

Economic Growth in Greece: barriers and prospects

Professor Apostolis Philippopoulos

Professor of Economics, Department of Economics, Athens University of Economics and Business

Dr George Economides

Associate Professor of Economics, Department of International & European Economic Studies,
School of Economic Sciences, Athens University of Economics and Business

Chair: Dr Vassilis Monastiriotis

Associate Professor of Political Economy, LSE

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Hellenic Observatory, LSE

George Economides and Apostolis Philippopoulos

Athens University of Economics and Business, and CESifo

February 25, 2020

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- But, before we search for engines of growth, we need to identify the barriers to growth.

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- First, we decompose the output loss into its main drivers/causes (barriers to growth).
- Second, building upon the first task, we study counter-factuals (engines of growth).

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- Step C: We study counter-factuals since 2009.

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- Brunnermeier and Reis (2019)

- Arrelano and Bai (2016)

Quantitative macro papers on the Greek crisis

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- Gourinchas, Philippon and Vayanos (2017)

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- In sum, typical international crisis (Gourinchas and Obstfeld, 2012, Lorenzoni, 2014)

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- As a result change in sovereign debt ownership.

About financial assistance: official fiscal bailouts

Public debt to GDP and its holders. Source: Public Debt Management Agency and Greek Ministry of Finance.

Year	Total Public Debt (% of GDP)	λ^{eu} (% of total public debt)	λ^g (% of total public debt)
2008	109.4	0	75
2009	126.7	0	75
2010	146.2	9.3	46.3
2011	172.1	19.9	24.7
2012	159.6	59.9	20.3
2013	177.4	66.3	18.2
2014	178.9	67.2	16.9
2015	176.8	68.6	16.1
2016	180.8	69.8	16.0

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- See below for the effectiveness of such policies

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- Examples: Sinn (2014), Bindseil and König (2011) and Whelan (2014, 2017).

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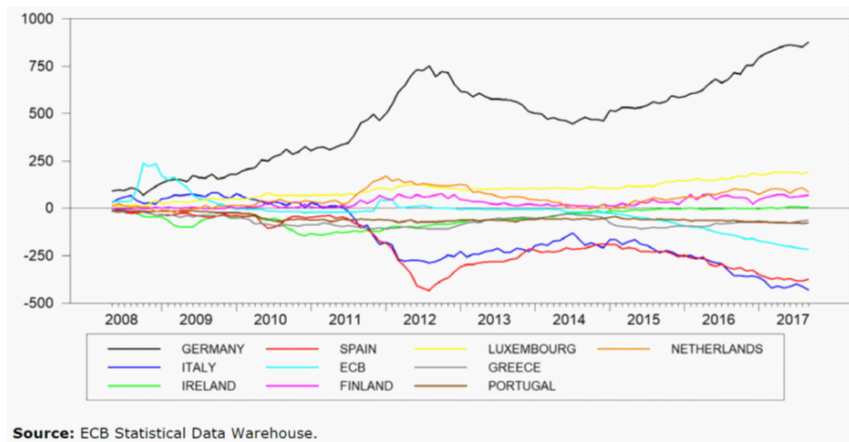
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- See below for the role of TARGET2 in our model.

TARGET2 data

TARGET2 balances for the ECB and a selection of countries (billions of Euros)



Bank of Greece's assets

(billions of euros, end of year, source: Bank of Greece)

Year	Lending to Banks	Securities	Government long-term debt	Total Assets
2007	9	10	8	42
2008	38	14	8	71
2009	50	21	7	86
2010	98	24	7	13
2011	128	21	7	168
2012	121	21	6	160
2013	73	21	6	109
2014	56	31	5	103
2015	107	40	5	163
2016	67	57	6	142
2017	34	74	6	125
2018	11	76	5	109

Bank of Greece's liabilities

(billions of euros, end of year, source: Bank of Greece)

Year	Banknotes	TARGET2	Reserves	Gov deposits	Total liabilities
2007	16	10	7	1	42
2008	18	35	8	1	71
2009	21	49	8	1	86
2010	22	87	10	2	138
2011	23	105	5	5	168
2012	23	98	2	7	160
2013	25	51	2	8	109
2014	27	49	3	5	103
2015	29	94	1	5	163
2016	30	72	1	9	142
2017	31	59	2	12	125
2018	33	29	7	25	109

About fiscal austerity

Government revenue and expenditure. (% of GDP, source: European Commission, Report on Public Finances in EMU)

Variable	2008	2010	2011	2014	2016	2018
Revenue	40	41	44	47	49	48
Expenditure	50	53	54	51	49	48

