The Erosion of Public Capital in Portugal

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August 2026

Abstract

This note documents the erosion of Portugal's public capital stock since 2013 and examines some of its macroeconomic implications. I use the perpetual-inventory method to extend the International Monetary Fund's public capital series with European Commission macroeconomic data through 2027. In 2026, the stock is projected to remain 12.2 percent below its 2013 peak, while its ratio to GDP is projected to have fallen from 77.2 to 52.6 percent. A simple statistical analysis documents significant positive co-movement between public-capital and labor-productivity growth at short horizons. A calibrated production-function exercise using a range of elasticities from the literature suggests that the post-2013 decline in public capital may have reduced GDP per capita in 2026 by between 0.7 and 5.3 percent, with a central calibration of 1.4 percent.

JEL codes: E22, H50, H54, O47.
Keywords: public investment, public capital, infrastructure, Portugal, fiscal policy.

1 Introduction

Public investment is a small but consequential component of government expenditure. It creates assets that support production and the delivery of public services over many years: transport networks, schools and universities, hospitals, courts, administrative buildings, defense installations, and digital infrastructure, among many others. Because these assets depreciate physically and become technologically obsolete, maintaining the productive capacity of the public sector requires a continuing flow of replacement and modernization expenditure. A sustained gap between gross investment and depreciation eventually reduces the stock of usable public capital.

Portugal provides a clear illustration of this mechanism. Fiscal consolidation after the euro-area sovereign debt crisis placed government expenditure under severe pressure. Adjustment was unavoidable in the presence of financing constraints, but the composition of such adjustment remained a policy choice. Public investment is politically easier to reduce than social transfers or current consumption because the immediate effects are often less visible. Maintenance can be

*I thank António Costa for inviting me to write a 2021 op-ed on the decline of public investment in Portugal that served as the basis for this analysis, as well as António Sampaio e Mello for an exchange that inspired me to formalize the arguments in a technical note. AI tools assisted in the preparation of this note. I reviewed and approved all final content and take full responsibility for any remaining errors. First version: August 2026. The views expressed in this note are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of St. Louis or the Federal Reserve System. Contact: miguel.fariaecastro@stls.frb.org.

deferred, projects can be postponed, and service quality may initially be protected by using existing assets more intensively. The budgetary saving appears at once while the cost accumulates slowly. Leading Portuguese economic-policy institutions, including the Public Finance Council and the Bank of Portugal, have increasingly drawn attention to the persistent weakness of public investment and its implications for the public capital stock (Conselho das Finanças Públicas, 2026; Banco de Portugal, 2026).

This note extends and updates the analysis conducted in Faria-e-Castro (2021), where I documented that Portuguese public investment had declined sharply after 2010 and that the estimated public capital stock had begun to contract around 2013. The intervening years have made it possible to evaluate whether this episode was temporary. They have also included the pandemic, and the Recovery and Resilience Plan (PRR in Portuguese), which provided a significant boost to public investment supported by European funds.

Using the July 2026 AMECO vintage, this note makes four contributions. First, it documents how the IMF capital-stock series is extended with AMECO observations. Second, it distinguishes historical estimates from the exceptional investment increase forecast for 2026. Third, it quantifies the decline in real public capital and its ratio to GDP, compares investment with current expenditure, and calculates the flow required to preserve the 2013 stock. Fourth, it examines the possible macroeconomic implications through descriptive productivity regressions and a calibrated Cobb–Douglas counterfactual that holds public capital at its 2013 level.

The main finding is that the erosion did not reverse during the first half of the 2020s. The public capital stock peaks at about 242.6 bn 2017 international dollars in 2013 and reaches a trough of about 210.4 bn in 2024, a cumulative decline of 13.3 percent. Its ratio to GDP falls from 77.2 percent to 53.8 percent over the same interval. The July 2026 AMECO forecast implies that public investment rises to 4.3 percent of GDP in 2026 and that the capital stock increases more visibly in 2027. Yet the projected 2027 stock remains roughly 9 percent below its 2013 peak. A temporary investment surge is therefore not equivalent to reversing a decade of underinvestment.

The calibrated exercise illustrates why this persistence may matter for macroeconomic performance. Under the central estimate for the elasticity of output to the stock of public capital of 0.10, the capital shortfall relevant for production in 2026 corresponds to output and labor productivity about 1.4 percent below the constant-2013-stock counterfactual. Spread over 2013–2026, this is equivalent to an average annual growth contribution of approximately −0.11 percentage points. The implied 2026 gap ranges from 0.7 percent under a conservative elasticity of 0.05 to 5.3 percent under the upper estimate of 0.39. The exercise holds other inputs fixed and should be read as a disciplined accounting counterfactual, not as evidence that the decline in public capital causally generated the estimated output gap.

These estimates are accounting benchmarks rather than a welfare assessment. They measure depreciated acquisition values under an assumed post-2018 depreciation rate, not engineering condition, service quality, social returns, replacement costs, or the human and organizational capital of the state.[1] Section 2 describes the data sources, and the perpetual-inventory methodology. Section 3 presents the main results on public investment and capital. Section 4 documents simple statistical relationships between public-capital growth and labor-productivity growth, and it quantifies the potential macroeconomic implications of the post-2013 decline in public capital. Section 5 concludes.

[1] For broader perspectives on the composition and efficiency of Portuguese public investment, see Pereira (2013) and Pereira and Pereira (2016).

2 Methodology

2.1 Concepts and data sources

The historical benchmark is the IMF Investment and Capital Stock Dataset, documented in International Monetary Fund (2021). The IMF constructs internationally comparable public and private capital stocks following the perpetual-inventory approach of Kamps (2006) and Gupta et al. (2014). The source workbook used here contains Portugal's public capital and investment series, together with separately identified PPP capital and investment. The two components are added to form the broad stock and flow used in the update:

$$K_t = K_t^{\text{gov}} + K_t^{\text{PPP}}, \tag{1}$$

$$I_t = I_t^{\text{gov}} + I_t^{\text{PPP}}. \tag{2}$$

All IMF level series are expressed in billions of constant 2017 international dollars at purchasing-power parity. The extension uses the July 2026 vintage of the European Commission's AMECO database (European Commission, 2026). The relevant series are Portugal's real GDP (OVGD), GDP deflator (PVGD), general-government gross fixed capital formation at current prices (UIGG0), and the average implicit interest rate on government debt (AYIGD). Nominal public investment is converted to a real national-currency index by deflating it with the GDP deflator:

$$I_t^{\text{AMECO,real}} = \frac{I_t^{\text{AMECO,nominal}}}{P_t^{GDP}/100}. \tag{3}$$

The level of this national-currency series is not directly combined with the IMF level. Instead, its growth rate is used to extend the IMF-consistent investment series:

$$\widehat{I}_t = \widehat{I}_{t-1}\left(1 + g_t^{I,\text{AMECO}}\right), \qquad g_t^{I,\text{AMECO}} = \frac{I_t^{\text{AMECO,real}}}{I_{t-1}^{\text{AMECO,real}}} - 1. \tag{4}$$

This growth-rate splice preserves the IMF valuation and the level of the series at the last overlap observation while importing the subsequent AMECO dynamics. Real GDP is extended analogously with AMECO real-GDP growth:

$$\widehat{Y}_t = \widehat{Y}_{t-1}\left(1 + g_t^{Y,\text{AMECO}}\right). \tag{5}$$

In the source calculation, the last IMF observation is 2019 and the AMECO extension begins in 2020. In this vintage, 2025 is best regarded as an estimate and 2026–2027 as forecasts. The output series therefore mixes historical IMF estimates, AMECO-based updates for realized years, and forecast-based extensions. For this reason, all main-text time-series figures shade 2025–2027 to distinguish the forecast and estimated years from historical data.

