Public investment in Europe

Since the crisis, public investment has fallen in a number of European countries, particularly those that came under market pressure.[1] Low levels of public investment, if maintained over a prolonged period, may lead to a deterioration of public capital and diminish longer-term output. The fall in public investment and the current low interest rate environment have prompted calls to stimulate public investment spending as a way to increase short-term demand and raise potential output. In the European Union (EU), this has led to the adoption of the Investment Plan for Europe (2015). The fiscal positions of many EU countries remain precarious, however, and the provisions of the Stability and Growth Pact call for further fiscal consolidation in many of them. Using a model-based analysis, this article considers the circumstances under which additional public investment might best stimulate economic growth and what the impact on public finances would be.

1   Introduction

Public investment in Europe has fallen in recent years, which has led to calls to stimulate public investment in the current low interest rate environment. While, for the EU as a whole, the public investment-to-GDP ratio remains at the same level as before the crisis, in the euro area the ratio is somewhat lower. In particular, recent years have seen the ratio decline in countries that had to undergo sizeable fiscal adjustment owing to market pressure. The fall in public investment and persistently weak growth following the crisis have led to a debate on the desirability of increasing investment in public infrastructure. In this debate it is argued that public investment would be particularly effective in an environment of low borrowing costs for governments, in which monetary policy interest rates stand at around zero.[2] This has resulted in initiatives to stimulate public investment at both the national and international levels (see Box 1 on the Investment Plan for Europe).

The article assesses the impact of further public investment in terms of economic efficiency, longer-term growth and public finances. Section 2 provides an overview of recent developments in public investment in Europe and offers a comparison with the United States and Japan. Section 3 provides a brief overview of different strands of the literature on the contribution of public investment to output growth. Section 4 is dedicated to model simulations and examines the effect of additional public investment in the euro area. Section 5 concludes.

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[1]   In this article, public investment is measured using the gross fixed capital formation of the general government, which enables the use of comparable data available for a large number of countries. See Box 2 for more information on the limitations of these data and on measurement issues.

[2]   See, for example, "Is it time for an infrastructure push? The macroeconomic effects of public investment", *World Economic Outlook*, IMF, 2014.

Box 1
The Investment Plan for Europe – "the Juncker plan"

The Investment Plan for Europe – also known as the Juncker Plan, after the current President of the European Commission – is a package of measures presented by the Commission in late 2014, aimed at unlocking public and private investment in the real economy amounting to at least €315 billion (around 2% of EU GDP in 2015) over the period 2015-17.[3] The Plan has three pillars: (i) setting up a European Fund for Strategic Investment (EFSI) to mobilise private investment; (ii) helping investors to find and launch new investment projects by creating a European Investment Advisory Hub and a European Investment Project Portal; and (iii) improving framework conditions for investment through structural reforms at the European and national levels.

With regard to the first pillar, the EFSI Regulation was approved in June 2015 – less than five months after the Commission presented the legislative proposal – and the Fund started its preliminary operations in October of the same year. Operationally, a guarantee of €16 billion has been created under the EU budget, which will be used to build EFSI public guarantees. The European Investment Bank (EIB) has committed an additional €5 billion. This initial sum of public money will give the EFSI a risk-absorbing capacity of €21 billion, which is expected to be leveraged by €294 billion of private funding – i.e. by a factor of 15 (which is based on historical experience). These funds will be used through two "windows": the Infrastructure and Innovation Window (to be deployed by the EIB and expected to finance around 75% of the final €315 billion target) and the SME Window (to be deployed by the European Investment Fund (EIF)).

The EFSI lending operations are designed to go beyond the standard EIB and EIF activities. EFSI operations should be designed to finance, at "sustainable" rates, those projects that cannot be funded either by the market or by the standard EIB/EIF instruments because of the company's size, the high risk involved in new technologies or the deadlines required. In this respect, the EFSI is expected to generate "additional" investment projects alongside the ongoing EIB/EIF investment pipeline.[4]

So far, nine Member States (Bulgaria, Germany, Spain, France, Italy, Luxembourg, Poland, Slovakia and the United Kingdom) have pledged around €43 billion to co-finance EFSI projects, but none have contributed directly to EFSI capital. Despite the favourable treatment, provided under the Stability and Growth Pact, of contributions to the EFSI in the form of guarantees or cash, the contributions announced by the above-mentioned Member States will be only at the level of individual projects and national investment platforms.[5] Hence, these Member States will only be participating in investment projects in their own country. This signals the difficulty involved

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[3]   See the European Commission's Communication entitled "An investment Plan for Europe", available at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2014:903:FIN.

[4]   For the full description of this requirement, see Annex II which provides the relevant extract of Regulation (EU) 2015/1017 of the European Parliament and of the Council of 25 June 2015 on the European Fund for Strategic Investments.

