00	29,276.00	48,123.00
1690-99	27,720.90	18,179.00	45,899.90
1700-09	37,392.90	36,294.30	73,687.20
1710-19	37,108.10	41,133.60	78,241.70

Dutch & English Silver Exports to Asia 1660-9 to 1710-9 in kilograms



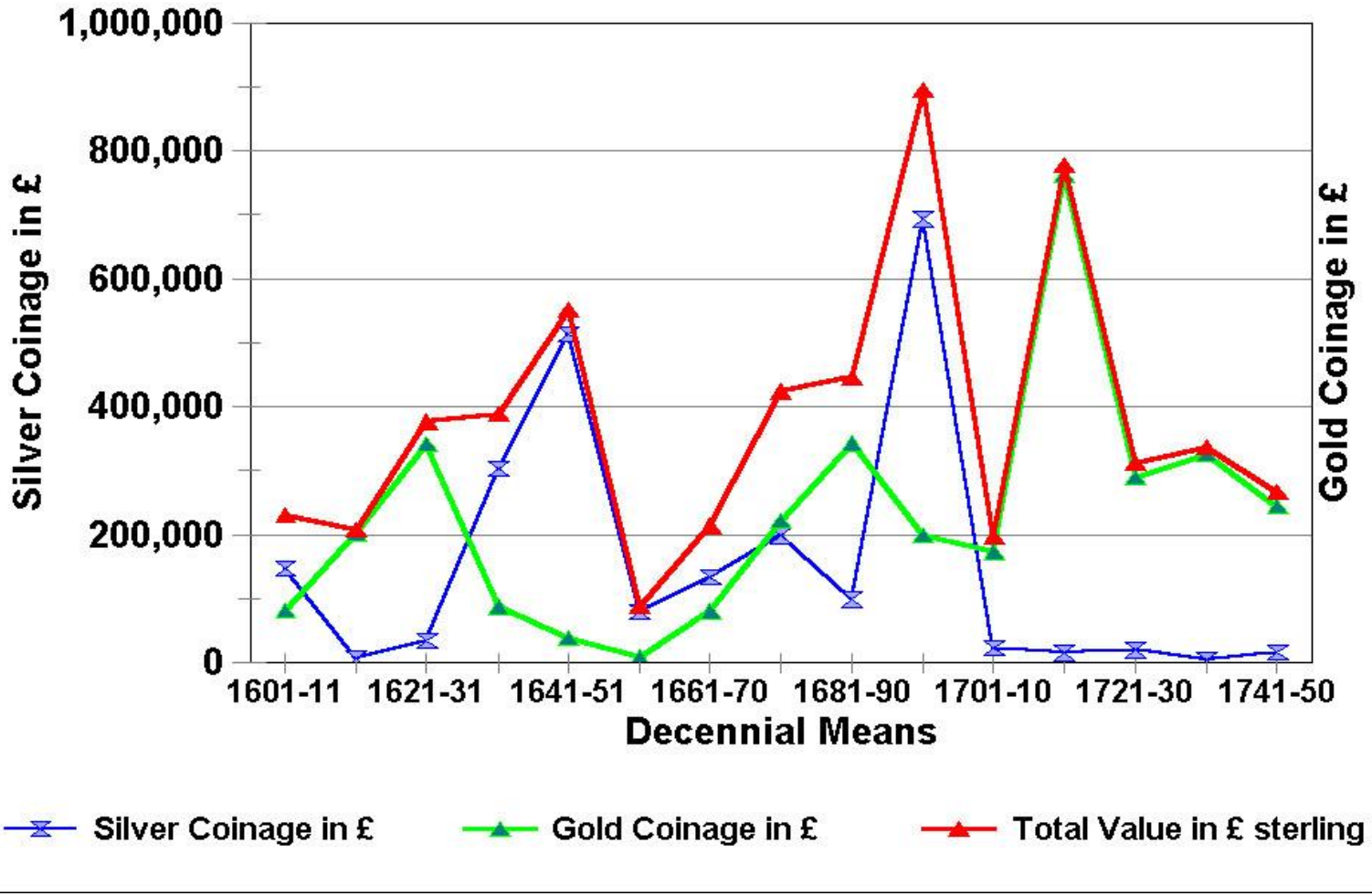
Western Merchandise entering Symrna (Izmir), Turkey

in 1686 - 87

Merchandise	Value in Turkish Piastres	percent total textiles	percent total merchandise	percent total value of trade
Woollens	1,576,610	94.32%	74.22%	49.56%
Silk Fabrics	74,600	4.46%	3.51%	2.34%
Bonnets	20,266	1.21%	0.95%	0.64%
Total Textiles	1,671,476	100.00%	78.68%	52.54%
Oher Industrial Goods	185,055		8.71%	5.82%
Raw materials	10,740		0.51%	0.34%
Colonial Products	257,070		12.10%	8.08%
Total Merchandise	2,124,341		100.00%	66.78%
Coin and Bullion	1,057,000			33.22%
Total Value of Trade	3,181,341			100.00%