2.2 Perpetual inventory and depreciation

The IMF timing convention assumes that new investment becomes productive halfway through the year. For the capital stock measured at the beginning of a period, the accumulation equation is

$$K_{t+1} = (1-\delta_t)K_t + \left(1 - \frac{\delta_t}{2}\right) I_t, \tag{6}$$

where δ_t is the depreciation rate. The second term allows investment installed, on average, at midyear to undergo half a year of depreciation.

For years in which K_t, I_t, and K_{t+1} are observed, equation (6) can be inverted to back out the implied depreciation rate:

$$\delta_t = \frac{K_t + I_t - K_{t+1}}{K_t + \frac{1}{2}I_t}. \tag{7}$$

The inferred rate rises gradually in the historical file, consistent with the IMF assumption that depreciation for public assets in high-income economies increases from 2.5 percent in 1960 to 4.55 percent in 2016. The source calculation holds the last available inferred rate fixed after 2018, at approximately 4.62 percent per year. The updated stock is then obtained recursively from equation (6).

2.3 Ratios, timing, and interpretation

The reported intensity measures are

$$i_t = 100\frac{I_t}{Y_t}, \qquad k_t = 100\frac{K_t}{Y_t}. \tag{8}$$

The stock-to-flow ratio K_t/Y_t is widely used as a scale normalization, but it should not be interpreted as a literal share of annual output. It may rise during recessions even if real capital falls, as occurred in 2020, and it can decline because GDP grows even when the real stock is approximately flat. Accordingly, the analysis reports both levels and ratios.

The estimates are gross, not efficiency-adjusted. Two economies with the same measured capital stock may obtain different services from it because of project selection, procurement, maintenance, congestion, geographic allocation, or administrative capacity. Gupta et al. (2014) emphasizes the distinction between measured and efficiency-adjusted public capital. Moreover, physical-capital accounts do not measure the skills of teachers, medical personnel, engineers, or public administrators, even though these inputs complement physical assets. The calculations therefore answer a narrow but useful question: under a standardized depreciation schedule, has recorded gross fixed capital formation been sufficient to replace the public assets that wear out?

3 Results

3.1 The investment decline

Figure 1 displays real public investment from 1960 through 2027. The broad historical pattern is an extended expansion followed by a dramatic post-crisis contraction. Public investment falls especially sharply after 2010 and reaches its modern low in the middle of the 2010s. Measured relative to

GDP, it declines to 1.55 percent in 2016. This compression is large enough that gross investment no longer offsets estimated depreciation.

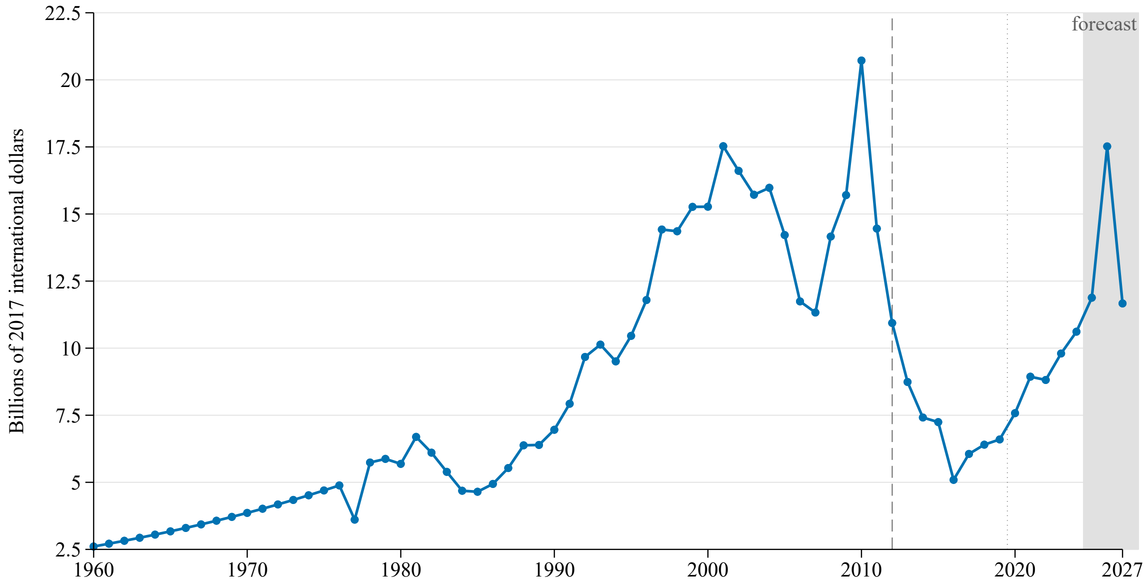

Figure 1: Real public investment in Portugal
Notes: Billions of constant 2017 international dollars. Public investment includes the public and PPP components in the IMF data and is extended after 2019 using real growth in AMECO general-government gross fixed capital formation. The dashed line marks 2012; the dotted line marks the start of the AMECO extension. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF Investment and Capital Stock Dataset and AMECO, July 2026 vintage.

The update also points to a recovery, but one that must be read carefully. Investment rises to 2.71 percent of GDP in 2024 and is projected to reach 4.33 percent in 2026 before falling back to 2.83 percent in 2027. The 47 percent real growth rate embedded in the 2026 AMECO forecast is exceptional and likely reflects the timing of investment associated with European funds and the PRR. Because the spike is forecast-based and temporary, it is too early to conclude that Portugal has moved to a persistently higher public-investment regime.

Figure 2 compares public investment as a share of GDP with the average interest rate on public debt. The comparison is not an accounting identity, but it illustrates changing fiscal priorities and constraints. During much of the post-sovereign-debt-crisis period, the investment ratio remained low even as the average interest burden declined. Lower financing costs did not automatically translate into sufficient capital formation.

