

American Treasure and the Decline of Spain

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Motivation

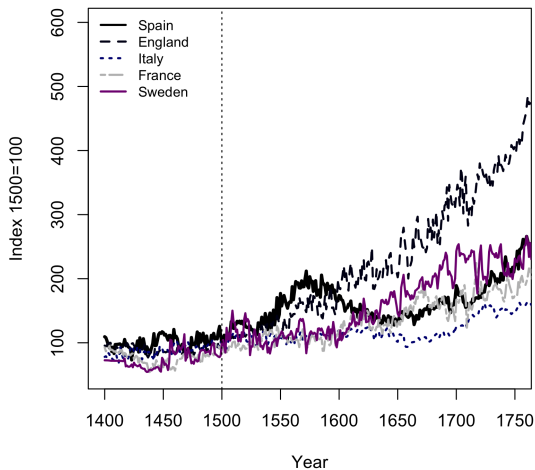


Figure: GDP per capita 1990 dollars - index 1500=100

American treasure, e.g. Potosí, shown here in 1553

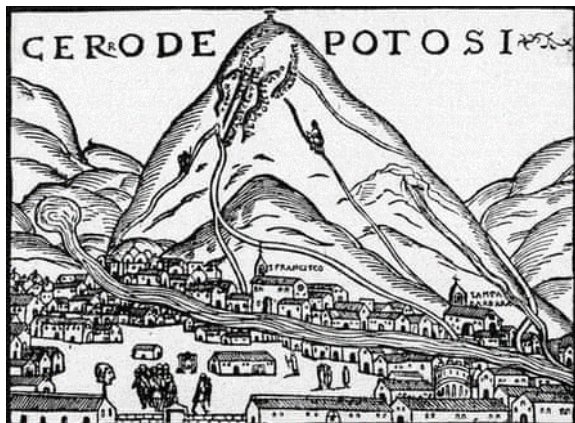


Figure: At its peak in the early 17th century, more than 150,000 people lived in Potosí

This paper

- ▶ **Research question:** What was the long-term impact of the influx of silver and gold on Spain's economic development?
- ▶ **Data:** cross-country annual time series taken from recent developments in the historical national accounts literature
- ▶ **Method:** Augmented-SCM where
 - ▶ **Treatment:** being a first-wave receiver
 - ▶ **Counterfactual:** second-wave receiver

Main results

- ▶ The price level grew annually, on average, 30 percent more in Spain than in its synthetic.

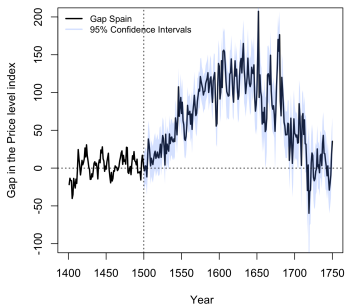


Figure: Gap of the Price level in silver

Notes: We used the Ridge Augmented Synthetic Control Method. The price level index gap is defined as the difference between the observed price level index and the estimated counterfactual.

Main results

- ▶ GDP per capita grew annually, on average, 12 percent more in Spain than in its synthetic (from 1550 to 1600). However, this effect is reversed in the following years.

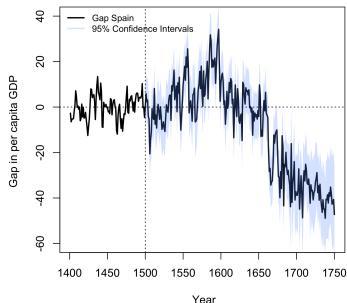


Figure: Gap of the GDP per capita 1990 G-K dollars

Notes: We used the Ridge Augmented Synthetic Control Method. The gap in per capita GDP is defined as the difference between the observed GDP per capita index and the estimated counterfactual.

