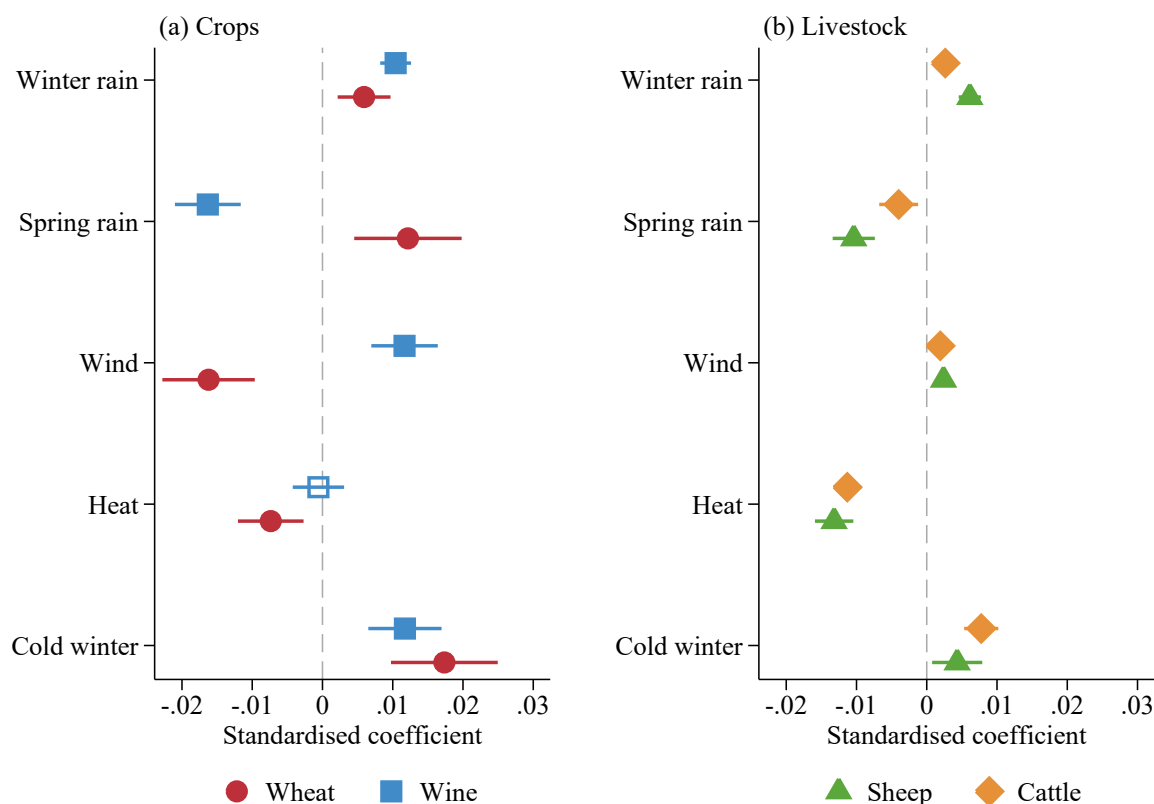


Commodity portfolios mediate climate-driven wealth inequality

Supplementary Information

Cross-commodity climate sensitivity



Supplementary Fig. 1: Standardised climate coefficients across all four commodities. Coefficients from Table 1 divided by the outcome standard deviation to permit cross-commodity comparison. Panel (a) shows crops (wheat and wine). Panel (b) shows livestock (sheep and cattle). Filled markers indicate significance at 5%.

Crop calendar

Supplementary Table 1: Agricultural calendar for wheat and wine at the eighteenth-century Cape

Month	Wheat	Wine
<i>Year t – 1. Growing season</i>		
April	Fallow	Post-harvest pruning
May	Ploughing	Dormancy
June	Sowing	Dormancy
July	Tillering	Winter pruning
August	Tillering	Winter pruning
September	Grain fill	Bud break
October	Grain fill	Flowering
November	Maturation	Fruit set
December	Harvest begins	Berry development
<i>Year t. Harvest and enumeration</i>		
January	Harvest	Ripening
February	Threshing	Vintage
March	Harvest complete	Vintage

[Notes] Based on Wallace's agricultural calendar for viticulture and field crops. The table follows the crop year ending with the March *opgaaf*. April–December fall in year $t - 1$, while January–March fall in census year t . Wheat sowing occurs May–June; harvest runs December–February. Vines are pruned after vintage and again in winter.

Stayer robustness

Supplementary Table 2: Stayer robustness in the multivariate cross-year specification

	Full sample	Stayers only
<i>Wheat (FD, cross-year)</i>		
Growing rain	0.421 ^{***} (0.002)	0.622 ^{***} (0.005)
Wind (harvest)	-1.153 ^{***} (<0.001)	-0.874 ^{**} (0.024)
R^2	0.076	0.075
N	1,289	679
<i>Wine (FE, cross-year)</i>		
Winter rain	0.205 ^{***} (<0.001)	0.250 ^{***} (<0.001)
Spring rain	-0.320 ^{***} (<0.001)	-0.301 ^{***} (<0.001)
R_w^2	0.101	0.089
N	3,589	1,792