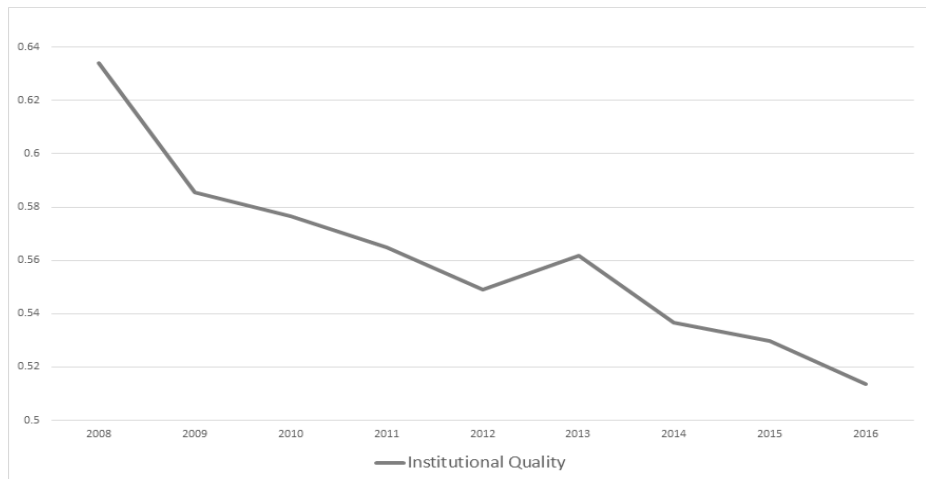
About fiscal austerity

Fiscal (spending-tax) policy mix. (Source: Eurostat)

Var	2008	2009	2010	2012	2013	2014	2015	2016
s^g	9.1	10.2	9.8	9.0	8.2	8.0	8.1	7.9
s^w	11.6	13.0	12.4	12.8	12.2	12.2	12.2	12.3
s^j	5.8	5.7	3.6	2.5	3.4	3.6	3.9	3.5
s^{tr}	18.9	20.5	20.9	23.1	21.4	21.7	22.1	22.2
τ^y	27.3	26.6	26.9	32.5	31.3	32.4	33.6	35.5
τ^c	16.8	15.2	17.7	18.5	18.7	19.1	19.5	21.8
b/y	109.4	126.7	146.2	159.6	177.4	178.9	176.8	180.8

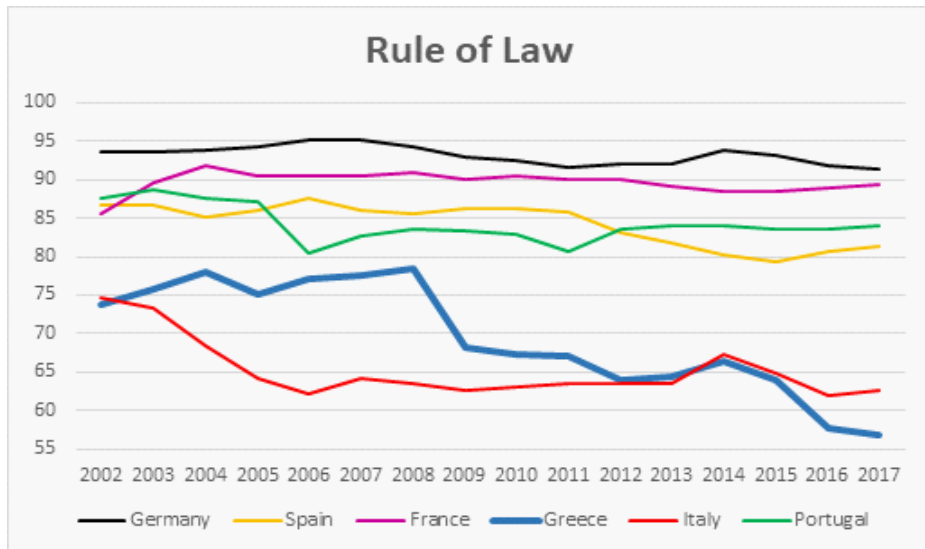
About institutions: property rights in Greece

(PR is constructed as the average of "the rule of law", "regulatory quality" and "political stability and absence of violence/terrorism", rescaled from 0 to 1. Source: World Governance Indicators)



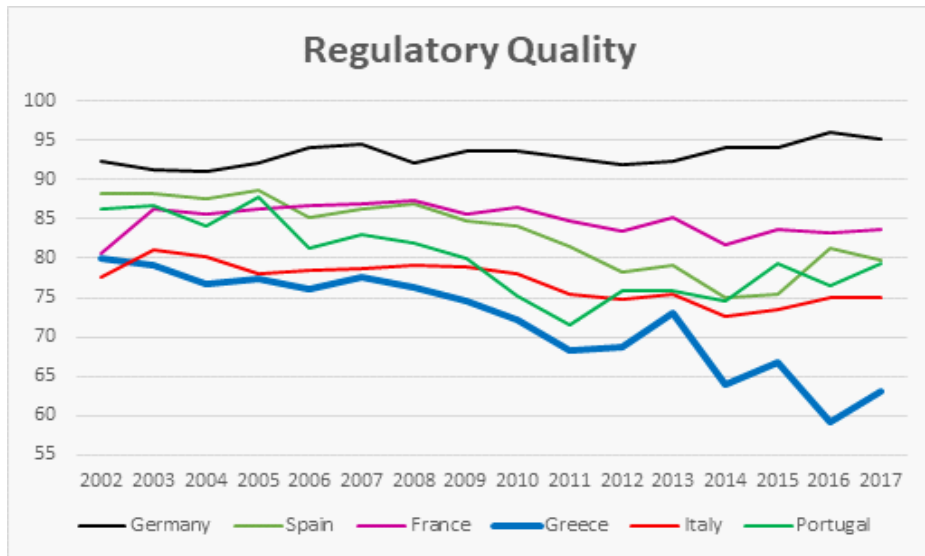
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Rule of law, comparison to other countries