Economic mechanisms – The “Dutch Disease”

- ▶ inflation led to an appreciation of the real exchange rate
- ▶ tradable industries less competitive
 - ▶ The “imbalance between incoming and outgoing trade grew ever larger as the rise in Spanish prices compared to foreign ones placed the industry of Seville in a position of obvious inferiority. Guilds of shipwrights, caulkers, and rope-makers (an Andalusian specialty) almost disappeared, and the number of silk looms decreased very noticeably” (Vives, 2015, p.436, 428).
- ▶ imports increased, exports were much reduced
 - ▶ For example, wool exports through the port of Santander consisted only of 11 ships and 605 sacks of wool annually by 1622, compared with 66 ships and 17,000 sacks just half a century before
 - ▶ From 1548, foreign cloth was admitted duty-free, and Spain “remained a net importer of cloth until the nineteenth century” (Cameron and Neal, 2016);
- ▶ relative price of non-tradables rose
 - ▶ The price of non-traded goods increased between 10 and 14% starting in 1550 and ending between 1575 and 1580 (Drelichman, 2005)
 - ▶ House prices also increased during the same period (Drelichman and Agudo, 2014)

Political mechanisms

- ▶ Political resource curse: rent seeking and reduced executive checks
- ▶ Gradual political shift towards absolutism and state capture (Henriques and Palma, 2023)
 - ▶ Frequency of parliamentary meetings
 - ▶ Laws enacted
 - ▶ Frequency and amount of extraordinary taxes
- ▶ State was captured by foreign interests and internal lobbies
 - ▶ The reason that expensive imperial wars in the Netherlands, Italy, Portugal, and with England could be paid for was the additional silver available to the Crown, and the fact that progressively weaker parliaments were unable to check the executive.

How big was this shock?

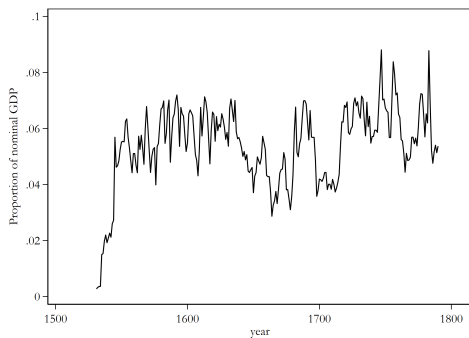


Figure: American silver production divided by Spain's nominal GDP

Source: Palma (2022).

Alternative explanations?

- ▶ Low state capacity / market integration (Grafe, 2011)
 - ▶ fragmentation was not unusual, and was mainly determined by geography (Cermeno and Santiago-Caballero, 2020)
 - ▶ Catalan trade was well integrated to that of Castile (Vives, 2015, pp.362)
- ▶ Initial institutions (Acemoglu et al. 2005)
 - ▶ parliaments met as frequently in Iberia than in England until the XVII century, and exercised no less constraints (Henriques and Palma, 2022)
 - ▶ the cost of sovereign borrowing was lower in Iberia than in England, loan maturities were longer (Karaman and Pamuk, 2010, 2013)
- ▶ Religion (Becker et al., 2016)
 - ▶ protestant countries only began growing systematically more than a century after their Reformations, and not all of them did (Broadberry, 2021)
- ▶ the south discriminated against women to a larger extent than Northwestern Europe did (Van Zanden et al., 2019).
 - ▶ marriage practices and social norms at the family level, gender wage gaps, and women's labor market position were similar in Iberia to Western Europe (Drelichman and Gonzalez Agudo, 2020; Palma et al., 2023)

Data

Annual data, from 1400-1750.

- ▶ Price level in silver - index 1500=100
- ▶ GDP per capita 1990 G-K dollars - index 1500=100
- ▶ GDP 1990 G-K dollars - index 1500=100
- ▶ Population

Countries

- ▶ Spain (Alvarez-Nogal and Prados de la Escosura, 2013)
- ▶ England (Broadberry et al. 2015), France (Ridolfi and Nuvolari, 2021), Italy (Malanima, 2011), and Sweden (Krantz 2017) + Portugal (Palma and Reis, 2019).
- ▶ We do not use: the Netherlands (van Zanden and Van Leeuwen, 2012) and Germany (Pfister, 2022).

Augmented Synthetic Control Method (ASCM)

- ▶ The synthetic control is a vector of weights, γ , associated with each of the available N donor units for the pre-treatment period (Abadie, 2021).

- ▶ The ridge-augmented SCM estimator (Ben-Michael et al., 2020) is:

$$\hat{Y}_{1T}^{aug}(0) = \sum_{i=2}^N \hat{\gamma}_i^{aug} Y_{iT}$$

- ▶ The weights $\hat{\gamma}^{aug}$ are the solution to:

$$\min_{\gamma} \frac{1}{2\lambda^{ridge}} \|(Y_{1T_0} - Y'_{iT_0}\gamma)\|_2^2 + \frac{1}{2} \|\gamma - \hat{\gamma}^{scm}\|_2^2 \quad (1)$$

$$\text{subject to } \sum_{i=2}^N \gamma_i = 1$$

- ▶ Where $\hat{\gamma}^{aug} = \hat{\gamma}^{scm} + (Y_{1T_0} - Y'_{iT_0}\gamma)'(Y'_{iT_0} Y_{iT_0} + \lambda^{ridge} I_{T_0})^{-1} Y_{iT_0}$

How to select λ^{ridge} ?