[Notes] Key coefficients from the multivariate cross-year specification. The full sample includes households observed at least five years. Stayers are households present from at least 1770 to 1780. p -values in parentheses. Wheat uses first differences; wine uses household fixed effects. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

First differences versus fixed effects

Supplementary Table 3: First differences versus fixed effects in multivariate cross-year specifications

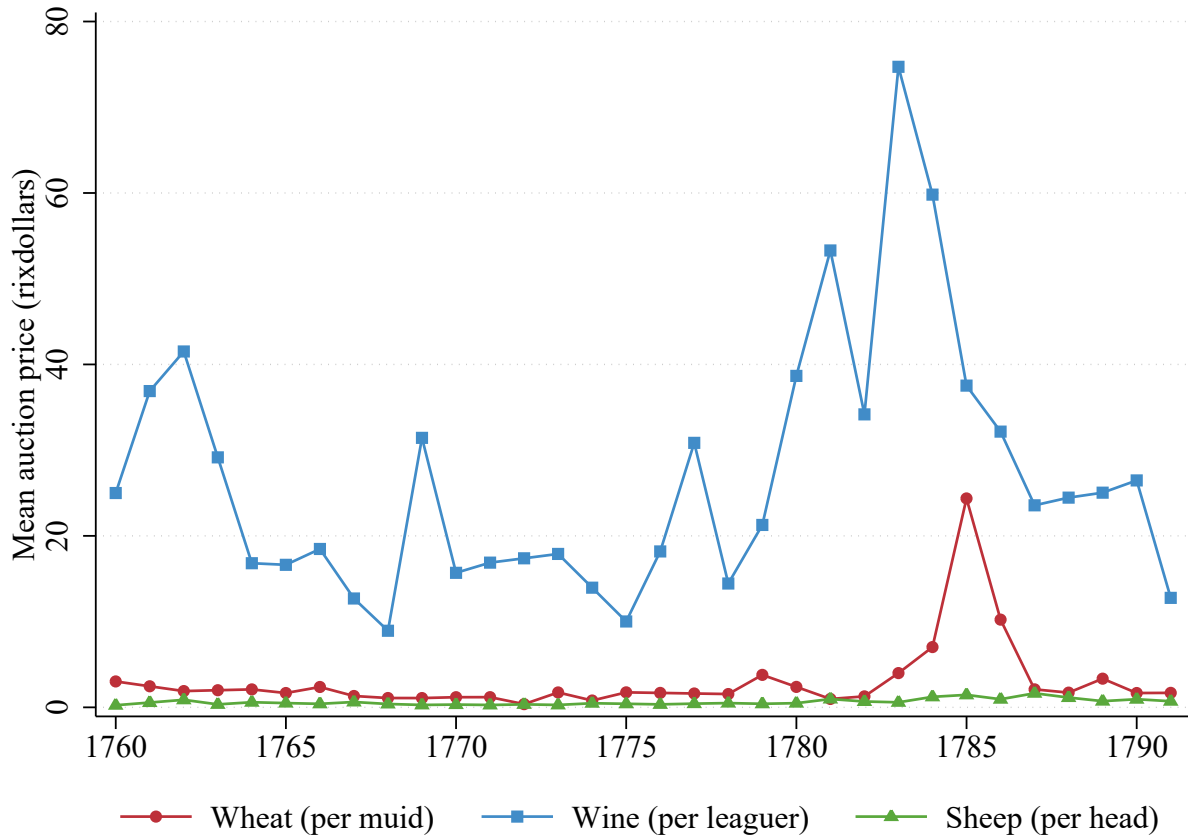
	Wheat		Wine	
	FD	FE	FD	FE
R^2 / R_w^2	0.076	0.021	0.163	0.101
N	1,289	2,169	2,539	3,589
Growing rain	0.421	-0.259	n.a.	n.a.
Wind (harvest/vintage)	-1.153	0.045	n.a.	n.a.
Winter rain	n.a.	n.a.	0.173	0.205

[Notes] Multivariate cross-year specification. FD denotes first-differenced OLS. FE denotes household fixed effects. Wheat is the primary case. The FD estimator is preferred because it removes slow-moving confounds that attenuate the FE coefficients. Wine coefficients are consistent across estimators. The baseline net PCI and the FD/FE net PCI correlate at 0.963.

Supplementary Table 4: Household descriptive statistics by wealth tercile

	T1 (poorest)	T2	T3 (wealthiest)
<i>Wealth and assets</i>			
Mean wealth (rd)	14	282	2654
Enslaved people	1.2	2.3	9.7
Sheep	163.3	268.8	392.6
Wheat (<i>muids</i>)	36.0	46.6	77.0
Wine (<i>leaguers</i>)	6.9	9.9	22.2
<i>Portfolio shares</i>			
Enslaved share of wealth	0.7%	20.1%	65.1%
Livestock share of wealth	1.8%	33.6%	20.5%
<i>Participation rates</i>			
Wheat producers	0.1%	1.2%	19.1%
Wine producers	0.2%	2.9%	31.8%
Sheep holders	0.4%	32.8%	59.9%
Cattle holders	1.1%	39.4%	80.7%
Households	373	932	804

[Notes] Sample restricted to households observed for at least five years. Wealth is monetised using auction prices for enslaved people, cattle, sheep, and horses. Terciles are defined on time-averaged household wealth. Production and asset figures are conditional means among holders. Participation rates are the share of household-years in which the commodity is held or produced. $N = 26,561$ household-year observations across 2,109 households.