3.2 The composition of expenditure adjustment

AMECO's general-government accounts make it possible to compare public investment with other expenditure categories using a common source, valuation basis, and denominator. Figure 3 reports public investment, cash social benefits, and the difference between government final consumption and public investment, all as shares of GDP. Cash social benefits correspond to AMECO's "social benefits other than social transfers in kind" series and therefore exclude benefits provided to households in kind, which are included in government final consumption. The difference between government

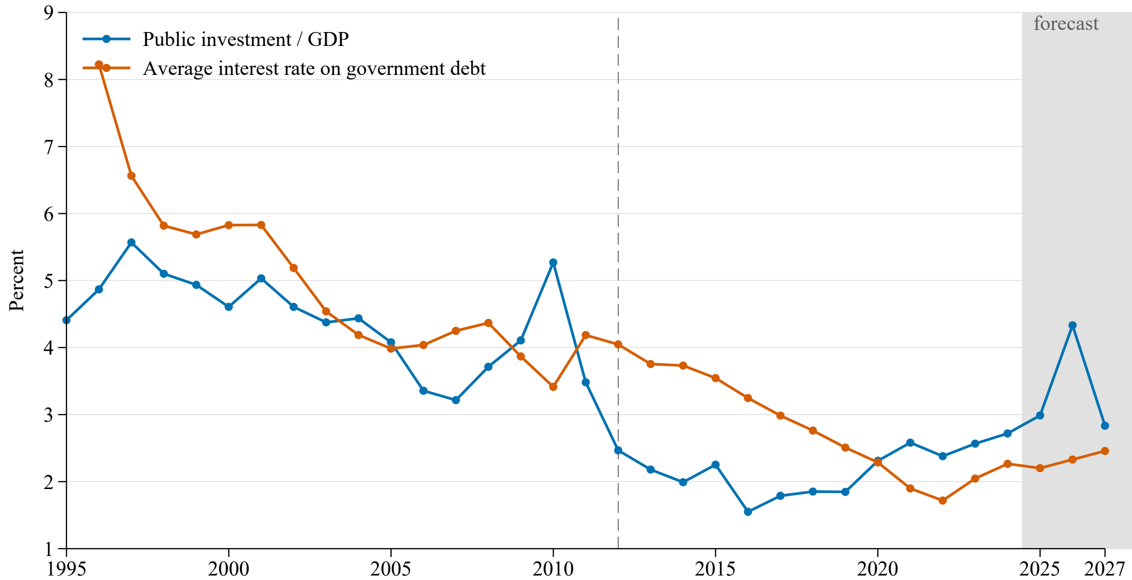

Figure 2: Public investment and the average interest rate on government debt
Notes: Percent. Both series are taken directly from AMECO. Public investment is general-government gross fixed capital formation as a share of GDP. The interest-rate series is AMECO's average implicit interest rate on government debt. The dashed line marks 2012; shading denotes the AMECO estimate/forecast period (2025–2027). Source: AMECO, July 2026 vintage.

consumption and public investment is not a national-accounts category; it is constructed to highlight the changing gap between the two expenditure ratios.

The long-run comparison shows that the composition of spending shifted away from investment. Between 1995 and 2024, public investment fell from 4.4 to 2.7 percent of GDP. Government consumption changed comparatively little, declining from 17.5 to 16.8 percent, whereas cash social benefits rose substantially, from 10.8 to 16.0 percent. Consequently, the difference between government consumption and investment increased from 13.1 to 14.1 percent of GDP. The widening gap makes the relative compression of investment especially visible.

The same asymmetry is visible around the sovereign-debt crisis, although all categories were affected to some degree. From 2010 to 2024, public investment fell from 5.3 to 2.7 percent of GDP—a decline of almost one half. Government consumption declined from 20.6 to 16.8 percent, while cash social benefits moved only from 16.6 to 16.0 percent. The investment series also reached its trough much sooner, at 1.55 percent of GDP in 2016. These patterns are consistent with the political-economy mechanism discussed above: capital spending can be compressed quickly because the deterioration of the corresponding services is delayed, whereas reductions in current consumption and transfers are more immediately visible to households and public-sector employees.

The AMECO forecast anticipates an investment surge in 2026 without a comparable change in consumption or transfers. This reinforces the importance of distinguishing a temporary, program-driven increase from a durable change in expenditure composition. A sustained rebuilding of public capital requires investment to remain sufficiently high after temporary European financing programs expire.

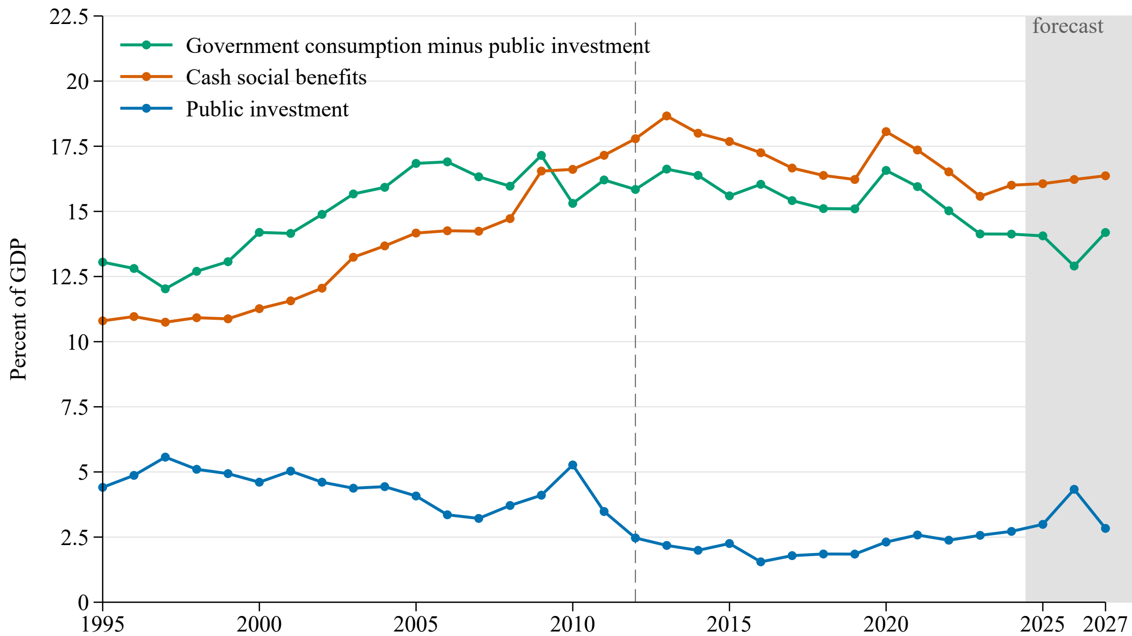

Figure 3: Public investment, government consumption less public investment, and cash social benefits in Portugal

Notes: Percent of GDP at current prices. Public investment is general-government gross fixed capital formation. "Government consumption minus public investment" is the difference between the two AMECO ratios and is not a national-accounts expenditure category. Cash social benefits exclude social transfers in kind. The dashed vertical line marks 2012. Shading denotes the AMECO estimate/forecast period (2025–2027). Source: AMECO, July 2026 vintage.