[5]   The Commission clarified in January 2015 that cash contributions used to set up the EFSI will not be counted when defining the fiscal adjustment under either the preventive or corrective arm of the Stability and Growth Pact. If a country's budget deficit exceeds 3% of GDP, the Commission will not launch an excessive deficit procedure if the excess is due to a contribution to the EFSI, provided that the deviation is small and expected to be temporary. Even when assessing the fulfilment of the debt criterion, contributions to the EFSI will not be taken into account.

in overcoming the "juste retour" principle often mentioned in discussions on the EU budget, namely each Member State's primary concern for ensuring that its contribution to the EU's financial resources flows back into the national economy. EFSI-financed projects will not be allocated on the basis of national keys but only on their merits.

The second pillar of the Investment Plan is crucial for eliminating a number of procedural and information-related inefficiencies in terms of matching investment projects with private and public financing. The European Investment Advisory Hub, established within the EIB and financed by both the EIB and the Commission, is expected to: (i) offer investment guidance and expertise; (ii) provide a platform for the exchange of know-how; and (iii) coordinate existing technical assistance. The European Investment Project Portal, on the other hand, will help investors to find investment opportunities by listing investment projects which support EU objectives and are expected to start within three years, with or without EFSI funding.

To strengthen the work under the third pillar of the Investment Plan, improving the investment climate at the Member State level has been made an integral part of the 2016 European Semester process. To this end, the 2016 Annual Growth Survey (AGS) has been accompanied by a staff working document on challenges to Member States' investment environments.[6] The document summarises each country's investment profile and identifies key challenges to investment at the national level in the following fields: (i) public administration/business environment; (ii) labour market/ education; (iii) financial sector/taxation; (iv) research, development and innovation; and (v) sector-specific regulation. The main challenges identified at this stage are expected to be analysed further within the framework of the European Semester process, particularly in the country reports, and through thematic discussions within the Council and its Committees. These challenges could also lead to country-specific recommendations being addressed to individual Member States.

An EU agenda will complement Member States' actions in removing barriers to investment. With regard to the actions to be taken at the European level, the Commission has specified that progress towards a "Digital Single Market", "Energy Union" and "Capital Markets Union" is key to improving the business environment and financing conditions in the EU. The 16 targeted actions under the Digital Single Market strategy are expected to be delivered by the end of 2016, while the 15 actions announced for the Energy Union will be implemented in 2016-17. The action plan for the Capital Markets Union was published by the Commission on 30 September 2015.[7] The document discusses the EFSI and other pillars of the Investment Plan, and announces the Commission's intention to present revised calibrations in EU prudential legislation for the insurance sector (the Solvency II Directive) to ensure that insurance companies are subject to regulatory treatment that could further stimulate long-term investment.

Further progress under the third pillar of the Investment Plan is crucial for its success. Triggering investments through the use of public funds requires careful examination of how to employ these resources most effectively; at the same time, it requires effective implementation of

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6   See the European Commission's staff working document entitled "Challenges to Member States' Investment Environments", available at http://ec.europa.eu/europe2020/pdf/2016/ags2016_challenges_ ms_investment_environments_en.pdf.

7   See the European Commission's Communication entitled "Action Plan on Building a Capital Markets Union", available at http://ec.europa.eu/finance/capital-markets-union/docs/building-cmu-action-plan_en.pdf.

specific public policies, notably structural reforms, in order to improve the investment climate. For this reason, the Plan includes a comprehensive set of measures across different policy areas. 2015 was marked by swift progress under the first pillar: the 2016 AGS reports that, by the end of 2015, the EFSI was expected to have mobilised around €50 billion for investment in Europe. This represents around 15% of the overall target agreed for the period 2015-17. In the remaining two years, concrete and effective policy measures under the other two pillars will be essential to complement EFSI funding and to ensure that these additional funds can be effectively deployed and channelled into the European economy. More specifically, under the third pillar, the implementation of reforms targeted at frictions that hold back investment demand (such as reducing the administrative burden on young firms or speeding up insolvency proceedings) has the potential to raise the opportunity cost of investment now and allow finance to flow quickly to the new investment opportunities that these reforms create.[8]

2 Recent developments in public investment

Both public and private investment have fallen in the years following the financial and sovereign debt crisis. After being stable at around 3% of GDP for more than a decade, public investment in the euro area started to increase in 2005, reaching 3.6% of GDP in 2009 (see Chart 1). In the years following the crisis, public investment reverted to a ratio below the pre-crisis average of 3% of GDP. For the EU as a whole, the public investment ratio follows a similar pattern, with a less pronounced post-crisis retrenchment. Developments in public investment in Europe mirror developments in the United States, albeit at a lower level. By contrast, the public investment-to-GDP ratio in Japan went into long-term decline following
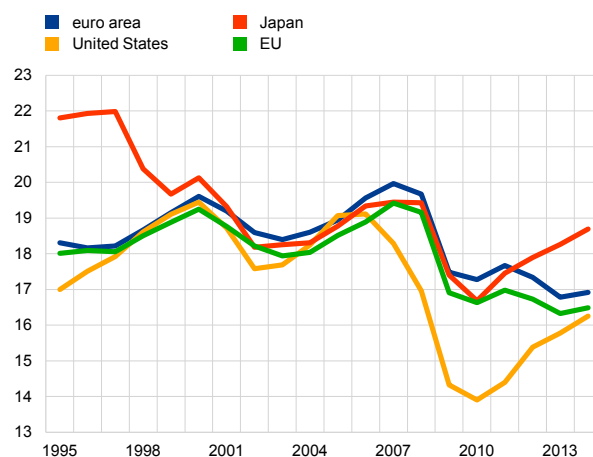
Chart 1
Public investment