Supplementary Fig. 2: Mean auction prices for wheat (per *muid*), wine (per *leaguer*), and sheep (per head), 1760–1791. Wheat and wine prices show no clear systematic movement with predicted local output. Sheep prices are more volatile and are tested separately in the main text.

Exposure and inequality diagnostics

Supplementary Table 5: Exposure dispersion under alternative household weighting schemes

Exposure measure	$\hat{\beta}$	SE	p	R^2
Indicator exposure on baseline PCI	12.76	9.18	0.177	0.206
Household-mean scale exposure on baseline PCI	26.26	15.91	0.111	0.263
Lagged scale exposure on baseline PCI	27.09	12.52	0.040	0.411
Household-mean scale exposure on crop-only PCI	17.72	18.85	0.356	0.120
Lagged crop-only scale exposure on crop-only PCI	12.90	11.39	0.268	0.183

[Notes] Each row reports a year-level OLS regression of the cross-sectional standard deviation of predicted household climate impact on a standardised PCI measure, with robust standard errors. Indicator exposure assigns households the commodity-specific PCI when they produce or hold the commodity. Household-mean scale exposure weights each commodity by the household's mean output or stock relative to the annual mean. Lagged scale exposure weights each commodity by lagged output or stock relative to the annual mean. Crop-only variants use wheat and wine only.

Supplementary Table 6: Additional diagnostics for generated PCI, distributional exposure, accumulation, prices and placebo leads

Diagnostic	Target	$\hat{\beta}$	SE/SD	p /share	N /reps
<i>Panel A. Generated-regressor bootstrap</i>					
Parametric first-stage coefficient bootstrap	Gini on rebuilt PCI	0.0087	0.0005	1.000	1,000
Household-cluster full-pipeline bootstrap	Gini on rebuilt PCI	0.0124	0.0029	0.975	199
<i>Panel B. Model-consistent distributional exposure</i>					
Exposure-wealth covariance	Current measured-asset Gini	0.0069	0.0023	0.007	25
Crop-only exposure-wealth covariance	Current measured-asset Gini	0.0060	0.0019	0.005	25
T3-T1 exposure gap	Current T3-T1 wealth gap	690.62	171.22	<0.001	25
T3-T1 exposure gap with trend	Current T3-T1 wealth gap	186.29	102.87	0.084	25
<i>Panel C. Household-level accumulation</i>					
All-commodity lagged scale exposure	Δ measured assets	48.1530	13.2489	<0.001	19,727
All-commodity lagged scale exposure	Δ IHS measured assets	0.0199	0.0082	0.015	19,727
Crop-only lagged scale exposure	Δ no-livestock assets	50.7805	13.1877	<0.001	19,728
Crop-only lagged scale exposure	Δ IHS no-livestock assets	0.0184	0.0082	0.025	19,728
<i>Panel D. Auction-price robustness</i>					
Wheat mean auction price	Wheat PCI	0.0845	0.0921	0.369	23
Wine mean auction price	Wine PCI	-0.6902	0.7570	0.372	24
Sheep median auction price	Sheep PCI	0.0030	0.0013	0.032	27
<i>Panel E. Placebo leads</i>					
Future baseline PCI	Current measured-asset Gini	0.0053	0.0023	0.030	24
Future exposure gap	Current T3-T1 wealth gap	733.67	148.31	<0.001	24

[Notes] Panel A reports generated-regressor bootstraps. SE/SD is the standard deviation of bootstrap coefficients; p /share is the share of replications with $p < 0.05$. Panel B reports year-level regressions using lagged scale-weighted household exposure. Panel C reports household-level regressions of next-year asset change on standardised lagged scale-weighted exposure, controlling for current assets and year fixed effects, with standard errors clustered by household. Panel D reports additional auction-price checks. Panel E reports placebo-lead checks.

Extensive margin and production participation

Supplementary Table 7: Extensive margin and production participation

	Wheat producer	Wine producer	Sheep holder
<i>Panel A. FE with trend (full sample)</i>			
PCI	-0.0006 ^{***} (<0.001)	0.0011 ^{***} (0.004)	0.0001 ^{**} (0.026)
Trend	Yes	Yes	Yes
<i>Panel B. First differences (full sample)</i>			
Δ PCI	0.0004 [*] (0.051)	0.0004 (0.262)	0.0000 (0.358)
<i>Panel C. FE with trend (stayers only)</i>			
PCI	-0.0011 ^{***} (<0.001)	0.0007 (0.226)	0.0004 ^{***} (<0.001)
Trend	Yes	Yes	Yes
Household FE / Δ	Yes	Yes	Yes

[Notes] Dependent variable is a binary indicator equal to one if the household produces the commodity in that year. PCI is the commodity-specific Predicted Climate Impact. Panel A uses household fixed effects with a linear time trend. Panel B uses first-differenced OLS. Panel C repeats Panel A for stayer households. p -values in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