3.3 Accumulated erosion of the capital stock

The low-investment period translates mechanically, but gradually, into a lower stock. Figure 4 shows that real public capital peaks in 2013 at 242.6 bn 2017 international dollars. It then declines in every year through 2024, reaching 210.4 bn. The cumulative loss is 32.2 bn, or 13.3 percent of the peak stock. Put differently, by 2024 the estimated real stock had returned to approximately its level in the early 2000s, despite a substantially larger economy and greater demands on public infrastructure. A complementary recent assessment appears in Box 9 of the Banco de Portugal's June 2026 Economic Bulletin (Banco de Portugal, 2026). Appendix Figure A.1 plots the depreciation rate implied by the IMF stock-flow identity through 2018 and identifies the subsequent period over which the terminal rate is held fixed.

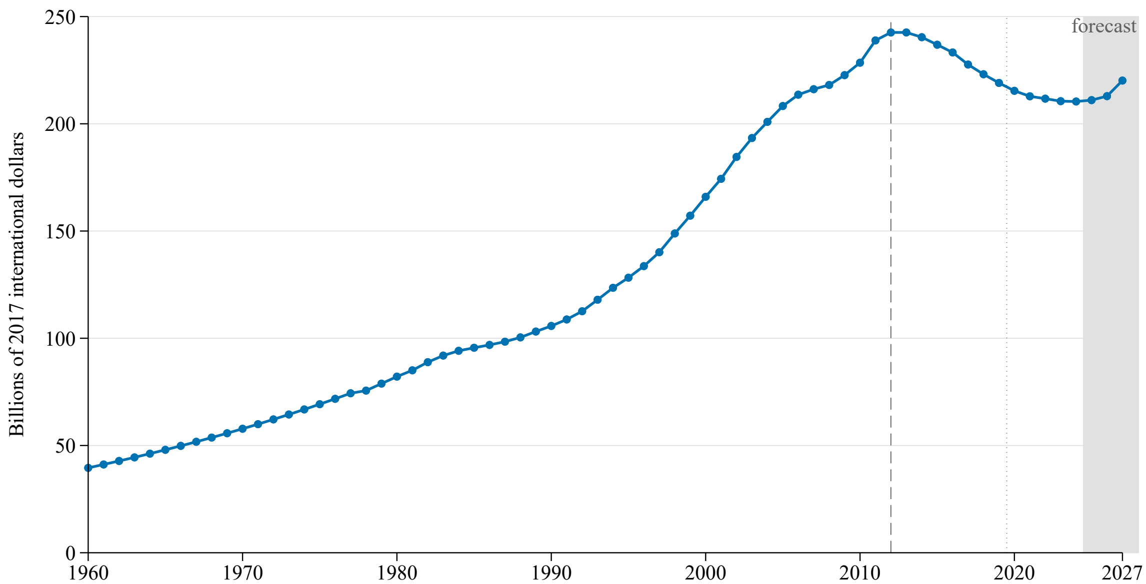

Figure 4: Estimated real public capital stock in Portugal

Notes: Billions of constant 2017 international dollars. The stock combines IMF public and PPP capital and is extended after 2019 using equation (6). The dashed vertical line marks 2012; the dotted vertical line marks the start of the AMECO extension. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF and author's calculations using AMECO, July 2026 vintage.

The timing of recovery is important. Under the IMF convention, investment during year t affects the beginning-of-year stock in $t + 1$. Public investment in 2023 was still slightly below the approximate maintenance requirement, and the 2024 increase was only just sufficient to stabilize the stock. The stock rises modestly in 2025 and 2026 and more clearly in 2027, when the projected 2026 surge is incorporated. The projected 2027 stock is 220.2 billion, about 9.2 percent below the 2013 peak. Thus even full realization of the AMECO forecast would repair only part of the accumulated decline.

Scaling by GDP makes the erosion more pronounced (Figure 5). The ratio peaks at 77.2 percent in 2013 and falls to 53.8 percent in 2024, a decline of 23.4 percentage points. The increase in 2020 is a denominator effect: real GDP fell more sharply than the capital stock during the pandemic. As growth resumed, the ratio continued downward. The projected ratio reaches 52.6 percent in 2026 and 53.4 percent in 2027, remaining close to its historical low.

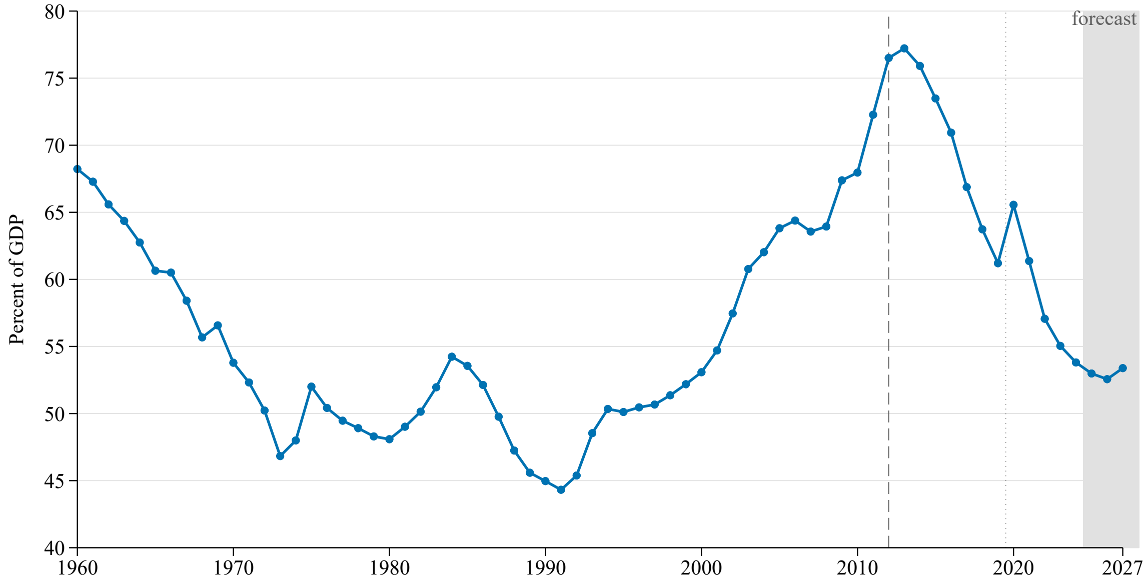

Figure 5: Estimated public capital stock relative to GDP
Notes: Percent of real GDP. Because the numerator is a stock and the denominator a flow, the ratio is a scale indicator rather than an output share. The dashed vertical line marks 2012; the dotted vertical line marks the start of the AMECO extension. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF and author's calculations using AMECO, July 2026 vintage.

Table 1: Selected observations

Year	Investment	Capital stock	Capital/GDP
	(bn 2017 international dollars)		(percent)
2013	8.7	242.6	77.2
2019	6.6	219.1	61.2
2020	7.6	215.4	65.6
2024	10.6	210.4	53.8
2025^{e}	11.9	211.0	53.0
2026^{e}	17.5	212.9	52.6
2027^{e}	11.7	220.2	53.4

Notes: Superscript *e* denotes an AMECO estimate or projection. Investment and capital are in billions of constant 2017 international dollars. The IMF series is extended after 2019 with AMECO growth rates. Sources: IMF, AMECO July 2026 vintage, and author's calculations.