(as a percentage of GDP)

- euro area
- United States
- Japan
- EU
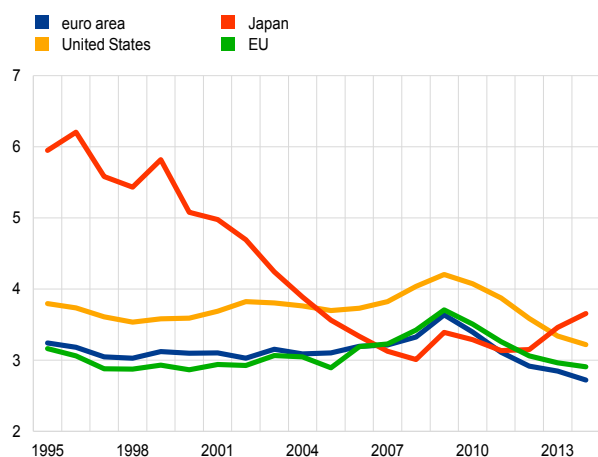
Source: European Commission.

Chart 2
Private investment

(as a percentage of GDP)

- euro area
- United States
- Japan
- EU

Source: European Commission.

[8] See the introductory speech by the President of the ECB at the ECB Forum on Central Banking, Sintra, 22 May 2015, available at https://www.ecb.europa.eu/press/key/date/2015/html/sp150522.en.html

the high levels observed in the mid-1990s, although more recently it has started to pick up. Private sector investment in Europe declined during and after the crisis, and has not yet recovered, by contrast with developments in the United States and Japan (see Chart 2). While public investment data are subject to various limitations, in particular measurement issues (see Box 2), the recent developments observed in public investment are difficult to attribute to those limitations. For example, although the increased use of public-private partnerships (PPPs) and privatisations has been shifting parts of previously public investment to private investment since the 1970s, the decline in post-crisis public investment in the EU has been accompanied by a fall, not an increase, in private investment (see Charts 1 and 2).

Developments in public investment are very heterogeneous across countries in the EU. When comparing pre-crisis public investment, as a percentage of GDP, with the average over the past three years, three distinct groups of countries can be identified (see Chart 3). First, there have been large investment cuts in countries with substantial fiscal consolidation needs. The largest declines in public investment ratios took place in countries with initially high general government investment rates, which were in some cases related to pre-crisis booms, and in countries under market pressure. Most notably, public investment-to-GDP ratios fell in Croatia, Portugal, Greece, Spain, Cyprus and Ireland. Second, in countries with relatively low levels of general government investment in the years leading up to the crisis, public investment has neither declined much nor increased (Belgium, Germany and Austria). Third, public investment has increased in a number of eastern EU countries, in particular those that have benefited from the increasing use of cohesion funds after joining the EU (Latvia, Poland, Romania and Bulgaria).

As a ratio of government expenditure, developments in public investment have been even more heterogeneous across EU countries. When measured as a percentage of GDP (see Chart 3), the investment ratio is influenced by the

Chart 3

Public investment-to-GDP ratio
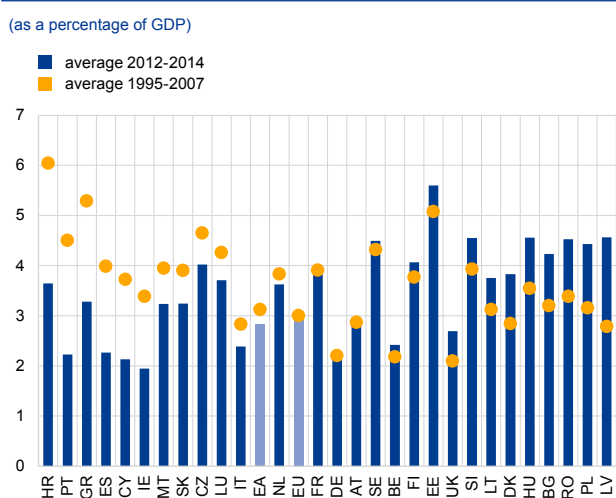
(as a percentage of GDP)

Source: European Commission.
Note: Countries ordered by change in average public investment 2012-14 versus 1995-2007.