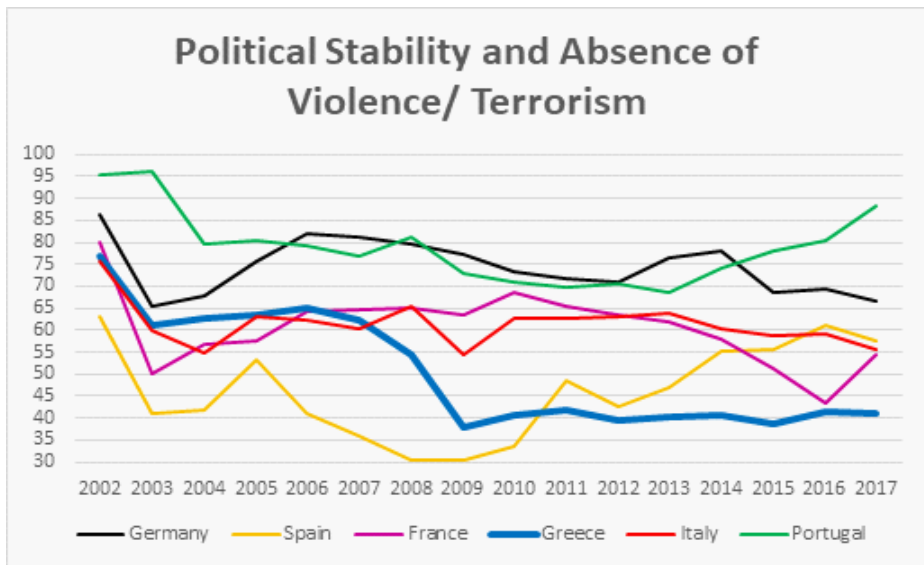
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Regulatory quality, comparison to other countries



About institutions

Political stability and absence of violence/terrorism, comparison to other countries



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- entrepreneurs also own shares of firms/banks and participate in financial markets ▶ entrepreneurs

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- budget constraint [▶ GBC](#)
- tax, spending, public debt and its decomposition as in the data - fiscal austerity and official bailout

- **National central bank in the eurosystem**

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- But can balance-sheet (size and mix), or quantitative, monetary policy "alleviate fiscal burdens" and affect national resources?

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- But, given the expansion of CBs' balance sheets, since 2008:
 - add frictions (see Walsh, 2017, chapter 11)
 - but, even without frictions, in a CU, balance sheet policies can have redistributive real allocation effects (see Reis, 2013, 2017, and Sinn, 2014)

- Our formal criterion: Do balance-sheet quantitative monetary instruments/items remain (after using market-clearing conditions, etc) in the budget constraint of the consolidated public sector and in the balance of payments?

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- According to this criterion: bonds purchased by ECB, dividends paid by ECB, and TARGET2 balances can play this role at least in principle (see also Reis, 2013, 2017, and Sinn, 2014).

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 - TARGET2 liabilities to the ES do remain in the above constraints breaking Wallace's neutrality proposition.
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 - **That is, accommodative monetary policy, or fiscal dominance, at member-country level.**

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- This distorts incentives as agents expend resources to capture the rents (Acemoglu and Robinson, 2019, etc)
- **Rent seeking technology: Tullock-type rent seeking competition** (Murphy et al., 1991, Dixit, 2004, Esteban and Ray, 2011, etc) ▶ Tullock-type

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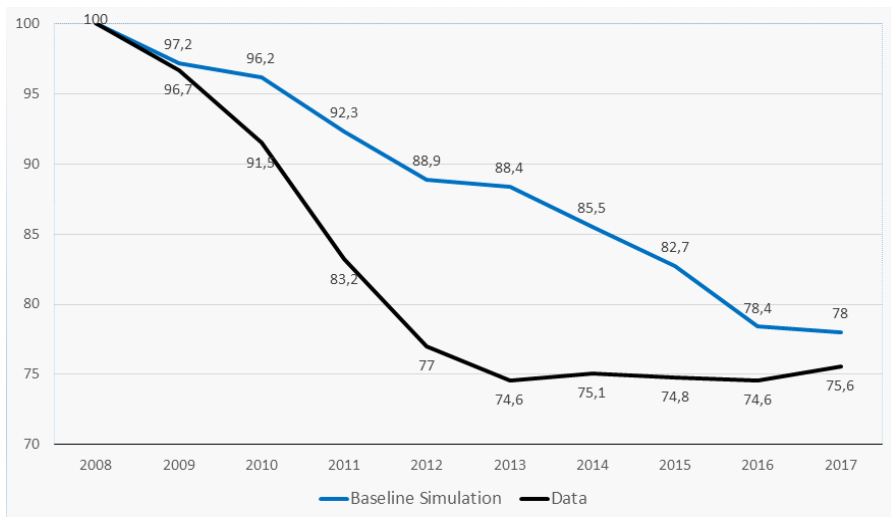
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- **Deterministic (perfect foresight equilibrium)**