3.4 Economic and policy interpretation

The accounting decline is economically relevant through two broad channels. First, public capital enters private production directly. Roads, ports, airports, energy and water networks, and digital systems reduce transport, coordination, and transaction costs. When those systems become congested, unreliable, or technologically obsolete, private firms require more time and resources to produce a given amount of output. A large empirical literature associates public capital with growth and productivity, although causal returns vary across countries and projects (Pereira, 2000; Gupta et al., 2010). Section 4 further explores these effects and tries to quantify the implications of the decline in the stock of public capital for the level of GDP and growth.

Second, physical capital is complementary to labor in the provision of public services. Education depends not only on teachers but also on adequate schools, laboratories, and digital equipment. Health care depends on medical staff and organizational capacity, but also on hospitals, diagnostic equipment, and information systems. A decline in the quantity or quality of these assets can reduce current well-being and future productivity. The broader concern is therefore not that a statistical series has fallen, but that the decline may reveal a growing mismatch between the assets available to the state and the services society expects it to provide.

These channels unfold slowly. Cutting an investment appropriation can improve the contemporaneous fiscal balance without immediately closing a road or hospital. Existing capital continues to provide services, maintenance backlogs are imperfectly observed, and users adapt. The full cost becomes visible only as failures become more frequent, capacity constraints bind, and replacement becomes unavoidable. This delay creates a political-economy asymmetry: current voters receive the benefit of fiscal savings while future taxpayers and service users bear part of the cost. Population aging may reinforce this asymmetry if electoral demand shifts toward current transfers and away from investment with long horizons.

3.5 Investment required to preserve the 2013 capital stock

A potential useful indicator is the investment flow required to maintain the public capital stock at a given level. This indicator can be constructed directly from the perpetual-inventory equation. Applying equation (6) to a stock fixed at its 2013 peak gives

$$\widetilde{I}_t^{\text{maint}} = \frac{\delta_t K_{2013}^G}{1 - \delta_t/2}. \tag{9}$$

Figure 6 compares this maintenance requirement with realized public investment, with both flows divided by realized GDP in year t.[2] The required share declines gradually as GDP grows because the target real stock is fixed: it is about 3.5 percent of GDP in 2013 and 2.8 percent in 2026. Realized investment remained below the requirement for most of the intervening period. The estimated 2025 flow and especially the projected 2026 surge exceed the maintenance requirement, allowing the stock to begin recovering, although not immediately returning it to its 2013 level.

[2]Note that this is a simplified "partial equilibrium" measure, as GDP would have been different than its realized value given different investment policies.

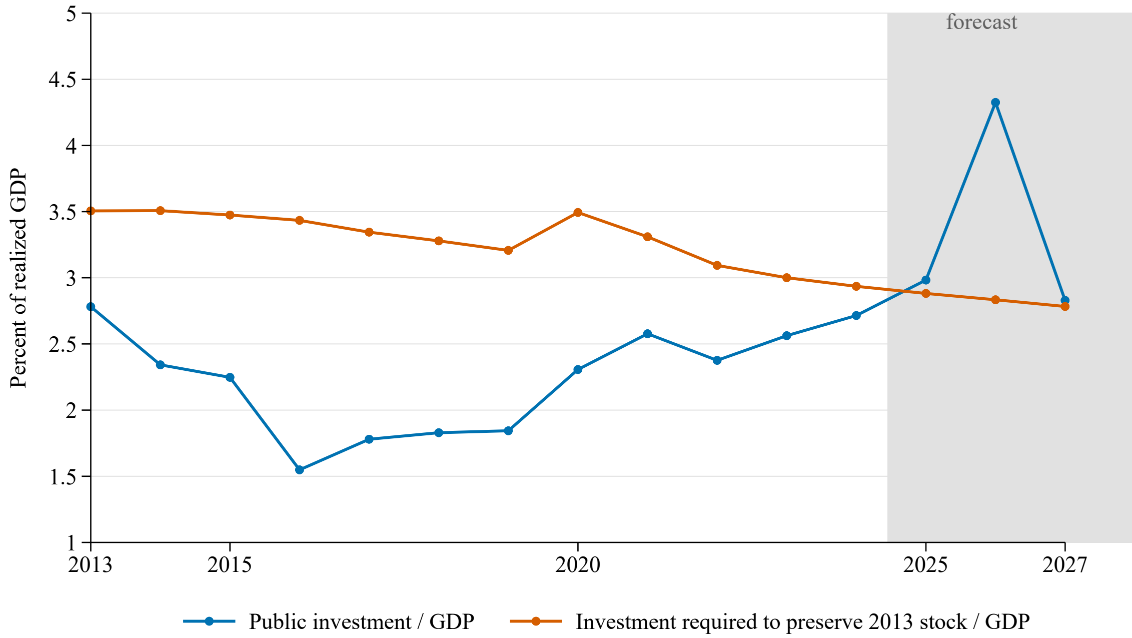

Figure 6: Public investment and the flow required to preserve the 2013 capital stock

Notes: Both series are expressed as percentages of realized GDP. The maintenance requirement is $\delta_t K^G_{2013}/(1-\delta_t/2)$ and therefore holds the real public-capital stock fixed at its 2013 level under the IMF timing convention. Public investment is the IMF-consistent series extended with AMECO real-investment growth. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF, AMECO July 2026 vintage, and author's calculations.

4 Macroeconomic implications

Public capital can affect aggregate performance by raising the productivity of private inputs. Transport and digital networks reduce firms' operating costs; education and health infrastructure complement workers' skills; and reliable administrative, judicial, water, and energy systems reduce delays and uncertainty. These mechanisms suggest a positive relationship between the growth of the public capital stock and productivity growth. In this section, I first document a simple statistical association between labor-productivity and public-capital growth in Portugal. I then use a calibrated production-function framework to quantify the potential implications of the post-2013 decline in public capital for output and productivity.

4.1 Production-function framework and external evidence

To organize the empirical exercise, consider an aggregate Cobb–Douglas production function that distinguishes private and public capital:

$$Y_t = A_t K^{\alpha}_{t-1} (K^G_{t-1})^{\eta} N_t^{1-\alpha-\eta}, \tag{10}$$

where Y_t is real GDP, A_t is total factor productivity, K_{t-1} is private capital, K^G_{t-1} is public capital, and N_t is employment. Dividing by employment gives

$$\frac{Y_t}{N_t} = A_t \left(\frac{K_{t-1}}{N_t}\right)^{\alpha} \left(\frac{K^G_{t-1}}{N_t}\right)^{\eta}. \tag{11}$$

The parameter η is the direct elasticity of output with respect to public capital, holding productivity, private capital, and employment fixed.

Estimating η from a single aggregate time series is difficult. Output and both capital stocks trend strongly; public investment responds endogenously to economic and fiscal conditions; and private and public capital may be complementary. Early aggregate production-function estimates were often large, while later panel and dynamic studies generally found more moderate effects. For Portugal, Ligthart (2000) estimated elasticities around 0.37–0.39 using production-function, cointegration, and VAR methods. Pina and St. Aubyn (2005) also estimated a cointegrated production system for Portugal with private, public, and human capital. In a broad international panel, Gupta et al. (2010) estimated a public-capital elasticity of approximately 0.13 for OECD economies. More recent work has emphasized heterogeneous dynamics, infrastructure quality, and imperfect substitution between public and private capital (Calderón et al., 2015; An et al., 2019).