Chart 4

Public investment-to-government expenditure ratio
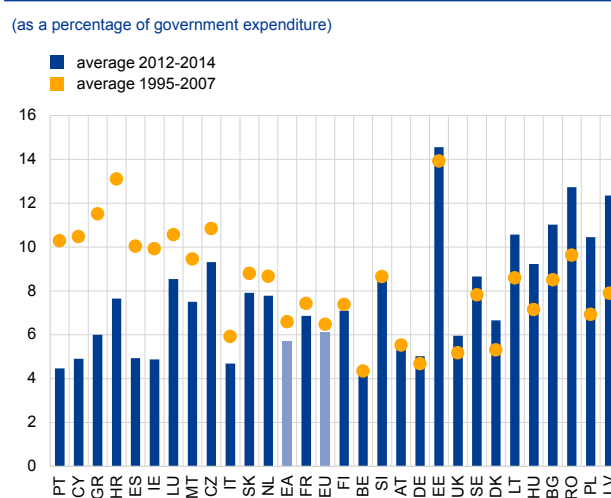
(as a percentage of government expenditure)

Source: European Commission.
Note: Countries ordered by change in average public investment 2012-14 versus 1995-2007.

negative effect of the crisis on output growth. As a share of total public expenditure (see Chart 4), the decline in investment in countries under market pressure reflects the fact that government investment was used more intensively than other expenditure items as a consolidation instrument.

Box 2
Public investment and capital: data and measurement issues

This box discusses the limitations of the data on public investment and capital, which should be taken into account when interpreting comparisons across countries and over time. At least four specific points may be mentioned. First, the distinction between investment and other government expenditure is not always clear with respect to their effect on the productive capacity of the economy. In the national accounts, gross fixed capital formation consists of resident producers' acquisitions minus disposals of fixed tangible or intangible assets, in particular machinery and equipment, vehicles, dwellings and other buildings. However, while education and health care expenditure contributes to reinforcing (private) human capital stock, thus also enhancing the supply side of the economy and contributing to growth, it is mostly considered to be current expenditure rather than investment. Moreover, public investment also includes expenditure on sports stadiums and military equipment, which have debatable effects on the productive capacity of the economy. The distinction between capital and consumption spending has also changed over time. For example, under the current statistical standard, ESA 2010, expenditure on Research and Development and purely military equipment (i.e. without possible civilian use) is treated as capital expenditure, whereas it was considered to be consumption under the previous statistical standard (ESA 95).[9] Second, the distinction between public and private investment is not always clear in practice, for example when private parties participate in infrastructure projects through PPPs with budgetary risks for the government posed by (explicit or implicit) guarantees. Third, the delineation between the public and private sectors also differs between countries, which partly explains the differences observed across Member States. Last, public capital stock data are not observed but are rather constructed, based on investment flow data, depreciation rates and an estimate of the initial public capital stocks.

Alternative measures of (public) investment, e.g. physical measures, such as broadband penetration, the length of roads and railways or the number of fixed telephone lines, can only partly circumvent some of the limitations of investment (or capital stock) data. Significant limitations include the facts that the quality of infrastructure is often not correctly measured, including the question of valuations, and that comparable cross-country data are scarce and heterogeneous.

With these caveats in mind, this article, as in most of the literature, uses the conventional measure of government investment as defined in national accounts.

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[9] For further information, see "New international standards in statistics – enhancements to methodology and data availability", *Monthly Bulletin*, ECB, August 2014.

3   The contribution of public investment to growth

An increase in public investment can positively affect economic growth in two ways. First, an increase in public investment has positive effects on aggregate demand. In addition, efficient public investment can contribute to the economy's productive capacity by increasing the stock of public capital. However, it is important to consider the cost and benefit of additional public capital carefully, taking into account the financing alternatives and their effects on output and public finances.

**There is considerable uncertainty surrounding the size of short-term fiscal multipliers.** Public investment is usually found to be an expenditure category with a relatively high short-term fiscal multiplier, but there is considerable uncertainty surrounding the size of the multipliers that are found to be country, time and episode-specific.[10] They are, for example, larger during recessions, but found to be smaller in the presence of weak public finances, particularly when debt sustainability is at risk. In addition, multipliers depend on how the expenditure is financed, whether through debt, increases in revenues or cuts in other expenditure categories.

Empirical estimates of the effect of public capital increases on output tend to be positive but heterogeneous. Estimates based on production or cost functions typically find a (small) positive effect, but with considerable variation according to the time period, country, measure of capital and estimation method (see Chart 5). Estimates of the output elasticity of public capital taken from 68 papers published between 1983 and 2008 find an average output elasticity of 0.106, after correcting for a possible publication bias.[11] The general conclusion from this strand of the literature

Chart 5

Production function estimates of the output elasticity of public capital

(frequency of estimates)
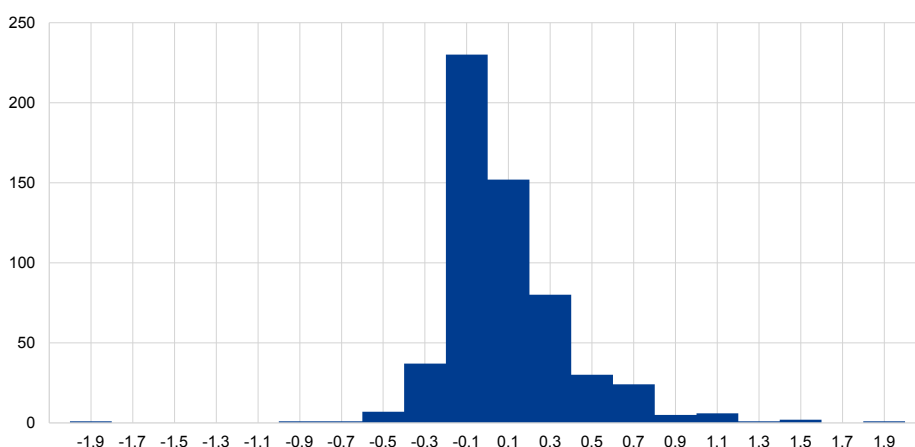
Source: Bom, P.R.D. and Ligthart, J.E., "What have we learned from three decades of research on the productivity of public capital?", *Journal of Economic Surveys*, Vol. 28, No 5, 2014, pp. 889-916.