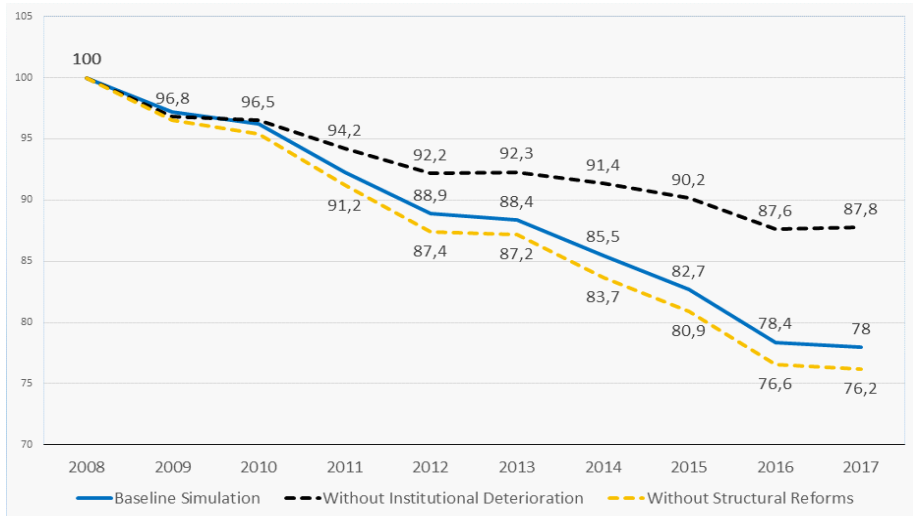
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- **Dynare toolbox**