Given this uncertainty, the analysis below separates two questions. First, simple time-series regressions document whether labor-productivity and public-capital growth move together in Portugal. Second, a calibrated accounting exercise applies a transparent range of external estimates, $\eta \in [0.05, 0.39]$, to the observed post-2013 capital decline. The lower end is conservative, 0.10 is used as a central calibration, and the upper end corresponds approximately to the older Portugal-specific estimates. Neither exercise identifies a causal elasticity.

4.2 Simple statistical relationships

Labor productivity, LP_t, is AMECO real GDP at reference-year prices per person employed (code RVGDE). Public capital, K^G_t, is the combined public and PPP stock constructed in Section 2. I estimate the bivariate relationship

$$g^{LP}_t = \alpha + \beta_s g^{K^G}_{t-s} + u_t, \qquad s \in \{0, 1, \ldots, 5\}.$$

Both variables are annual log growth rates in percent. The contemporaneous specification allows productivity and public capital to move together within a year; the remaining columns allow public-capital growth to precede productivity growth by one to five years. Real-GDP growth is deliberately not included as a control because GDP is the numerator of labor productivity. The reported standard errors are heteroskedasticity-robust.

The estimated association is positive but horizon-dependent. A one-percentage-point increase in contemporaneous public-capital growth is associated with approximately 0.41 percentage point higher labor-productivity growth. The one-year-lag coefficient is 0.38 and the two-year-lag coefficient is 0.31; these estimates are statistically significant at the 5, 5, and 10 percent levels, respectively. Coefficients at longer lags remain positive but are not statistically significant.

Several identification problems prevent a causal interpretation. Fiscal policy responds to the cycle, so output and investment may share common shocks; higher expected growth may itself induce

Table 2: Labor-productivity and public-capital growth

Public-capital growth dated	t	$t-1$	$t-2$	$t-3$	$t-4$	$t-5$
Coefficient	0.4061**	0.3822**	0.3138*	0.3115	0.2527	0.2465
Robust standard error	(0.1607)	(0.1718)	(0.1772)	(0.1963)	(0.1912)	(0.1974)

Notes: Each column is a separate bivariate regression. Column headings indicate the date of public-capital growth relative to labor-productivity growth in year t. Growth rates are annual log differences in percent. Standard errors are heteroskedasticity-robust. Regressions use available observations within 1961–2024; longer lags therefore have slightly fewer observations. *, **, and *** denote significance at the 10, 5, and 1 percent levels. The sample excludes 2025–2027 estimates and forecasts. Sources: IMF, AMECO July 2026 vintage, and author's calculations.

public investment; completed projects may affect productivity only after long and heterogeneous lags; and the perpetual-inventory stock measures depreciated expenditure rather than the quantity or quality of capital services. Aggregation also obscures which assets matter for which sectors. A stronger causal design would require project-level or regional variation, measures of infrastructure use and quality, and instruments or institutional discontinuities that isolate investment changes unrelated to contemporaneous productivity prospects.

The β_s coefficients should therefore not be interpreted as estimates of η. Equation (11) contains private-capital intensity and unobserved productivity, while the bivariate regressions omit both. The regressions document Portuguese comovement; the calibrated exercise uses the external literature to discipline the economically relevant elasticity.

4.3 Calibrated consequences of the post-2013 decline

Consider a counterfactual in which gross investment from 2013 onward was just sufficient to hold real public capital at its 2013 peak, so that $\widetilde{K}_t^G = K_{2013}^G$. Holding A_t, private capital, and employment at their observed values, equation (10) implies

$$\ln Y_t - \ln \widetilde{Y}_t = \eta \left(\ln K_{t-1}^G - \ln \widetilde{K}_{t-1}^G \right). \tag{12}$$

Because employment is held fixed, the proportional effect on labor productivity is identical. This is a partial-equilibrium accounting calculation: it excludes crowding-in of private capital, endogenous employment and productivity responses, financing effects, and differences between measured capital and effective capital services.

The estimated stock remained below its 2013 peak through 2026. Because output in year t depends on public capital in $t-1$, Table 3 applies alternative values of η to the decline in the stock between 2013 and 2025 to calculate the output and labor-productivity gap in 2026. The central calibration $\eta = 0.10$ translates the relevant capital shortfall into an output and labor-productivity gap and an average annual growth contribution over 2013–2026. The conservative $\eta = 0.05$ calibration yields a smaller effect, whereas the older Portugal-specific upper estimate yields a substantially larger one. The wide range is a feature of the exercise: parameter uncertainty is economically material and should remain visible. The table shows that, depending on the value of η, the post-2013 decline in public capital could imply output 0.7–5.3 percent lower in 2026 than if the stock had been preserved at its 2013 level, equivalent to an average annual growth drag of 0.05–0.42 percentage points over 2013–2026.

Figure 7 displays the same calculation in levels, using the log of AMECO real GDP per capita.

Table 3: Calibrated effect of the decline in public capital

Assumed η	2026 output gap, %	Avg. ann. growth contrib., pp
0.05	-0.7	-0.05
0.10	-1.4	-0.11
0.15	-2.1	-0.16
0.20	-2.7	-0.21
0.25	-3.4	-0.27
0.30	-4.1	-0.32
0.39	-5.3	-0.42

Notes: Because output in 2026 depends on public capital in 2025, the output and labor-productivity gap is $100[(K^G_{2025}/K^G_{2013})^\eta - 1]$. The average annual contribution is $100\eta \ln(K^G_{2025}/K^G_{2013})/(2026 - 2013)$. Negative values indicate lower output and productivity relative to a counterfactual that holds public capital at its 2013 level. This is a calibrated partial-equilibrium accounting exercise, not a causal estimate. Sources: IMF, AMECO July 2026 vintage, and author's calculations.

Counterfactual GDP per capita is constructed from equation (12), holding population at its observed value and public capital at its 2013 level. The central line uses $\eta = 0.10$ and the band spans 0.05–0.39. The counterfactual and actual series coincide before the capital-stock decline can affect production and then separate as the cumulative public-capital gap widens.