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[10]   For an overview, see "Fiscal multipliers and the timing of consolidation", *Monthly Bulletin*, ECB, April 2014, pp. 75-89.

[11]   See, for example, Bom, P.R.D. and Ligthart, J.E., "What have we learned from three decades of research on the productivity of public capital?", *Journal of Economic Surveys*, Vol. 28, No 5, 2014, pp. 889-916.

is that public capital supports the potential output level, in particular investment in core infrastructure, e.g. roads, railways and telecommunications. The positive contribution of public capital increases to growth shows a decline over time. This might be related to a downward trend in the marginal productivity of public capital in most developed countries, owing to the completion of infrastructure networks, such as roads or railways, rendering gains from additional investment smaller than in the past.[12]

Estimates of the impact of public investment that also consider the impact on public finances yield less positive results. The production and cost function approaches mentioned above highlight only the benefits of public investment or public capital. However, a government facing the decision of whether or not to invest more has to trade this additional investment off against lower public consumption expenditure, higher taxes or an increase in the debt level. Research based on VAR models, which take the trade-off between additional investment and its financing into account, often finds public capital to have a less positive effect on output growth than estimates based on production functions, and, in some cases, a neutral or even negative effect.[13]

Structural models can provide more insight into the determinants of the effectiveness of additional investment and the conditions under which investment is more or less productive. For example, in a period of fiscal expansion, the output effect will be greater if the monetary policy authority does not respond by increasing its policy rate. Furthermore, studies that take into account implementation delays in investment find only slightly positive or potentially even negative responses in output and employment in the short run.[14] However, rich structural models come at the price of imposing restrictions on the data, with public investment often assumed to be productive (and possible changes in productivity over time not accounted for). For example, model simulations are often conditional on choosing a positive output elasticity of public capital; by assumption, the output effect of public investment then outperforms that of public consumption.[15]

4 Model simulations: what determines the effectiveness of public investment?

Given the considerable uncertainty surrounding past estimates of the growth impact of public investment, a comprehensive approach is called for when evaluating the macroeconomic and fiscal implications of an increase in public investment. To this end, this article utilises the Euro Area and Global

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[12] See, for example, Pereira, A.M. and Andraz, J.M., "On the economic effects of public infrastructure investment: a survey of the international evidence", *Journal of Economic Development*, Vol. 38, No 4, 2013, pp. 1-37.

[13] See, for example, Kamps, C., "The Dynamic Effects of Public Capital: VAR Evidence for 22 OECD Countries", *International Tax and Public Finance*, Vol. 12, Issue 4, 2005, pp. 533-558.

[14] Leeper, E.M., Walker, T.B. and Yang, S-C.S., "Government investment and fiscal stimulus", *Journal of Monetary Economics*, Vol. 57, Issue 8, 2010, pp. 1000-1012.

[15] A rare example of unrestricted estimation in a general equilibrium model, using a real business cycle model with US data, can be found in Ercolani, V. and Valle e Azevdo, J., "The effects of public spending externalities", *Journal of Economic Dynamics and Control*, Vol. 46, Issue C, 2014, pp. 173-199, which finds that public investment is unproductive.

Economy (EAGLE) model[16], calibrated for Germany, the rest of the euro area, the United States and the rest of the world (see Box 3 for a short description of the fiscal block of the model). For illustrative purposes, this section considers a temporary increase in public investment in a large euro area country (Germany).[17] More specifically, public investment is increased by 1% of the initial GDP over 20 quarters, and thereafter gradually returns to the baseline level[18]. The additional investment is debt-financed, and the fiscal rule, based on the adjustment of non-distortionary taxes, remains inactive during the first ten years of the simulation period. Since the government, by assumption, finances its debt at a risk-free rate, the possible credit risk premium effects of a deteriorating public debt outlook are ignored in these simulations. Moreover, the potential risk associated with higher public debt is not fed back to the balance sheets of those economic sectors that hold the debt. This is an important caveat when interpreting the results, particularly for countries in which sovereign debt sustainability cannot be taken for granted and where domestic financial institutions have large government bond holdings. In the benchmark simulation, the single monetary policy interest rate does not increase in response to the implied changes in the euro area macroeconomic developments (up to eight quarters following the shock). Importantly, the monetary policy stance is fully anticipated by households and firms.