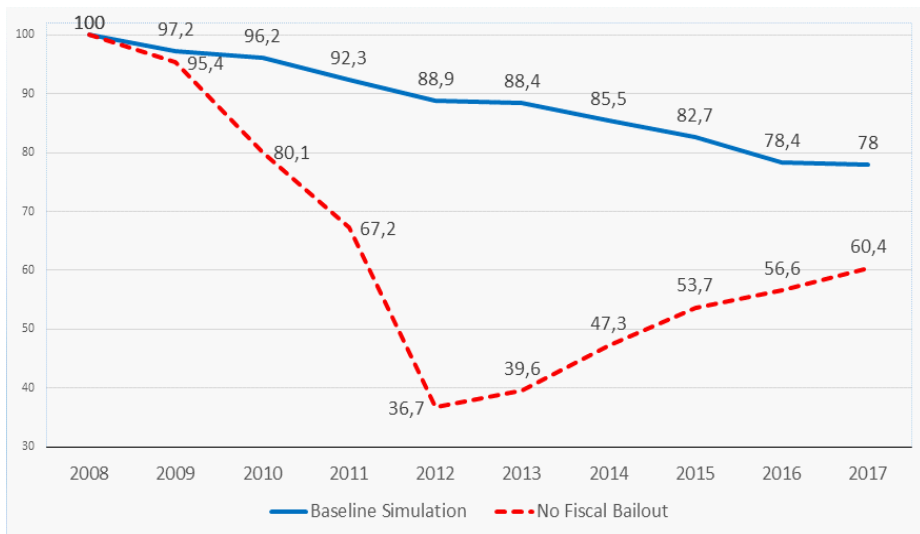
Output loss and data



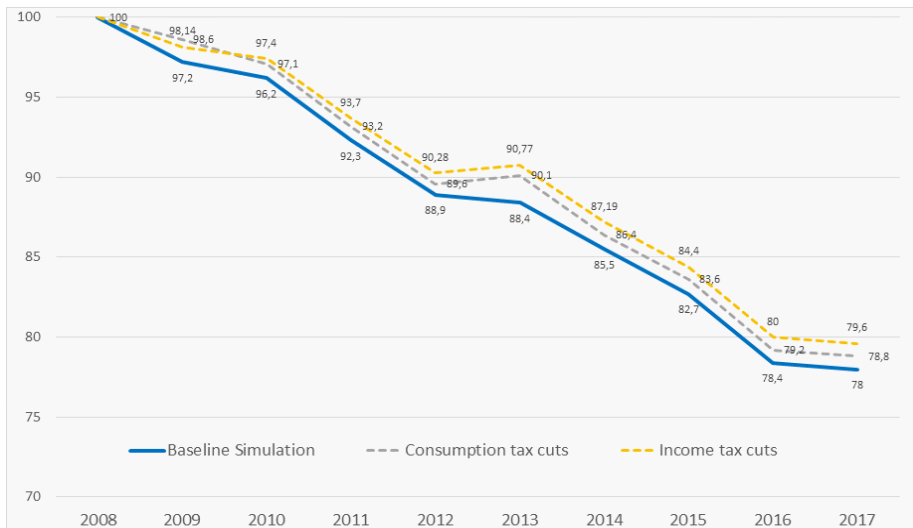
Output loss and its main drivers



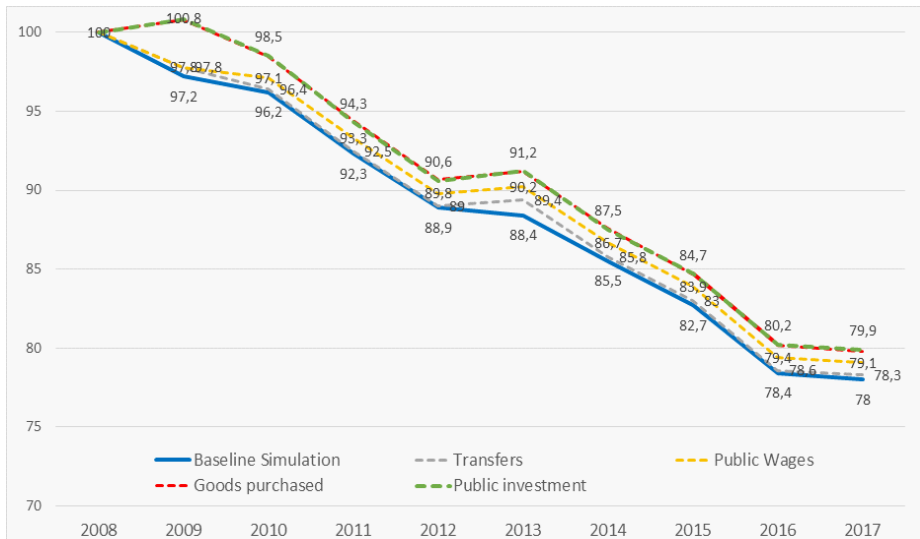
Counterfactual I: No fiscal bailout



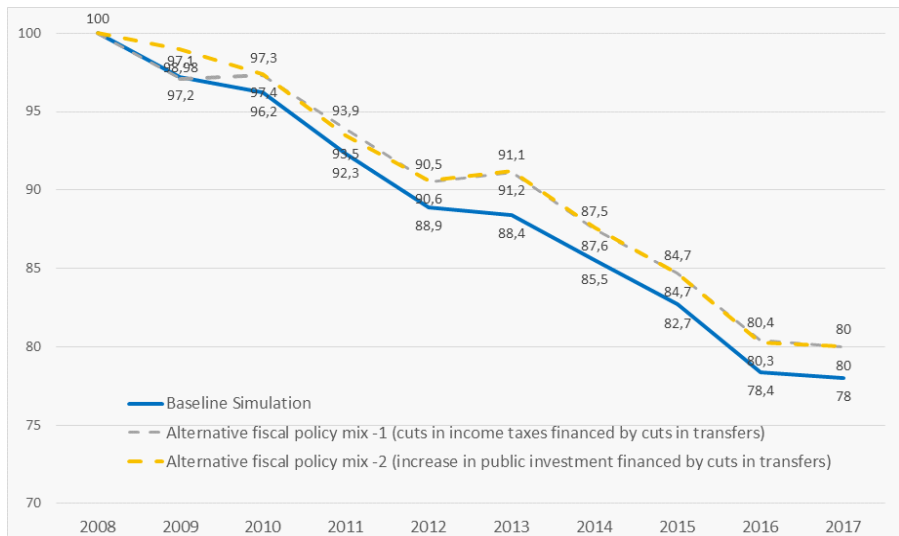
Counterfactual II: Less austerity - tax cuts



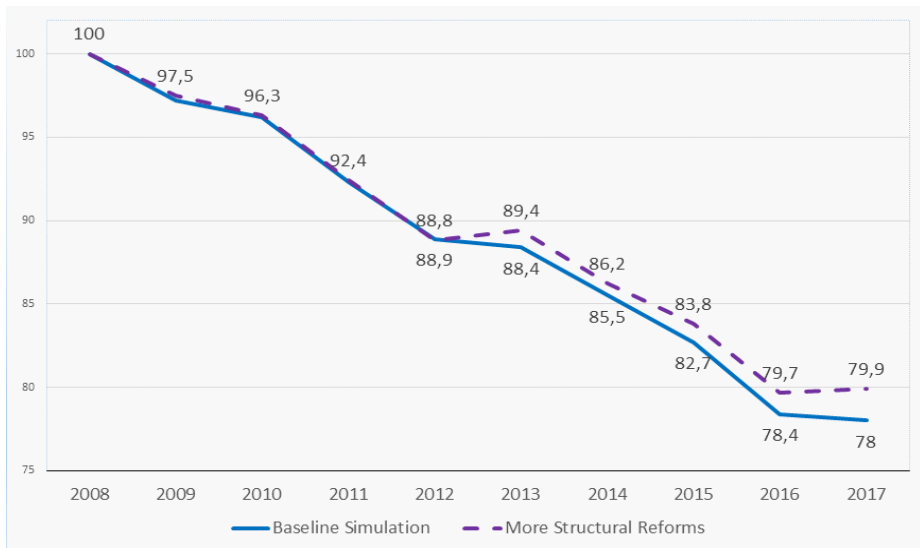
Counterfactual III: Less austerity - gov spending increases



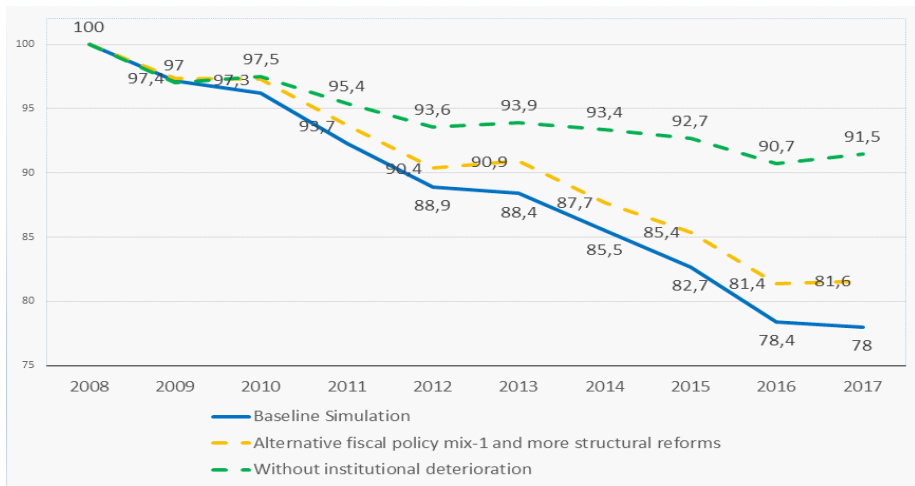
Counterfactual IV: Alternative fiscal policy mixes