PCI and inequality robustness

Supplementary Table 8: Robustness checks for PCI and measured asset inequality

Specification	$\hat{\beta}$	SE	p	R^2
Baseline PCI	0.0088	0.0032	0.011	0.277
Leave-one-year-out PCI	0.0052	0.0034	0.138	0.098
Crop-only PCI	0.0052	0.0027	0.069	0.095
Baseline PCI, no livestock wealth	0.0100	0.0050	0.056	0.232
Crop-only PCI, no livestock wealth	0.0048	0.0042	0.262	0.054
Baseline PCI with linear trend	0.0018	0.0030	0.550	0.533
Baseline PCI with quadratic trend	0.0024	0.0031	0.442	0.543

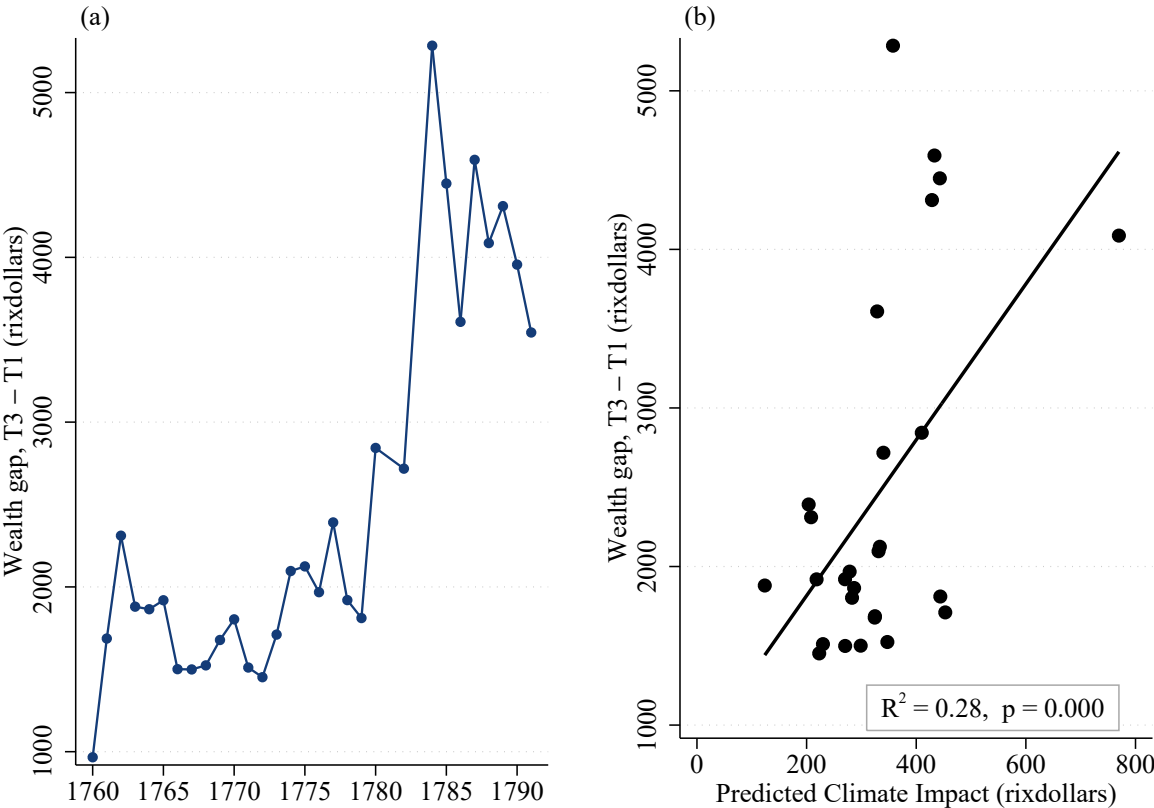
[Notes] Each row reports a year-level OLS regression of the measured asset Gini on a standardised PCI measure, with robust standard errors. The leave-one-year-out PCI re-estimates commodity-specific climate responses excluding the predicted year and then predicts that omitted year; its correlation with the in-sample PCI is 0.789. Crop-only PCI excludes livestock components from the PCI. No livestock wealth excludes cattle and sheep from the dependent-variable wealth measure. Trend specifications add linear or linear plus quadratic year controls.