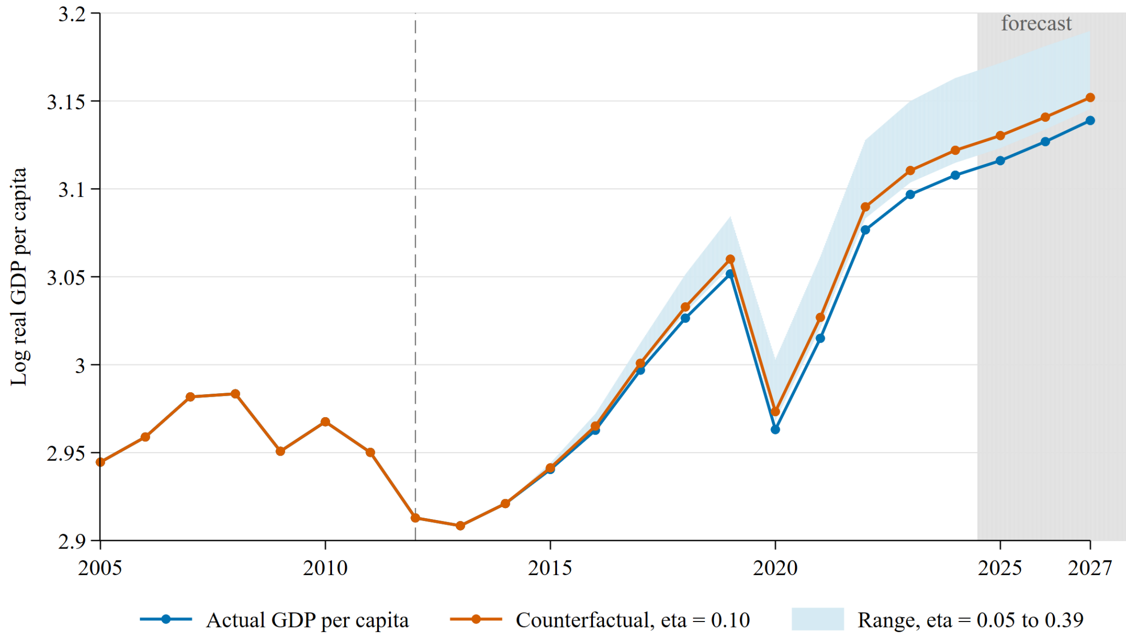

Figure 7: Actual and counterfactual real GDP per capita
Notes: Natural logarithm of real GDP per capita at 2020 reference prices (AMECO RVGDP). The counterfactual holds real public capital at its 2013 level while retaining observed population. The central counterfactual uses $\eta = 0.10$; the band spans $\eta = 0.05$ to 0.39. Output in year t depends on public capital in $t-1$, as in equation (10). The dashed vertical line marks 2012. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF, AMECO July 2026 vintage, and author's calculations.

The constant-stock benchmark is deliberately modest: it asks what would have happened if Portugal had merely prevented erosion, using the investment requirement documented in Section 3.5, not if public capital had continued growing at its pre-crisis rate. Two more expansionary benchmarks—continuation of a pre-2012 trend and stabilization of the capital-to-GDP ratio—would generate larger gaps but would also depend more heavily on contestable assumptions about the appropriate counterfactual path. For this reason, the constant-2013-stock case is the preferred baseline. Appendix Figures A.2 and A.3 report the corresponding GDP-per-capita counterfactuals for these two alternatives, with the ranges for the 2026 gap being 3%–21% below the counterfactual for the pre-2012 trend and 2%–14% below the counterfactual for the constant-ratio benchmark.

5 Conclusion

Portugal's post-2010 reduction in public investment was not merely a temporary decline in a spending flow: it generated a persistent contraction in the public capital stock. The updated series indicates that real public capital fell by 13.3 percent between its 2013 peak and 2024, while the capital-to-GDP ratio declined by more than 23 percentage points. This erosion is consistent with a decade in which gross investment was frequently insufficient to offset depreciation, even as government consumption and cash social benefits proved considerably more resilient as shares of GDP.

The July 2026 AMECO vintage contains encouraging but provisional news. It projects a very large increase in investment in 2026 and a partial recovery of the stock in 2027. This projection should be neither dismissed nor mistaken for an accomplished reversal. The projected increase is unusually large and temporary, and even the implied 2027 stock remains materially below its 2013 peak. Sustained rebuilding would require investment to remain above the maintenance threshold beyond the completion of the PRR and other temporary programs.

The macroeconomic exercise provides a quantitative interpretation of this accounting decline. The descriptive regressions indicate positive co-movement between public-capital and labor-productivity growth, but they do not identify a causal effect. I therefore complement them with a calibrated production-function framework that applies a range of elasticities from the literature to the observed post-2013 decline in public capital. Depending on the assumed elasticity, the results imply that output and labor productivity in 2026 could be 0.7–5.3 percent lower than under a counterfactual that preserves the 2013 stock. This corresponds to an average annual growth drag of 0.05–0.42 percentage points over 2013–2026. These calculations remain partial-equilibrium exercises. A fuller evaluation of the macroeconomic consequences of public underinvestment would require a structural model that accounts for the endogeneity of investment, complementarities between public and private capital, and the dynamic responses of employment and productivity.

An important caveat is that the analysis focuses on a narrow measure of public capital: physical assets explicitly recorded in the national accounts. It does not capture human capital, the quality of public services, or the efficiency of public administration. The decline in the measured stock may therefore understate the broader erosion of productive capacity and service quality that can accompany prolonged underinvestment.

Public-investment decisions shape both the productive capacity of the state and macroeconomic performance over horizons far longer than an annual budget or electoral term. Portugal's estimated public capital stock remains substantially below its peak, and a short-lived investment surge cannot by itself undo more than a decade of erosion. Preserving the stock requires a durable institutional commitment to maintenance and replacement. My interpretation is that the secular decline in public investment after 2010 may represent more than a temporary fiscal adjustment: it may reflect a structural shift in the political economy of public spending. Demographic forces, including population aging and declining fertility, may contribute to such a shift by increasing pressure for current expenditure relative to investment with long-dated returns. This interpretation is necessarily conjectural. Nevertheless, absent a durable change in investment priorities, the long-term outlook for Portugal's public capital stock remains concerning.