Counterfactual V: More structural reforms



Counterfactual VI: Alternative fiscal policy mix, stronger structural reforms and pre-crisis institutions



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 - More counterfactuals (e.g. conditional aid, and hypothetical scenarios from now on)

- Richer model:

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 - Two-country model (Greece and Germany)

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 - **institutions had not deteriorated since 2008**
 - a different budget "neutral" policy mix (e.g. lower income taxes and/or higher public investment in exchange of lower transfers) - see e.g. Economides et al. (2020)
 - **structural reforms (especially, in product market and public sector) had been implemented**

Thank you for your attention!

$$\begin{aligned}
 & (1 + \tau_t^c) \left(\frac{p_t^h}{p_t} c_{k,t}^h + \frac{p_t^f}{p_t} c_{k,t}^f \right) + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} f_{k,t-1} + \\
 & \quad + q_t s_{k,t} + \frac{p_t^h}{p_t} \psi^p(\cdot) + h_{k,t} = \\
 & \equiv (1 - \tau_t^y) w_t^k l_{k,t} + (q_t + \pi_{k,t}^i) s_{k,t-1} + \pi_{k,t}^p \\
 & \quad + \frac{e_t p_t^*}{p_t} f_{k,t} + \frac{p_{t-1}}{p_t} h_{k,t-1} + \bar{g}_t^{tr} + \\
 & + \left(\frac{\Gamma^k (s_{k,t})^\gamma}{N^k \Gamma^k (s_{k,t})^\gamma + N^w \Gamma^w (s_{w,t})^\gamma + N^b \Gamma^b (s_{b,t})^\gamma} \right) (1 - PR_t) Y_t
 \end{aligned}$$

► households

$$\begin{aligned}
 & (1 + \tau_t^c) \left(\frac{p_t^h}{p_t} c_{w,t}^h + \frac{p_t^f}{p_t} c_{w,t}^f \right) + j_{w,t} + h_{w,t} \equiv \\
 & \equiv (1 - \tau_t^y) w_t^w l_{w,t} + (1 + i_t^d) \frac{p_{t-1}}{p_t} j_{w,t-1} + \frac{p_{t-1}}{p_t} h_{w,t-1} + \bar{g}_t^{tr} + \\
 & + \left(\frac{\Gamma^w(s_{w,t})^\gamma}{N^k \Gamma^k(s_{k,t})^\gamma + N^w \Gamma^w(s_{w,t})^\gamma + N^b \Gamma^b(s_{b,t})^\gamma} \right) (1 - PR_t) Y_t
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$$\begin{aligned} & (1 + \tau_t^c) \left(\frac{p_t^h}{p_t} c_{b,t}^h + \frac{p_t^f}{p_t} c_{b,t}^f \right) + j_{b,t} + h_{b,t} = \\ & = (1 - \tau_t^y) w_t^g l_{b,t} + (1 + i_t^d) \frac{p_{t-1}}{p_t} j_{b,t-1} + \frac{p_{t-1}}{p_t} h_{b,t-1} + \bar{g}_t^{tr} + \\ & + \left(\frac{\Gamma^b(s_{b,t})^\gamma}{N^k \Gamma^k(s_{k,t})^\gamma + N^w \Gamma^w(s_{w,t})^\gamma + N^b \Gamma^b(s_{b,t})^\gamma} \right) (1 - PR_t) Y_t \end{aligned}$$

▶ households

Standard Dixit-Stiglitz technology:

$$y_{h,t}^h = \left[\sum_{i=1}^{N^i} \frac{1}{N^i} (y_{i,t}^h)^\theta \right]^{\frac{1}{\theta}}$$

Real profits:

$$y_{h,t}^h - \sum_{i=1}^{N^i} \frac{1}{N^i} \frac{p_{i,t}^h}{p_t^h} y_{i,t}^h$$

▶ private firms

Net profit:

$$\begin{aligned}\pi_{i,t} \equiv & (1 - \tau_t^\pi) \left[PR_t \frac{p_{i,t}^h}{p_t} y_{i,t}^h - w_t^w l_{i,t}^w - w_t^k l_{i,t}^k - \frac{p_t^f}{p_t} m_{i,t}^f \right] - \\ & - \frac{p_t^h}{p_t} [k_{i,t} - (1 - \delta)k_{i,t-1}] - \frac{p_t^h}{p_t} \frac{\zeta^k}{2} \left(\frac{k_{i,t}}{k_{i,t-1}} - 1 \right)^2 k_{i,t-1} - \\ & - \frac{p_t^h}{p_t} \frac{\zeta^p}{2} \left(\frac{p_{i,t}^h}{p_{i,t-1}^h} - 1 \right)^2 \bar{y}_{i,t}^h + \left(L_{i,t} - (1 + i_t^l) \frac{p_{t-1}}{p_t} L_{i,t-1} \right)\end{aligned}$$