Supplementary Table 9: Alternative distributional PCI variants

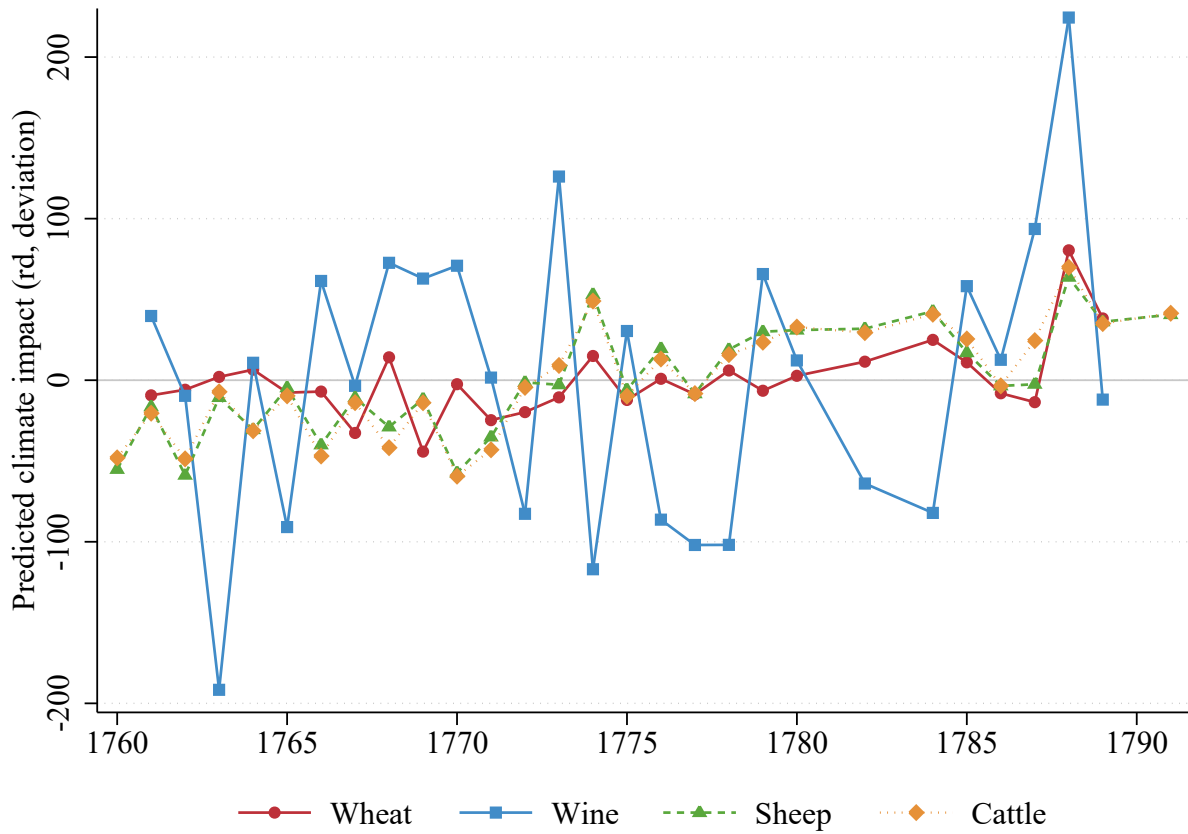
Diagnostic	Target	$\hat{\beta}$	SE	p	N
LOO crop-only exposure–wealth covariance	Current measured-asset Gini	0.0051	0.0016	0.004	25
LOO crop-only T3–T1 exposure gap	Current T3–T1 wealth gap	395.48	173.20	0.032	25
LOO crop-only exposure gap with trend	Current T3–T1 wealth gap	161.92	103.91	0.133	25
LOO crop-only exposure gap with decade controls	Current T3–T1 wealth gap	-22.32	98.10	0.822	25
Fixed pre-period all-commodity exposure gap	Current T3–T1 wealth gap	690.47	179.94	<0.001	27
Fixed pre-period exposure gap with trend	Current T3–T1 wealth gap	118.88	119.86	0.331	27

[Notes] LOO means leave-one-year-out commodity-response estimation, where the commodity climate responses used to predict year t are estimated without year t . Crop-only variants use wheat and wine only, removing livestock from the PCI construction. Fixed pre-period exposure uses household portfolios observed in 1761–1769.