- ▶ λ^{ridge} parameterizes the level of extrapolation and the level of improvement in pre-treatment fit (over the SCM solution)
- ▶ We use a **cross-validation** approach for selecting λ^{ridge} .
- ▶ Let $\hat{Y}_{1k}^{(-t)} = \sum_{i=2}^N \hat{\gamma}_{i(-t)}^{aug} Y_{ik}$ be the estimate of Y_{1k} (The time period t is excluded from the minimization problem (2)).
- ▶ We extend this idea to compute the leave-out cross validation MSE over time periods:

$$CV(\lambda) = \sum_{t=1}^{T_0} (Y_{1t} - \hat{Y}_{1t}^{(-1)})^2$$

- ▶ We choose λ to minimize CV or following the "one-standard-error" rule (Hastie et., 2009)

Price level in silver - index 1500=100

Results

[link](#)

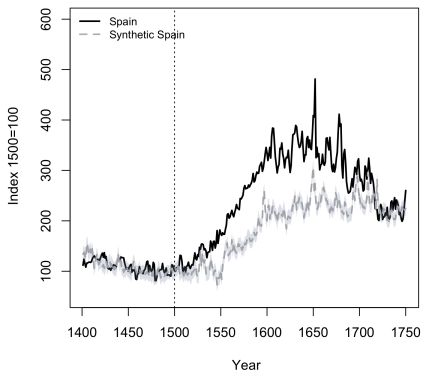


Figure: Price level in silver - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Results

link

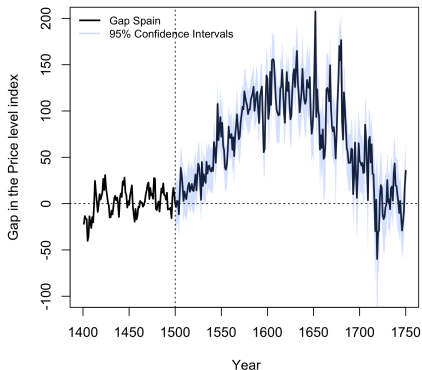


Figure: Gap of the Price level in silver

Notes: We used the Ridge Augmented Synthetic Control Method. The price level index gap is defined as the difference between the observed price level index and the estimated counterfactual.

link

Table: Country Weights

Countries	Weights
England	0.41
Sweden	0.25
France	0.35
Italy	-0.01

Notes: Composition of the Doppelganger for the Price level of Spain using a ridge augmented synthetic control method.

GDP per capita 1990 G-K dollars - index 1500=100

Results

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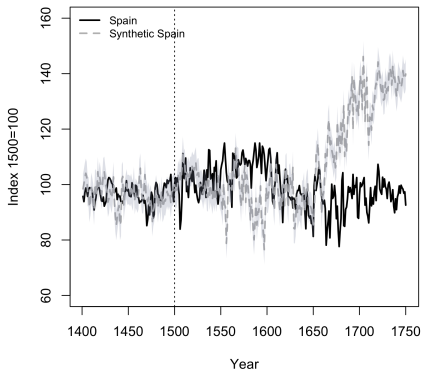


Figure: GDP per capita 1990 G-K dollars - index 1500=100

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Results

link

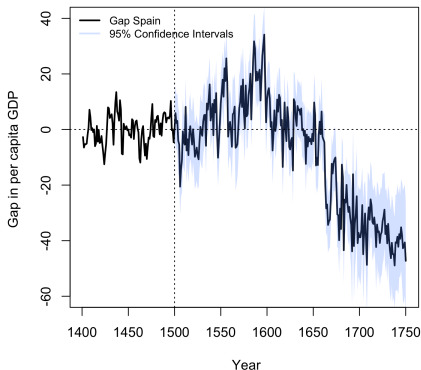


Figure: Gap of the GDP per capita 1990 G-K dollars

Notes: We used the Ridge Augmented Synthetic Control Method. The gap in per capita GDP is defined as the difference between the observed GDP per capita index and the estimated counterfactual.

link

Table: Country Weights

Countries	Weights
England	0.73
Sweden	0.12
Italy	0.09
France	0.06

Notes: Composition of the Doppelganger for the GDP per capita 1990 G-K dollars of Spain using a ridge augmented synthetic control method.