Production function:

$$y_{i,t}^h = A^p \left(\frac{N^g y_{i,t}^g}{N^i} \right)^\sigma \left[(\chi^p (k_{i,t-1})^{op} + (1 - \chi^p) (m_{i,t}^f)^{op})^{\frac{\alpha}{op}} (A^w l_{i,t}^w + A^k l_{i,t}^k)^{1-\alpha} \right]^{1-\sigma}$$

Borrowing constraint:

$$L_{i,t} \leq \rho^l \frac{p_t^h}{p_t} k_{i,t-1}$$

Demand for product:

$$p_{i,t}^h = p_t^h \left(\frac{y_{i,t}^h}{y_{h,t}^h} \right)^{\theta-1}$$

▶ private firms

There are N^c capital good firms indexed by the subscript $c = 1, 2, \dots, N^c$.
In each period, each c maximizes:

$$\pi_{c,t} \equiv Q_t x_{c,t} - x_{c,t}$$

▶ private firms

The **budget constraint** of each bank that connects changes in its assets and liabilities is:

$$L_{p,t} + b_{p,t} + \pi_{p,t} + (1 + i_t^d) \frac{p_{t-1}}{p_t} j_{p,t-1} + \frac{p_t^h}{p_t} \Xi(L_{p,t}, z_{p,t}, b_{p,t}) +$$

$$+ (1 + i_t^z) \frac{p_{t-1}}{p_t} z_{p,t-1} \equiv (1 + i_t^l) \frac{p_{t-1}}{p_t} L_{p,t-1} + (1 + i_t^*) \frac{p_{t-1}}{p_t} b_{p,t-1} + j_{p,t} + z_{p,t}$$

Borrowing constraint:

$$z_{p,t} \leq \rho^z (L_{p,t} + b_{p,t})$$

▶ private banks

The cost of each state firm for producing the public good is in real terms:

$$w_t^g l_t^g + \frac{p_t^h}{p_t} (g_{g,t}^g + g_{g,t}^i) + \frac{p_t^f}{p_t} m_{g,t}^g$$

The production function of each state firm is:

$$y_{g,t}^g = A^g \left(\chi^g (k_{g,t-1}^g)^{\theta_1} + (1 - \chi^g) (m_{g,t}^g)^{\theta_1} \right)^{\frac{\theta_1}{\theta_1}} (l_{g,t}^g)^{\theta_2} (g_{g,t}^g)^{1-\theta_1-\theta_2}$$

▶ state firms

The Government budget constraint

The flow budget constraint of the government written in per capita and real terms is:

$$\begin{aligned} & \bar{g}_t^{tr} + n^b \left[w_t^g l_{g,t}^g + \frac{p_t^h}{p_t} (g_{g,t}^g + g_{g,t}^i) + \frac{p_t^f}{p_t} m_{g,t}^g \right] + \\ & + (1 + i_t^*) \frac{p_{t-1}}{p_t} \lambda_{t-1}^d d_{t-1} + (1 + i_t^*) \frac{p_{t-1}}{p_t} \lambda_{t-1}^{ncb} d_{t-1} + \\ & (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} \frac{p_{t-1}}{e_{t-1} p_{t-1}^*} \lambda_{t-1}^g d_{t-1} + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} \frac{p_{t-1}}{e_{t-1} p_{t-1}^*} \lambda_{t-1}^{eu} d_{t-1} \\ & + \frac{p_t^h}{p_t} \psi^g(.) \equiv d_t + \frac{T_t}{N} + rcb_t^g \end{aligned}$$

The Government budget constraint

Total tax revenues in real terms are defined as:

$$\begin{aligned} T_t \equiv & \tau_t^c \left[N^k \left(\frac{p_t^h}{p_t} c_{k,t}^h + \frac{p_t^f}{p_t} c_{k,t}^f \right) + N^w \left(\frac{p_t^h}{p_t} c_{w,t}^h + \frac{p_t^f}{p_t} c_{w,t}^f \right) + \right. \\ & \left. + N^b \left(\frac{p_t^h}{p_t} c_{b,t}^h + \frac{p_t^f}{p_t} c_{b,t}^f \right) \right] + \tau_t^y N^k \left[\frac{p_t^h}{p_t} r_t^k k_{k,t-1} + \pi_{k,t} + w_t^k l_{k,t} \right] \\ & + \tau_t^y N^w w_t^w l_{w,t} + \tau_t^y N^b w_t^g l_{b,t} \end{aligned}$$

► treasury

The National central bank

The budget constraint of the NCB linking changes in assets and liabilities is (written in real and per capita terms):

$$\begin{aligned} & n^k z_{p,t} + \lambda_t^{ncb} d_t + rcb_t^g \equiv \\ & \equiv \left(h_t^n - \frac{p_{t-1}}{p_t} h_{t-1}^n \right) + \left(TARG_t - \frac{p_{t-1}}{p_t} TARG_{t-1} \right) + \\ & + n^k (1 + i_t^z) \frac{p_{t-1}}{p_t} z_{p,t-1} + (1 + i_t^*) \frac{p_{t-1}}{p_t} \lambda_{t-1}^{ncb} d_{t-1} \end{aligned}$$

where

$$h_t^n = n^k h_{k,t} + n^w h_{w,t} + n^b h_{b,t}$$

that is, banknotes are equal to currency held by the public for liquidity providing services.