Wealth gap and portfolio climate impact

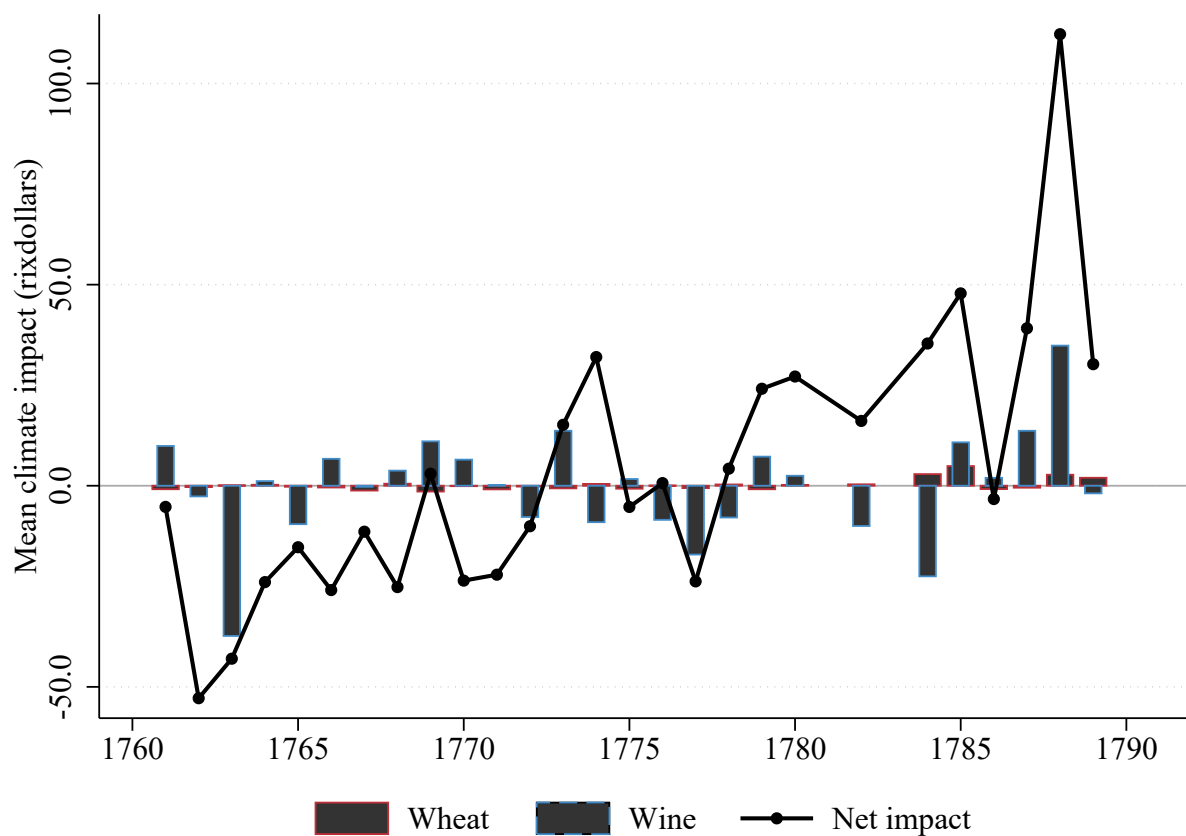


Supplementary Fig. 3: Wealth gap and climate. Panel (a) shows the T3-T1 wealth gap (mean wealth of richest tercile minus mean wealth of poorest tercile) over time. Panel (b) shows the wealth gap regressed on the PCI ($R^2 = 0.28, p < 0.001$).



Supplementary Fig. 4: Commodity-specific Predicted Climate Impact (deviation from mean, in *rixdollars*), 1760–1791. When the wheat PCI dips, the wine PCI typically rises, reflecting the opposing seasonal channels documented in Table 1.

Predicted climate impact by year



Supplementary Fig. 5: Mean monetised climate impact by year, 1760–1791. Bars show the predicted wheat and wine impacts in *rixdollars*; the line shows the net impact across all commodities.

Source and method tables

Supplementary Table 10: Auction prices and descriptive statistics (*rixdollars*)

Commodity	Mean	SD	Min	Max
Enslaved person	240.50	89.42	133.59	505.91