GDP 1990 G-K dollars - index 1500=100

Results

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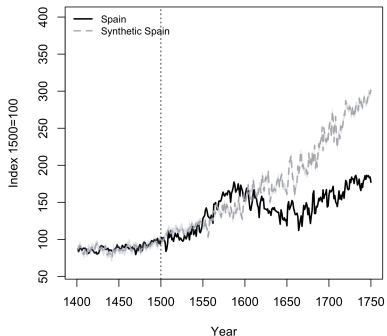


Figure: GDP 1990 G-K dollars - index 1500=100

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Results

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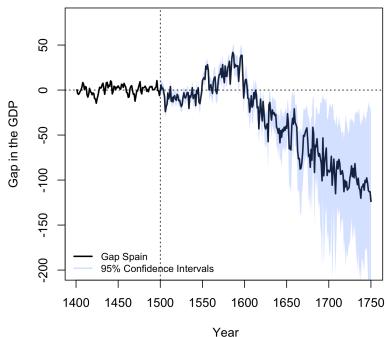


Figure: Gap of the GDP 1990 G-K dollars

Notes: We used the Ridge Augmented Synthetic Control Method. The gap in GDP 1990 G-K dollars is defined as the difference between the observed GDP index and the estimated counterfactual.

link

Table: Country Weights

Countries	Weights
England	0.57
France	0.39
Sweden	0.06
Italy	-0.02

Notes: Composition of the Doppelgänger for the GDP 1990 G-K dollars of Spain using a ridge augmented synthetic control method.

Robustness exercises

- ▶ in-time placebos with earlier starting treatment periods (1440, 1450, 1460, 1470, 1480, or 1490) or using 1530 as the start of the treatment period
- ▶ in-space placebos (leave-one out technique)
- ▶ inclusion of Portugal (1430-1580)
- ▶ simpler synthetic control method without extrapolation (Abadie and Gardeazabal (2003); Abadie et al. (2010))
- ▶ the same unweighted average of the donor countries is used to build a counterfactual

Concluding remarks

“Let London manufacture those fine fabrics of hers to her heart’s content; Holland her chambrays; Florence her cloth... Milan her brocades, Italy and Flanders their linens... so long as our capital can enjoy them; the only thing it proves is that all nations train journeymen for Madrid... for all the world serves her and she serves nobody” (Alfonso Núñez de Castro 1675)

By the mid-seventeen century, silver was becoming more than a little tarnished. Observers noted how all the silver of America had failed to bring prosperity to Spain” (Elliott 2008)

“[S]ince the discovery of the mines in America, industry has increased in all the nations of Europe, except in the possessors of those mines; and this may justly be ascribed, amongst other reasons, to the increase of gold and silver” (Hume 1742).

- ▶ Compared with a synthetic counterfactual, the price level in Spain increased by up to 200% more in the mid- seventeenth century.
- ▶ Spain’s GDP pc outperformed other European nations for 100 years: by 1600, it was 40% higher than in its counterfactual. However, this effect was reversed in the following 150: by 1750, GDP per capita was 40% lower than it would have been if Spain had not been the first-wave receiver.

Thank you for your attention

Robustness and Placebo tests

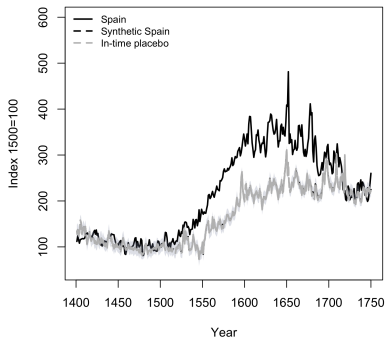


Figure: In-time placebos for the Price level in silver - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

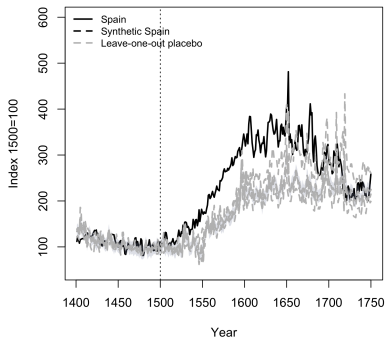


Figure: Leave-one-out placebos for the Price level in silver - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