Consolidated government budget constraint

The consolidated government budget constraint (in real and per capita terms) is:

$$\begin{aligned} & \bar{g}_t^{tr} + (1 + i_t^*) \frac{p_{t-1}}{p_t} \lambda_{t-1}^d d_{t-1} + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} \frac{p_{t-1}}{e_{t-1} p_{t-1}^*} \lambda_{t-1}^g d_{t-1} + \\ & + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} \frac{p_{t-1}}{e_{t-1} p_{t-1}^*} \lambda_{t-1}^{eu} d_{t-1} + \\ & + n^b \left[w_t^g l_{g,t}^g + \frac{p_t^h}{p_t} (g_{g,t}^g + g_{g,t}^i) + \frac{p_t^f}{p_t} m_{g,t}^g \right] + \end{aligned}$$

$$\begin{aligned}
& + \frac{p_t^h}{p_t} \frac{\psi^g}{2} \left[\frac{\frac{e_t p_t^*}{p_t} (n^k f_{k,t} + \lambda_t^g d_t)}{\frac{p_t^h}{p_t} n^k y_{i,t}^h} - \bar{f} \right]^2 n^k y_{i,t}^h = (\lambda_t^d + \lambda_t^g + \lambda_t^{eu}) d_t + \frac{T_t}{N} + \\
& + n^k h_{k,t} + n^w h_{w,t} + n^b h_{b,t} - \frac{p_{t-1}}{p_t} (n^k h_{k,t-1} + n^w h_{w,t-1} + n^b h_{b,t-1}) - \\
& - n^k \left(z_{p,t} - (1 + i_t^z) \frac{p_{t-1}}{p_t} z_{p,t-1} \right) + \left(TARG_t - \frac{p_{t-1}}{p_t} TARG_{t-1} \right)
\end{aligned}$$

▶ macro policy regime

Balance of payments

If we add up the budget constraints of all agents, we get the country's balance of payments (in real and per capita terms):

$$\begin{aligned} & \frac{p_t^f}{p_t} \left(n^k c_{k,t}^f + n^w c_{w,t}^f + n^b c_{b,t}^f + n^k m_{i,t}^f + n^b m_{g,t}^g \right) - \\ & - \frac{p_t^h}{p_t} c_t^{f*} + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} n^k f_{k,t-1} + \\ & + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} \frac{p_{t-1}}{e_{t-1} p_{t-1}^*} \lambda_{t-1}^g d_{t-1} + \\ & + (1 + i_t^*) \frac{p_{t-1}^*}{p_t^*} \frac{e_t p_t^*}{p_t} \frac{p_{t-1}}{e_{t-1} p_{t-1}^*} \lambda_{t-1}^{eu} d_{t-1} + \end{aligned}$$

$$\begin{aligned}
& + \frac{p_t^h}{p_t} \frac{\psi^p}{2} \left[\frac{\frac{e_t p_t^*}{p_t} (n^k f_{k,t} + \lambda_t^g d_t)}{\frac{p_t^h}{p_t} n^k y_{i,t}^h} - \bar{f} \right]^2 n^k y_{i,t}^h + \\
& + \frac{p_t^h}{p_t} \frac{\psi^g}{2} \left[\frac{\frac{e_t p_t^*}{p_t} (n^k f_{k,t} + \lambda_t^g d_t)}{\frac{p_t^h}{p_t} n^k y_{i,t}^h} - \bar{f} \right]^2 n^k y_{i,t}^h = \\
& = \frac{e_t p_t^*}{p_t} n^k f_{k,t} + \lambda_t^g d_t + \lambda_t^{eu} d_t + \left(TARG_t - \frac{p_{t-1}}{p_t} TARG_{t-1} \right)
\end{aligned}$$

▶ macro policy regime

Country's interest rate

Following most of the literature on small open economies we use the functional form:

$$i_t^* = i^* + \psi^* \left(\exp\left(\frac{d_t}{\frac{p_t^h}{p_t} n^k y_{i,t}^h} - \bar{d}\right) - 1 \right)$$

▶ stationarity

Tullock-type rent seeking competition

Given ill-defined property rights, we assume that:

- total real output, Y_t , is a contestable prize,
- $0 < PR_t \leq 1$ is the degree of protection of property rights and

$$\left(\frac{\Gamma^i(s_{i,t})^\gamma}{N^k \Gamma^k(s_{k,t})^\gamma + N^w \Gamma^w(s_{w,t})^\gamma + N^b \Gamma^b(s_{b,t})^\gamma} \right) (1 - PR_t) Y_t$$

is the fraction of the prize extracted by each agent $i = k, w, b$ in a Tullock (1980) type rent-seeking competition.

► institutions

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Professor Apostolis Philippopoulos

Professor of Economics, Department of Economics, Athens University of Economics and Business

Dr George Economides

Associate Professor of Economics, Department of International & European Economic Studies,
School of Economic Sciences, Athens University of Economics and Business

Chair: Dr Vassilis Monastiriotis

Associate Professor of Political Economy, LSE

#LSEGreece

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