Box 3
The fiscal block of the EAGLE model

With a few exceptions, the government sector representation in the EAGLE model is fairly standard in the context of general equilibrium macroeconomic models. Fiscal policy in the EAGLE model, unlike private sector behaviour, is not based on any explicit optimal decisions. Fiscal authorities set public expenditure proportional to nominal output, in line with the relevant long-term GDP ratios observed in the data. Similarly, on the revenue side, taxes are tied to the relevant tax bases via exogenous tax rates. The government may have a non-zero debt in equilibrium. The stability of government debt is ensured through an endogenous reaction in the non-distortionary taxes to deviations of the government debt-to-GDP ratio from its targeted value (the fiscal rule). Recent enhancement of the fiscal block, in line with Leeper et al. (2010),[19] enables public consumption and investment to play a greater role in affecting the optimal decision-making of the private sector.

More specifically, the public capital stock is assumed to be an important factor of production; therefore, variation in public investment may have strong and persistent supply-side effects. Intermediate-good production technology is formally specified as follows:

$$Y_t = z_t (K_{P,t})^\alpha (K_{G,t})^\beta (N_t)^{(1-\alpha-\beta)},$$

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[16]   Gomes, S., Jacquinot, P. and Pisani, M., "The EAGLE. A model for policy analysis of macroeconomic interdependence in the euro area", *Working Paper Series*, ECB, No 1195, 2010.

[17]   While the model is calibrated for Germany, the simulations should be considered illustrative of the economic channels involved, rather than country-specific.

[18]   The baseline levels are characterised by the steady state (long-term equilibrium) of the model.

[19]   Leeper, E.M., Walker, T.B. and Yang, S-C.S., "Government investment and fiscal stimulus", *Journal of Monetary Economics*, Vol. 57, Issue 8, 2010, pp. 1000-1012.

where Y_t is the output, z_t is the total factor productivity, $K_{P,t}$ and $K_{G,t}$ are the private and public capital stock respectively, N_t is the number of hours worked, and α and β are the output elasticity parameters of the private and public capital stock respectively. The public capital evolves by accumulating public investment net of depreciation:

$$K_{G,t} = (1 - \delta_G)K_{G,t-1} + I_{G,t}\varepsilon_t,$$

where δ_G is the public capital stock depreciation rate and ε_t is the public investment efficiency shock. The value of the output elasticity of the public capital stock determines the productivity of public capital (when $\beta = 0$, public investment does not feature any direct supply-side effects as the entire public capital stock is not productive). The variation in the investment efficiency shock controls the extent to which new investment expenditure contributes to the productive public infrastructure. The specific values of the parameters used in the baseline model simulations are similar to those used in Leeper et al. (2010): $\alpha = 0.30$, $\beta = 0.10$, $\delta_G = 0.025$.

Furthermore, private and public consumption goods are assumed to be complements, hence changes to public consumption may have persistent effects on private consumption. Households are assumed to derive utility from the consumption of a composite good consisting of private and public consumption goods:

$$CC_t = \left(v^{\frac{1}{\mu}}C_{P,t}^{\frac{\mu-1}{\mu}} + (1-v)^{\frac{1}{\mu}}C_{G,t}^{\frac{\mu-1}{\mu}} \right)^{\frac{\mu}{\mu-1}},$$

where CC_t is a composite consumption good, $C_{P,t}$ and $C_{G,t}$ are the private and public consumption goods respectively, v is the share of private goods in the consumption basket (when $v = 1$, public consumption yields no utility to households) and μ is the elasticity of substitution between government and private consumption ($\mu \to 0$ implies the government and private goods are perfect complements; $\mu \to \infty$ implies the government and private goods are perfect substitutes). The specific values of the parameters used in the baseline model simulations are in line with the euro area estimates reported in Coenen et al. (2013)[20]: $v = 0.75$ and $\mu = 0.50$.

The investment increase has a positive short and longer-term impact on the domestic economy, but it is not self-financing, as it results in an increase in the public debt-to-GDP ratio over the longer term. The investment shock implies a large positive impact on domestic GDP, even in the short run (see Chart 6). Domestic inflation initially increases, in line with stronger demand and an unresponsive monetary policy. The implied real interest rate declines temporarily, thereby providing a further boost to private demand in the short run. Over the medium term, the positive production capacity effects of the shock strengthen and output expands further to around 1.8% above its baseline value. On the fiscal side, short-run inflationary pressure and an expansion of domestic demand result in a cyclical increase in tax revenues. This partially offsets the deterioration in the
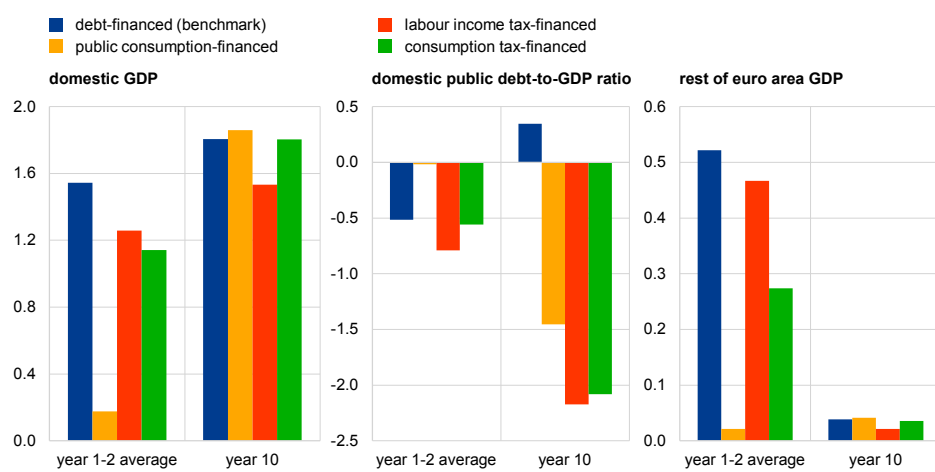
[20] Coenen, G., Straub, R. and Trabandt, M., "Gauging the effects of a fiscal stimulus package in the euro area", *Journal of Economic Dynamics and Control*, Vol. 37, Issue 2, 2013, pp. 367-386.