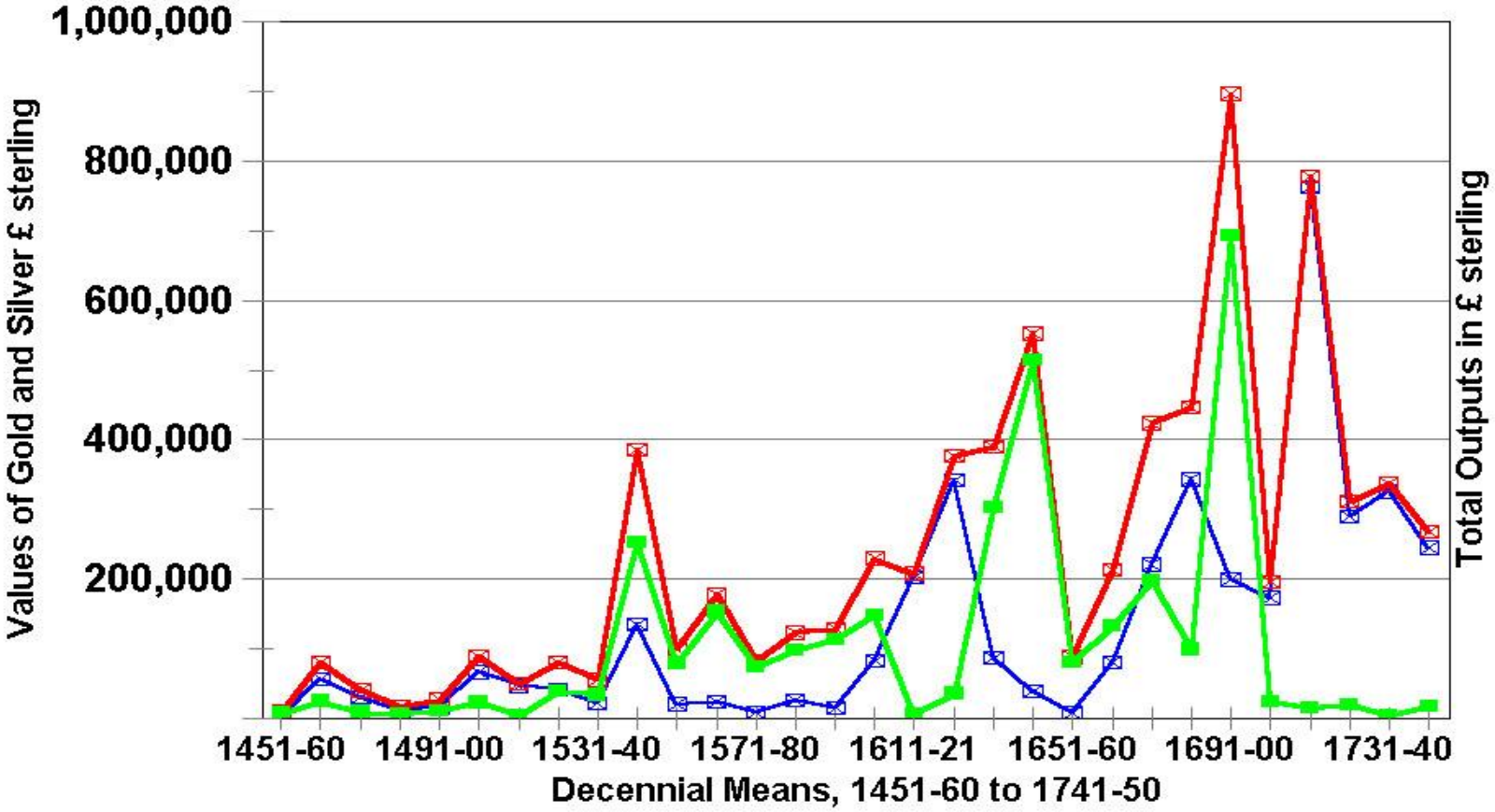
English Mint Outputs in £ Sterling

Silver and Gold: 1600 - 1750



English Mint Outputs, 1451-1750

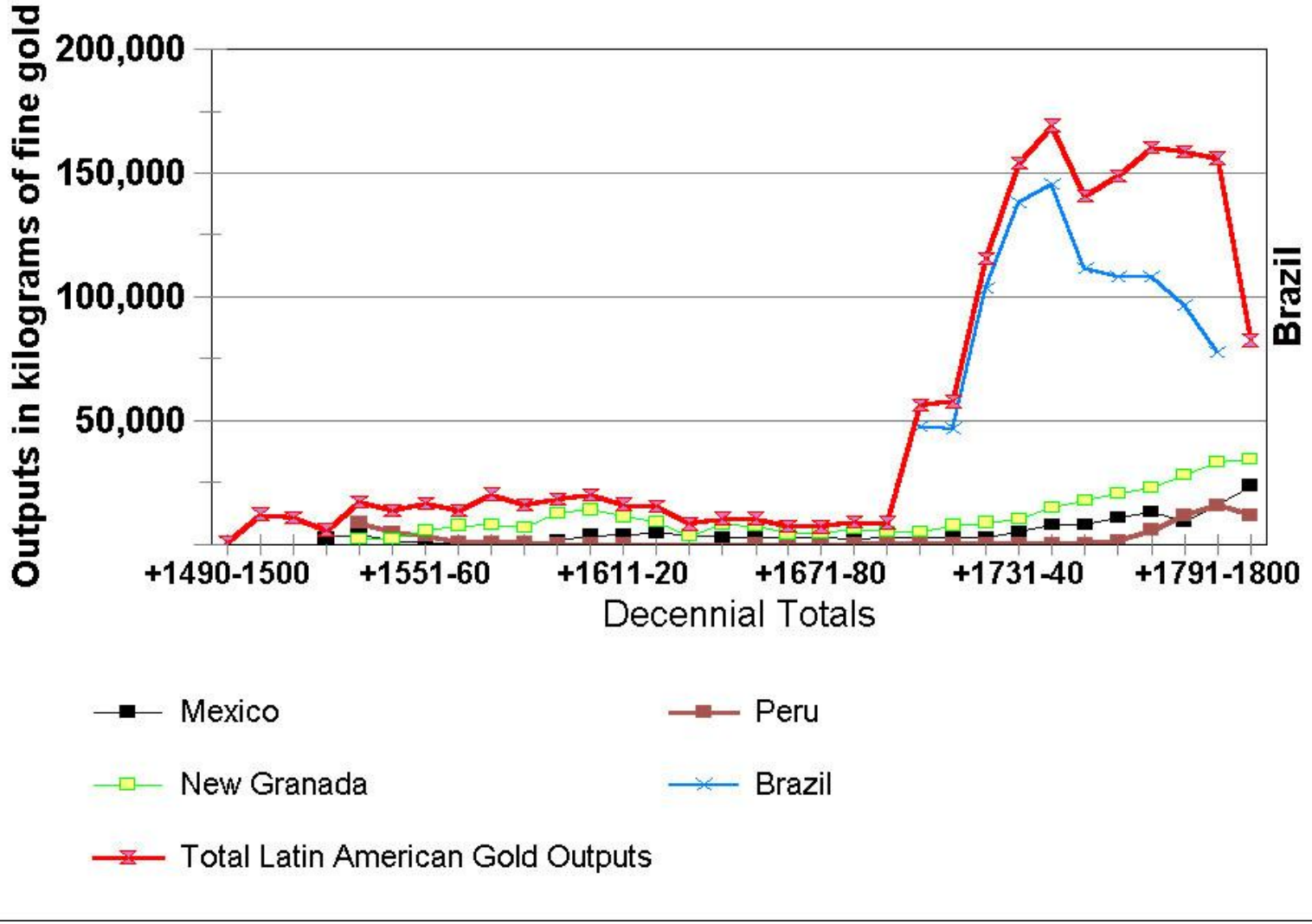
Gold & Silver Coinages in £ sterling



Monetary Changes, 1640 – 1740: remedies for monetary scarcities

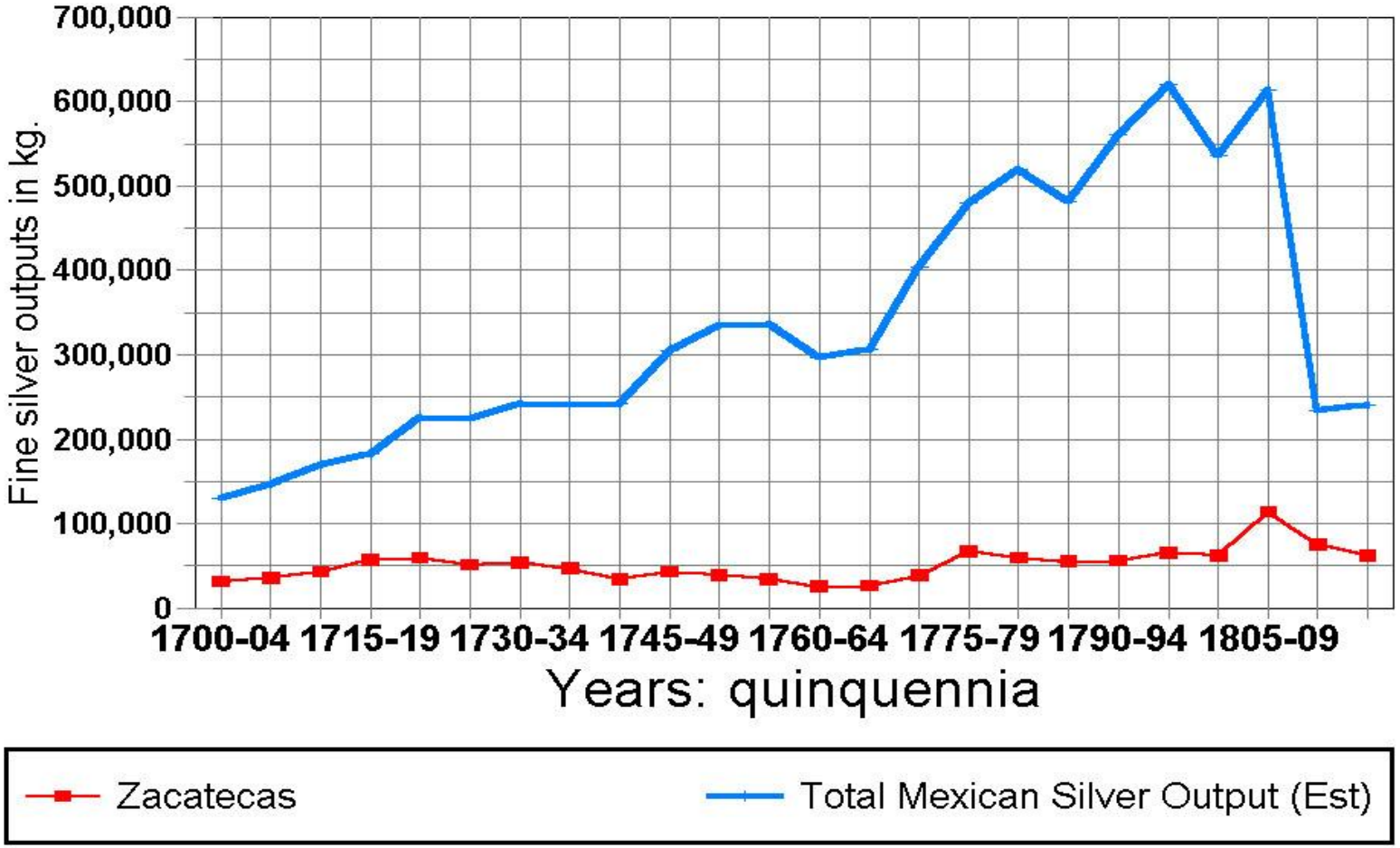
- 1) **much greater use of copper: 'Age of Copper': from German and then Swedish copper mines**
- - **1543: Habsburg Netherlands:** first to issue purely copper coins:
- - **1577: France** issues first all-copper coins
- - **1599: Spain** issues pure copper *vellon* coins
- - **1672: England** issues first copper pennies
- 2) **increased use of gold → leading to Gold Standard in England by the 1720s**
- - see the graph on Brazilian gold exports
- 3) **Credit: innovations in banking, finance, credit**:
- - especially issue of paper banknotes, from the 1660s

Latin American Gold Production 1501-10 to 1801-10, in kilograms



Mexican Silver Production 1700 - 1810

outputs in kg. fine silver: 5 yr means



World Outputs of Gold and Silver
1501-20 to 1901-10 in kilograms