Horse	20.39	8.79	4.90	39.81
Cattle (head)	6.98	2.72	3.50	16.58
Wine (<i>leaguer</i>)	24.29	11.30	8.94	59.81
Wheat (<i>muid</i>)	3.02	4.46	0.38	24.37
Sheep (head)	0.62	0.36	0.24	1.64

[Notes] Annual mean unit prices from estate auctions (*vendu rollen*, MOOC 10), 1760–1791. Each row reports the mean across annual price observations, weighting each year equally. Enslaved person prices average across male and female individual sales.

Household versus year clustering

Supplementary Table 11: Standard error comparison for household versus year clustering

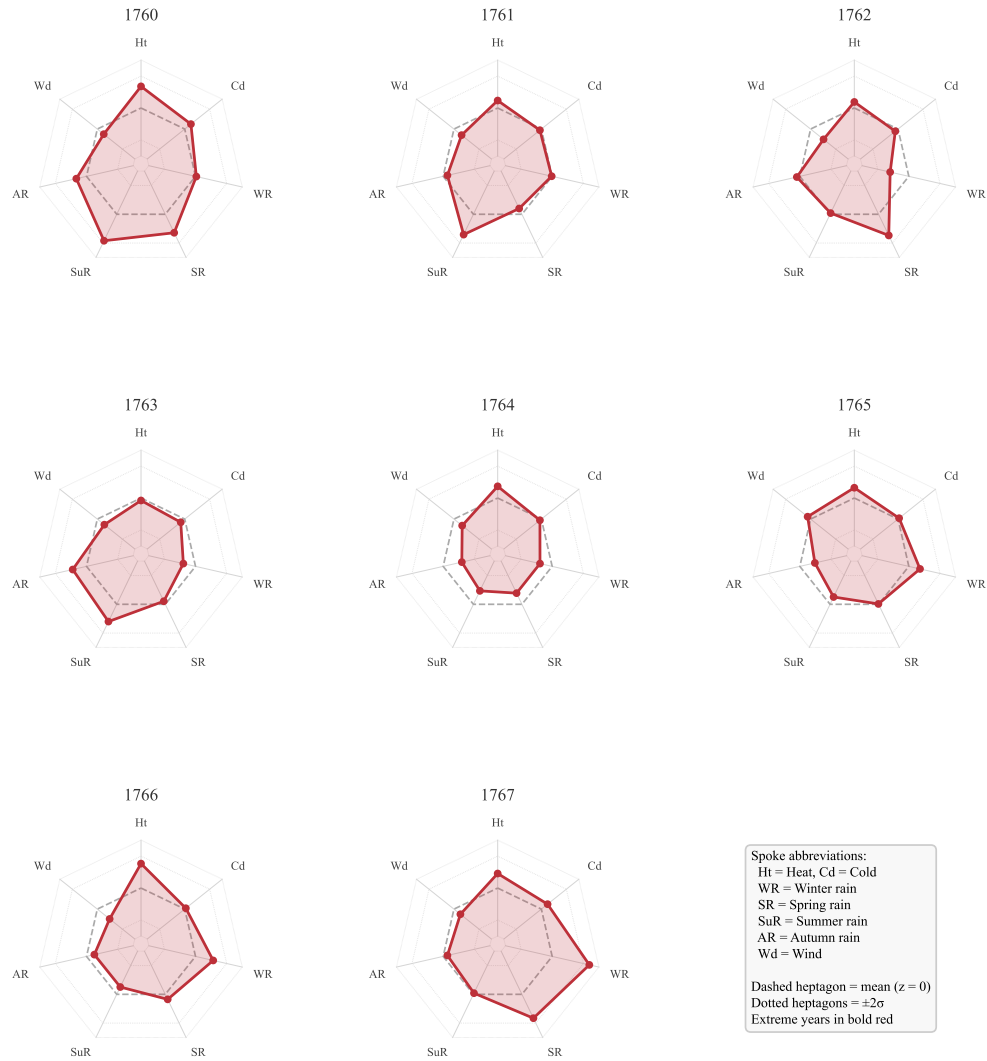
	$\hat{\beta}$	SE _{hh}	SE _{year}	Ratio
<i>Panel A. Annual rainfall^a</i>				
Wheat	-0.235	0.054	0.183	3.41
Wine	0.032	0.010	0.051	5.03
Sheep	-0.469	0.112	0.650	5.78
Cattle	-0.032	0.010	0.051	5.30
<i>Panel B. Predicted Climate Impact (PCI)</i>				
Wheat	1.000	0.213	0.407	1.91
Wine	1.000	0.071	0.190	2.67
Sheep	1.000	0.093	0.219	2.34
Cattle	1.000	0.092	0.239	2.59