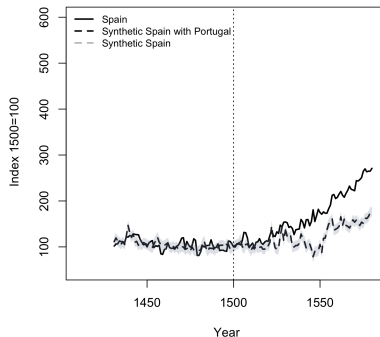


Figure: Robustness test for the Price level in silver - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method including Portugal in the donor pool. The pre-treatment period is between 1430 and 1500, and the post-treatment period is between 1501 and 1580. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

Table: Country Weights

Countries	Weights
Portugal	0.32
England	0.41
France	0.07
Sweden	0.21
Italy	-0.01

Notes: Composition of the Doppelganger for the Price level of Spain including Portugal in the donor pool.

Robustness and Placebo tests

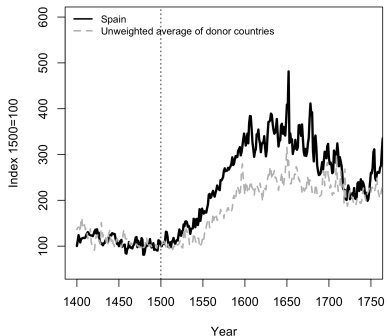


Figure: Unweighted average of donor countries for the Price level in silver - index 1500=100.

Robustness and Placebo tests

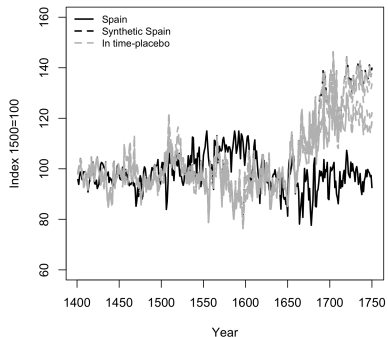


Figure: In-time placebos for the GDP per capita 1990 G-K dollars - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

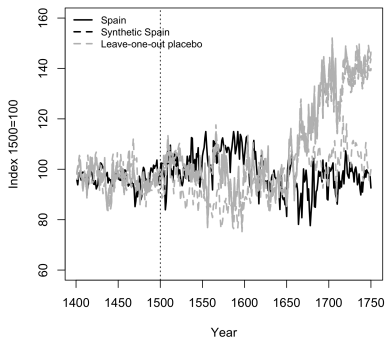


Figure: Leave-one-out placebos for the GDP per capita 1990 G-K dollars - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

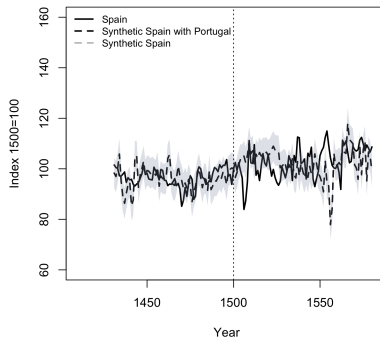


Figure: Robustness test for the GDP per capita 1990 G-K dollars - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method including Portugal in the donor pool. The pre-treatment period is between 1430 and 1500, and the post-treatment period is between 1501 and 1580. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

Table: Country Weights

Countries	Weights
Portugal	0.05
England	0.87
France	-0.00
Sweden	0.06
Italy	0.02

Notes: Composition of the Doppelganger for the GDP per capita 1990 G-K dollars of Spain including Portugal in the donor pool.

Robustness and Placebo tests

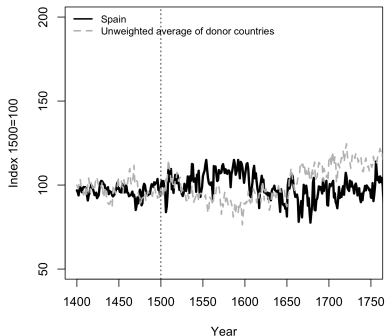


Figure: Unweighted average of donor countries for the GDP per capita 1990 G-K dollars - index 1500=100.