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A Additional figures

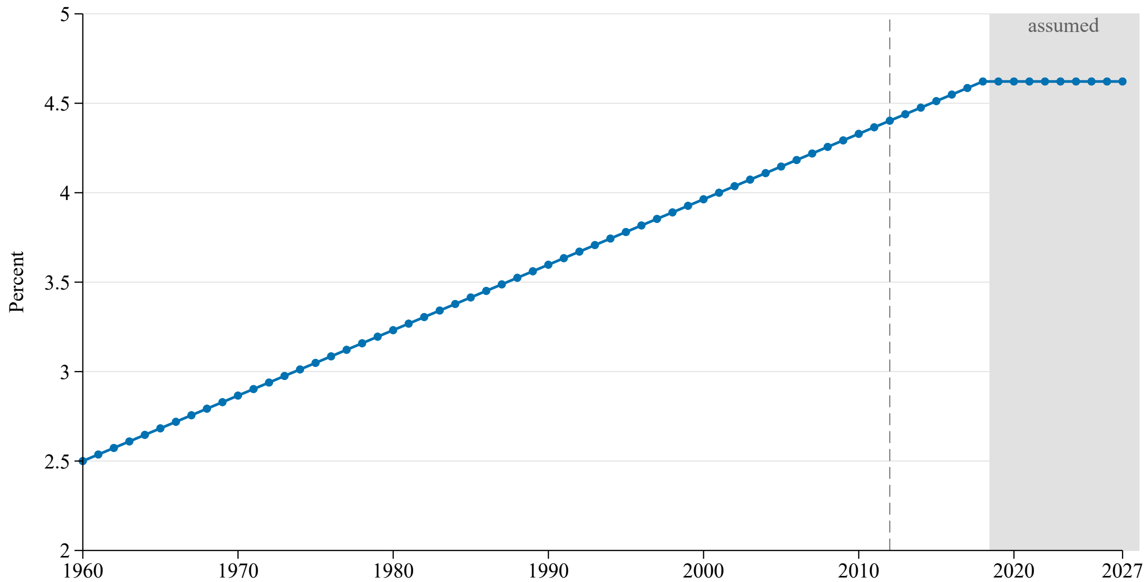

Figure A.1: Implied and assumed depreciation rate
Notes: Percent per year. Through 2018, the depreciation rate is inferred from the IMF stock-flow identity in equation (7). From 2019 onward, it is held fixed at its 2018 value of approximately 4.62 percent. The shaded region identifies the period in which the rate is assumed rather than inferred. The dashed vertical line marks 2012. Sources: IMF and author's calculations.

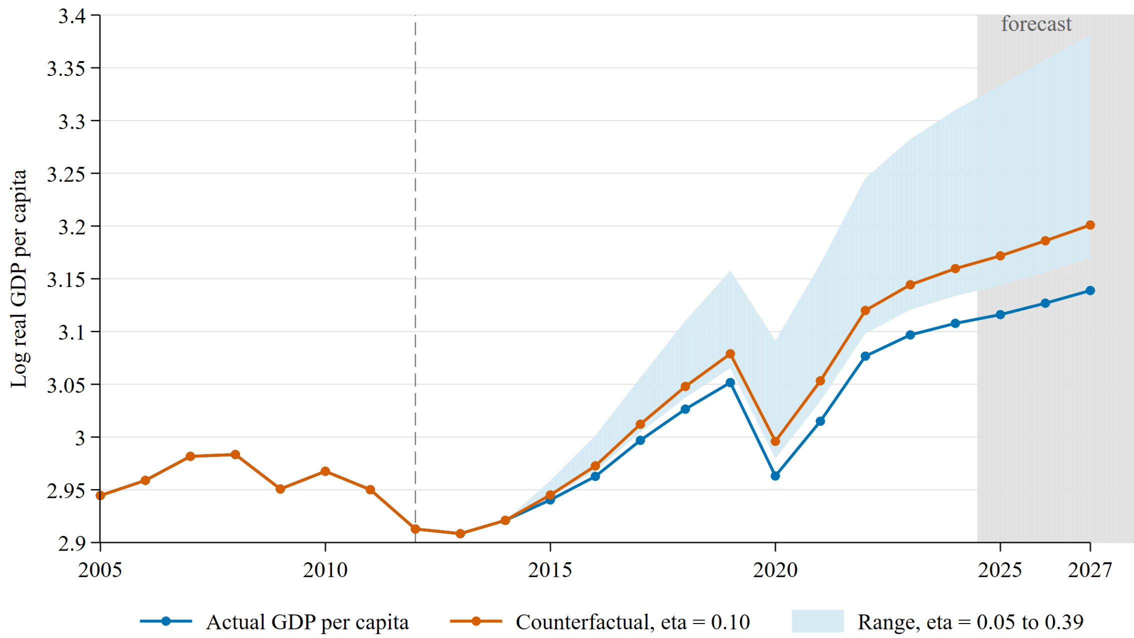

Figure A.2: GDP per capita under a continuation of the pre-2012 public-capital trend
Notes: Natural logarithm of real GDP per capita at 2020 reference prices (AMECO RVGDP). The counterfactual public-capital path extrapolates the log-linear trend estimated over 1995–2012 and is anchored at the observed 2013 stock. Population follows its observed path. The central counterfactual uses $\eta = 0.10$; the band spans $\eta = 0.05$ to 0.39. Output in year t depends on public capital in $t-1$. The dashed vertical line marks 2012. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF, AMECO July 2026 vintage, and author's calculations.

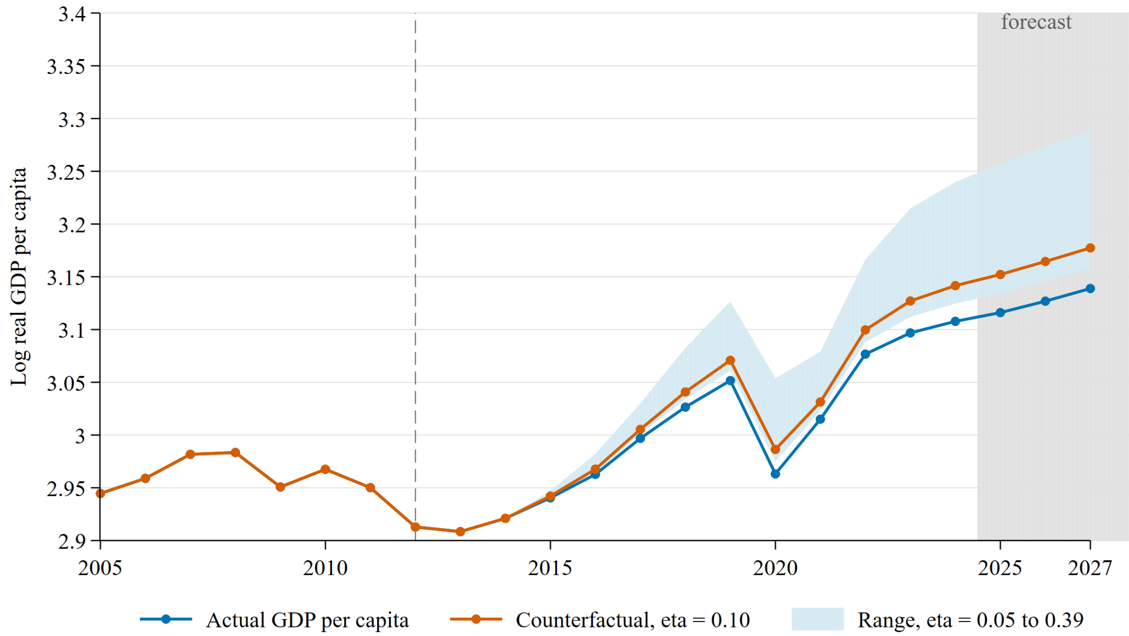

Figure A.3: GDP per capita with the public-capital-to-GDP ratio fixed at its 2013 level

Notes: Natural logarithm of real GDP per capita at 2020 reference prices (AMECO RVGDP). Counterfactual public capital equals 77.2 percent of realized GDP, its 2013 ratio, while population follows its observed path. The central counterfactual uses $\eta = 0.10$; the band spans $\eta = 0.05$ to 0.39. Output in year t depends on public capital in $t-1$. The dashed vertical line marks 2012. Shading denotes the AMECO estimate/forecast period (2025–2027). Sources: IMF, AMECO July 2026 vintage, and author's calculations.