[Notes] SE_{hh} clusters at the household level; SE_{year} clusters at the year level. The ratio is SE_{year}/SE_{hh}. Ratios above 1 indicate that household-clustered standard errors understate uncertainty relative to year-clustered standard errors. Climate varies at the year level. ^aPanel A reports auxiliary univariate annual-rainfall regressions retained for comparison.

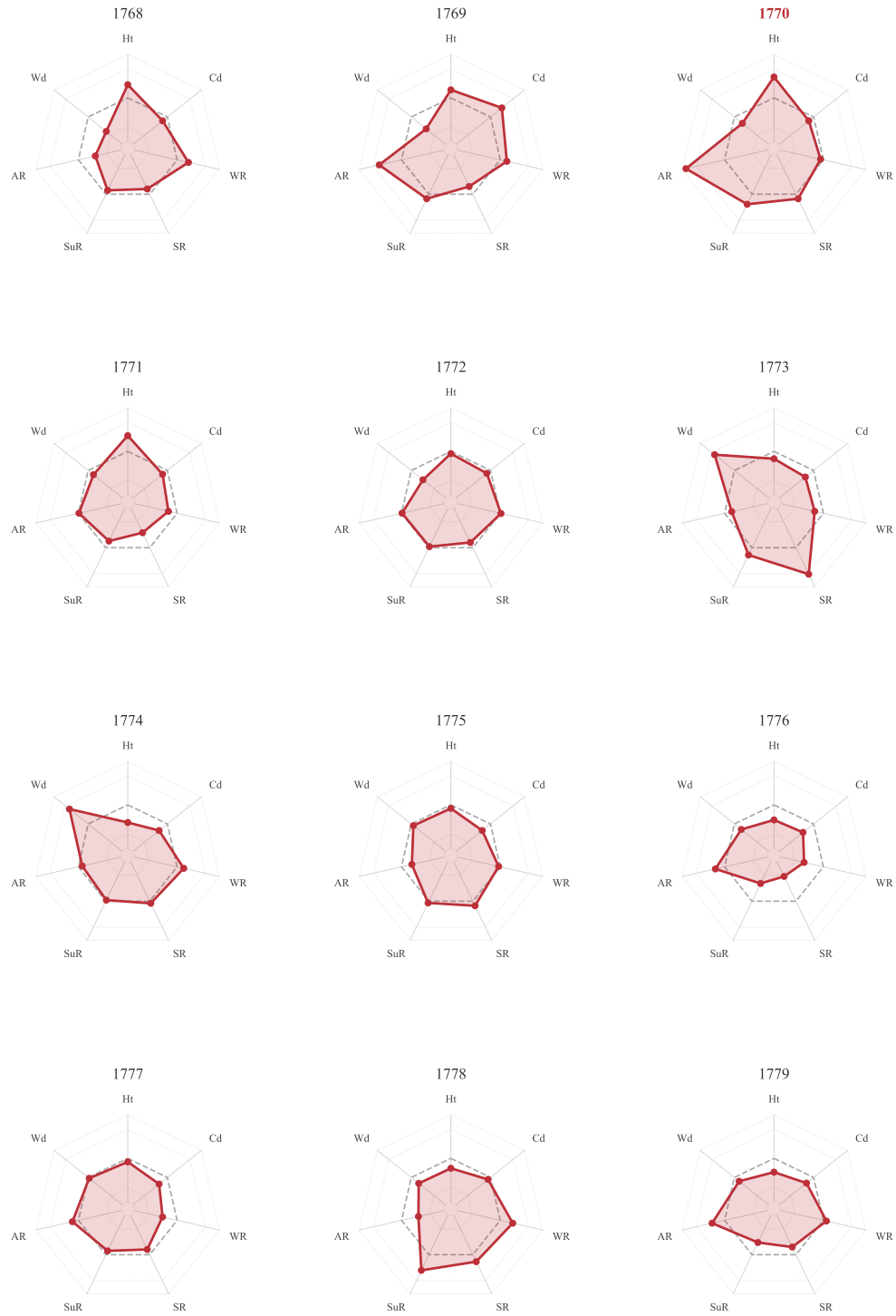
Climate profiles



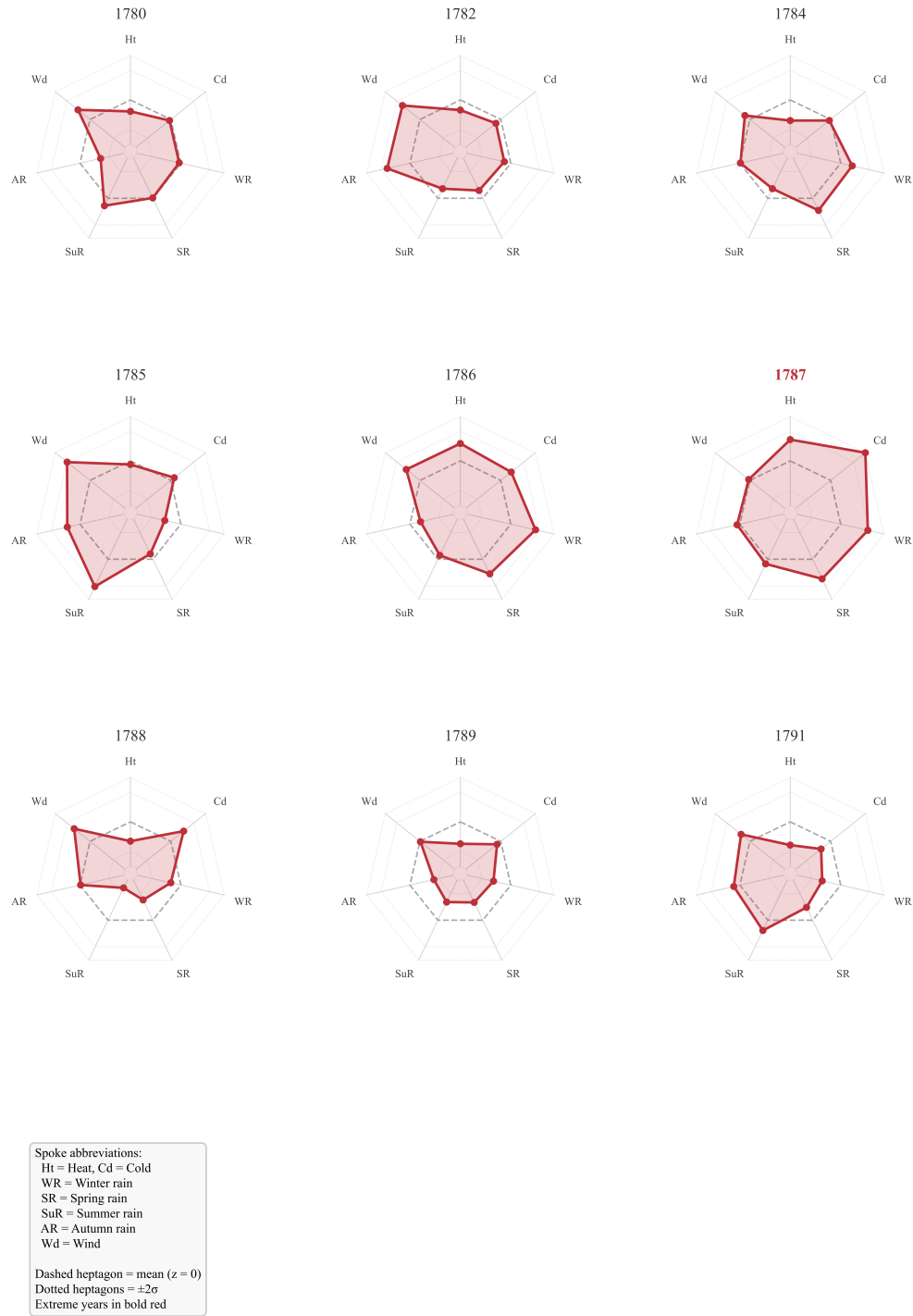
Supplementary Fig. 6: Climate profiles of extreme years. Each year satisfying the extreme criterion ($|z| > 2.5$ on any dimension, or $|z| > 2$ on two or more dimensions). Each spoke represents one of seven climate dimensions standardised to z -scores; the dashed heptagon marks the period mean.



Supplementary Fig. 7: Climate profiles, 1760–1767. Each radar chart displays the seven standardised climate dimensions for one year. Extreme years are labelled in bold red. The dashed heptagon marks the period mean ($z = 0$); dotted heptagons mark $\pm 2\sigma$.



Supplementary Fig. 8: Climate profiles, 1768–1779. See Supplementary Fig. 7 for legend.



Supplementary Fig. 9: Climate profiles, 1780–1791. Years 1781 and 1783 lack surviving OGR records; 1790 lacks usable climate data. See Supplementary Fig. 7 for legend.