Robustness and Placebo tests

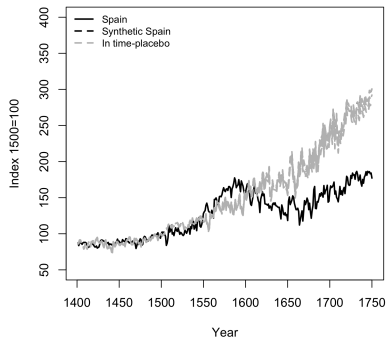


Figure: In-time placebos for the GDP 1990 G-K dollars - index 1500=100

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

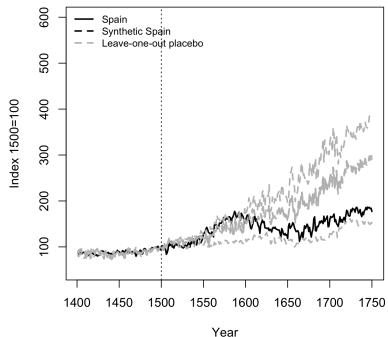


Figure: Leave-one-out placebos for the GDP 1990 G-K dollars - index 1500=100

Notes: We used the Ridge Augmented Synthetic Control Method. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

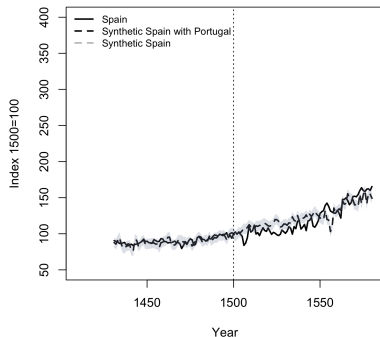


Figure: Robustness test for the GDP 1990 G-K dollars - index 1500=100.

Notes: We used the Ridge Augmented Synthetic Control Method including Portugal in the donor pool. The pre-treatment period is between 1430 and 1500, and the post-treatment period is between 1501 and 1580. The shaded area is one standard deviation of the difference between the outcome of interest and the estimated counterfactual during the pre-treatment period.

Robustness and Placebo tests

Table: Country Weights

Countries	Weights
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Notes: Composition of the Doppelganger for the GDP 1990 G-K dollars of Spain including Portugal in the donor pool.

Robustness and Placebo tests

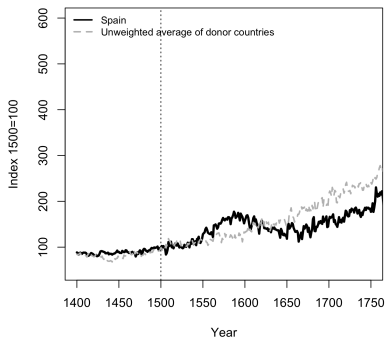


Figure: Unweighted average of donor countries for the GDP 1990 G-K dollars - index 1500=100.

Gold and Silver Stocks and Flows to Europe

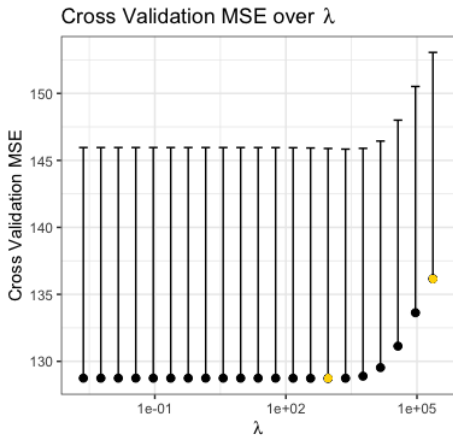
	Fine Silver, tons	Gold, silver-equivalent tons	Total, silver-equivalent tons
1492			
World stock	3600	3267	6867
European stock	828	751	1579
Imports to Europe			
Sixteenth century	7500	1659	9150
Seventeenth century	26168	2212	28380
Eigtheenth century	39157	21000	60157
Total Imports	73825	24862	97687

Notes: Adapted from Palma (2020)

Literature

- ▶ Sachs and Warner; (1995, 1997, 1999, 2001): relationship between natural resource dependence and economic growth.
- ▶ Gylfason, (2001), (2006); and Gylfason and Zoega, (2006): broader channels through which natural resource dependence could be affecting sustained economic growth: savings, investment and human capital formation.
- ▶ Drelichman, (2005);Hamilton, (1934); Palma, (2020); Palma and Santiago-Caballero,(2023): early modern Spain is a prominent case to study the resource curse hypothesis.

How to select λ^{ridge} ?



Notes: λ that minimize CV vs the maximal value of λ with MSE within one standard deviation of the minimal MSE.