government deficit implied by a higher level of investment expenditure. As a result, the government debt-to-GDP ratio falls in the short run. However, because the deficit remains higher as long as the extra public investment is sustained, without additional fiscal adjustments the government debt ratio increases, albeit moderately, in the medium run.

Chart 6

Model simulations with various financing options to increase public investment

(deviation from baseline; percentages)

- debt-financed (benchmark)
- public consumption-financed
- labour income tax-financed
- consumption tax-financed

Source: ECB staff calculations.

The simulations indicate a positive short-term output stimulus for the rest of the euro area. The public investment shock in the domestic economy has a positive spillover effect on the rest of the euro area economy, primarily owing to trade linkages. Higher import demand by the private sector and an increase in the relative price of domestic goods in the domestic economy contribute to stronger exports in the rest of the euro area.

Financing investment with tax increases or expenditure cuts reduces the short-term output effect but improves the sustainability of public finances. If the increase in public investment is financed by an equivalent (ex ante) reduction in public consumption (1% of GDP), the positive demand effects of the public investment shock are largely neutralised in the short run. When the increase in public investment is matched by an equivalent (ex ante) increase in labour income taxes or consumption taxes, the positive demand effects of the public investment shock are estimated to be somewhat weaker in comparison with the benchmark results under debt financing. Higher labour income taxes harm domestic exports via the deterioration of international price competitiveness. The consumption tax increase negatively affects primarily private consumption via the reduced disposable real income channel. In addition, the distortionary impact of the labour income tax increase on labour utilisation has substantial negative output implications in the long run. As regards public finances, the use of tax instruments for financing higher public investment expenditure results in more favourable government deficit dynamics in the short run and implies a diminishing longer-term path of government debt. These results are based on the assumption that the government keeps expenditure,

other than public investment, in line with the initial baseline level, and that revenues increase with the additional GDP growth. In other words, the additional tax revenues associated with the increase in economic activity from the investment shock are not used for additional expenditure but for public debt reduction.

The monetary policy response plays a crucial role in the macroeconomic effects of a public investment increase, in particular the spillover to the rest of the euro area. If, unlike in the benchmark simulation, the monetary policy does not accommodate the shock but, instead, raises interest rates in response to the higher inflation risks posed by the short-term increase in demand, the pick-up in both private consumption and investment becomes more muted and this, in turn, limits output gains in the short run (see Chart 7). Under this scenario, there will be a less favourable public debt development over the entire simulation horizon. Moreover, an endogenous monetary policy reaction essentially neutralises the positive spillover effects of the shock on the rest of the euro area, since positive foreign trade effects are offset by higher real interest rates. Similarly, when the constant interest rate policy is not anticipated by the private sector (unanticipated accommodative monetary policy), the macroeconomic response is likely to be more gradual than under the benchmark scenario. Furthermore, when the monetary policy response places less emphasis on smoothing interest rates and greater emphasis on stabilising inflation and output, i.e. when there is a quicker return from a fixed interest rate policy to a normal monetary policy setting ("aggressive normalisation"), the domestic effects and the spillover to the rest of the euro area are estimated to be considerably smaller.

Chart 7

Model simulations with different monetary policy responses

(deviation from baseline; percentages)

- anticipated accomodative monetary policy (benchmark)
- endogenous monetary policy
- unanticipated accomodative monetary policy
- anticipated accomodative monetary policy, aggressive normalisation
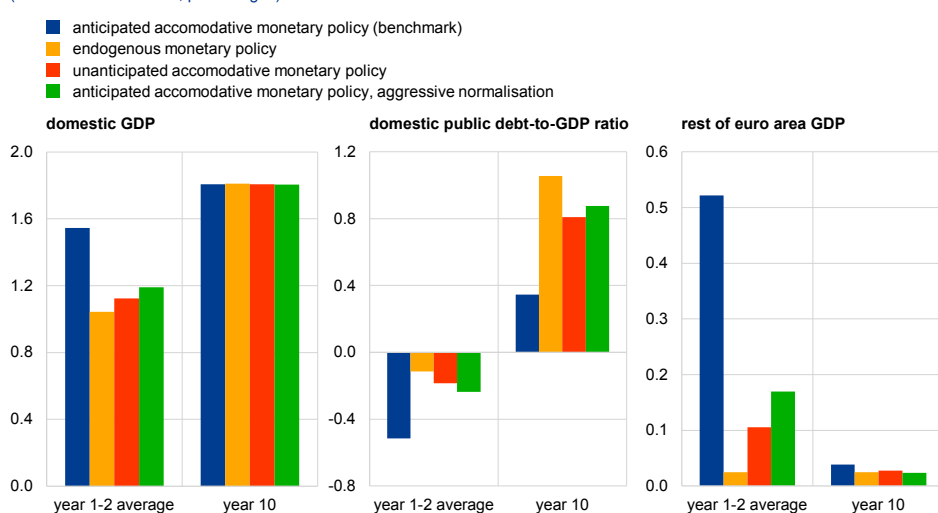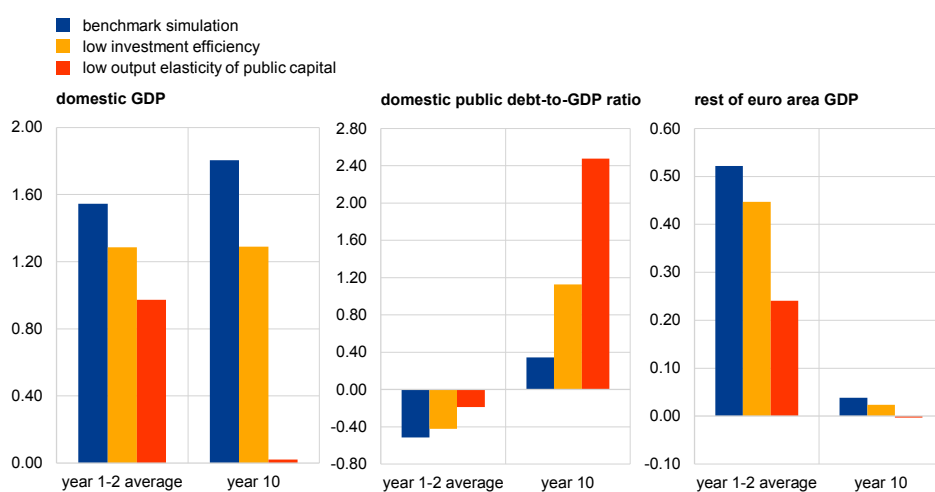

Source: ECB staff calculations.

Lower investment efficiency and lower productivity of public capital reduce the positive impact of additional public investment. In the benchmark simulation, all new public investment is initially assumed to be added to the productive capital stock and the output elasticity of the public capital stock is assumed to be positive and

calibrated to 0.1. An alternative scenario of low investment efficiency, in which only half of the new public investment contributes to the reinforcement of the productive public infrastructure, results in a weaker stimulus for the domestic economy and the rest of the euro area (see Chart 8). A simulation of efficient investment with a zero output elasticity of public capital (which essentially implies that the public capital has no productive use) gives rise to an even stronger dampening effect. In this case, higher public investment would have only demand-side direct effects. There is still a positive, but lower, impact on output in the short run. However, it gradually diminishes in the medium run, as private consumption and investment are no longer growth-supportive. Hence, the cyclical upswing in tax revenues is limited and fiscal balances deteriorate significantly. The spillovers to the rest of the euro area are also considerably smaller. The positive effect from investment thus hinges on investment efficiency and the productivity of public capital.

Chart 8

Model simulations with different degrees of investment efficiency and effectiveness of public capital

(deviation from baseline; percentages)

Source: ECB staff calculations.

5   Conclusions

Public investment in Europe has significantly declined since the crisis, although developments are heterogeneous across countries. This has led to calls to stimulate public investment in an environment of low borrowing costs for governments, weak economic growth and monetary policy at the lower bound.

An increase in public investment has positive demand effects and can contribute to the economy's potential output by increasing the stock of public capital. While the empirical literature on the effect of public capital on output typically finds a positive effect, estimates vary considerably according to the time period, country, measure of capital and estimation method. Similarly, the productivity of public capital increases may vary over time and could decline. Any increase in public

investment needs to be assessed in the light of its productivity, its financing and the relative costs and benefits of the financing options.

Model simulations of an increase in public investment in a large euro area economy illustrate the sensitivity of the implied output and budget implications to alternative policy implementation strategies. First, an increase in public investment will have the strongest short-term demand effects, including in terms of spillovers to other countries, with an anticipated accommodative monetary policy. This finding strengthens the case for increasing public investment in the current low-inflation environment. Second, a debt or revenue-financed increase in productive public investment implies significantly larger short-term output gains compared with an increase in investment financed by cutting other public expenditure. However, when distortionary taxes, e.g. labour income taxes, are used to finance public investment, the short-term output gains of additional public investment have to be traded off against tax-induced output losses over the longer term, whereas any increase in public investment financed by higher public debt must be weighed up against possible fiscal sustainability concerns. Last, the longer-term positive effects on the economy's potential output and the impact on public finances crucially depend on the effectiveness of investment and the productivity of public capital. If these are low, an increase in public investment is associated with a greater deterioration of the debt outlook and less persistent output gains. These findings underline the fact that economic considerations are important for ensuring a rigorous selection of productive investment projects.