DIW Weekly Report 31 2019

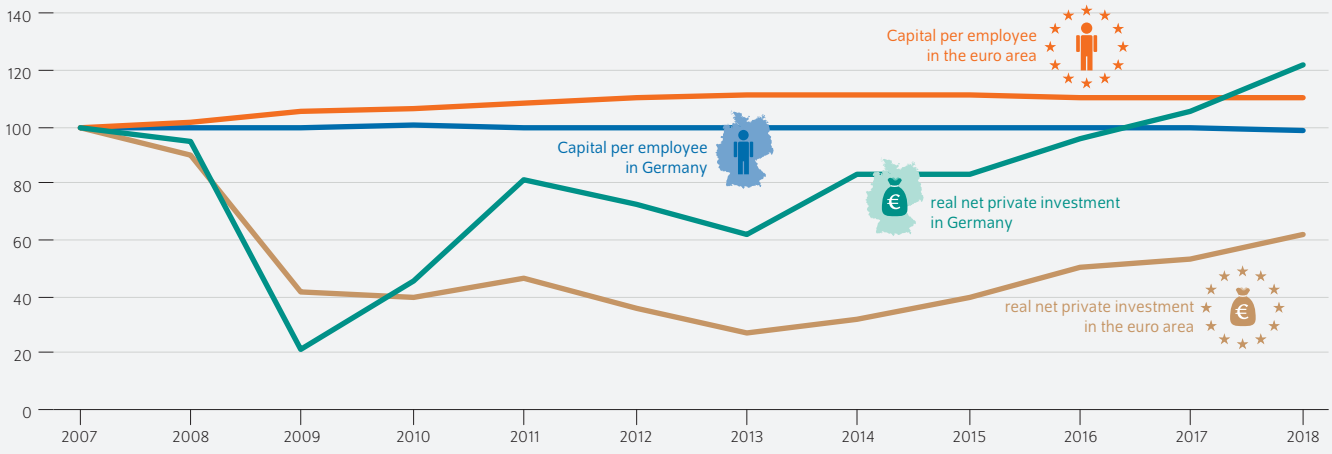
AT A GLANCE

Public investment a key prerequisite for private sector activity

By Marius Clemens, Marius Goerge, and Claus Michelsen

- Net investment in euro area still below pre-crisis level
- Private and public capital intensity plateau in euro area and Germany
- One billion euro additional public investment in the euro area would increase private investment by 1.1 billion euro after five years
- Effect greater in Germany; very strong for investment in construction and infrastructure
- To strengthen public investment, flexible expenditure rules should replace rigid balanced budget amendment

Private net investment increases in Germany more than in the euro area, but private capital intensity stagnates
Change in percentage, 2007 = 100



Sources: Author's own calculation, AMECO database.

FROM THE AUTHORS

"Public investment in education, housing, and environmental protection has in the euro area a strong effect for private sector activities over the medium-term. In Germany, public investment in construction and infrastructure is very effective"

— Marius Clemens —

Public investment a key prerequisite for private sector activity

By Marius Clemens, Marius Goerge, and Claus Michelsen

ABSTRACT

Ten years after the 2008 financial crisis, in the euro area investment is still below the pre-crisis level. Public and private investment growth is so weak that capital per worker (capital intensity) has virtually remained constant. An increase in public investment activity could ultimately stimulate private investment. Estimates for the euro area show that an increase in public investment by one billion euro goes hand in hand with a medium-term increase in private investment of around 1.1 billion euro. In Germany, the effect is somewhat greater. Investment in construction and infrastructure are the most significant drivers. The public sector's widespread reluctance to invest could partially explain the weakness in private investment activity. The public sector should now begin investing more. And the rigid balanced budget amendment (Schuldenbremse) should be replaced by more flexible expenditure rules.

Ten years after the financial and economic crisis of 2008, public and private investment still remain below their pre-crisis level.[1] The investment required to expand and modernize the capital stock and power the economy has been inadequate. This leads to the risk that the economy in the euro area and also in Germany will remain on a low growth trajectory in the medium term.[2]

There are a variety of explanations for reluctance to invest. Directly after the financial crisis, many companies did not have access to credit. When the European debt crisis followed two years later, confidence in the common currency and viability of the common economic area was shaken. Geopolitical crises came next – in Ukraine and Syria, for example – and most recently, significant trade policy uncertainty ranging from an unresolved Brexit to the erratic decisions of the U.S. government. To a great extent, these influences certainly explain private companies' recent reluctance to invest.

Public investment activity was particularly affected by the fact that many states made a major effort to reduce public debt after the crisis. However, in view of the zero interest policy, additional expenditure would have been financed at historically low terms.

The present report examines whether and the extent to which public investment in the euro area in general and Germany in particular have stimulated private investment activity. For the euro area,[3] it examined how public and private investment are mutually dependent on the aggregate level. In addition, different types of investment are examined in detail for Germany. For example, has public construction investment stimulated commercial building activity?

1 Ferdinand Fichtner, Marcel Fratzscher und Martin Gornig, "An Investment Agenda for Europe," *DIW Economic Bulletin* no. 7 (2014) (available online, accessed on 29.07.2019. This applies to all other online sources in this report unless stated otherwise.); Marcel Fratzscher, Martin Gornig und Alexander Schiersch, "Weak Corporate Investment Requires Immediate Action," *DIW Economic Bulletin* no. 15 (2016): 167–171 (available online).

2 See Stefan Bach et al., "More growth through higher investment," *DIW Economic Bulletin*, no. 8 (2013) (available online).

3 The overall study only considers the euro area countries that implemented the euro by 2004. They are: Belgium, Germany, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, and Spain.

DOI: https://doi.org/10.18723/diw_dwr:2019-31-2

Figure 1

Real net public and private investment of euro area and selected euro area countries[1]
In billion euros (in constant prices at 2010)

1 The twelve euro area countries that implemented the euro by 2004

Sources: Author's own calculation, AMECO database.

Private and public net investment in euro area are still below the 2007 level, in Germany especially public net investment has increased more in the last years.

Two perspectives on the effect of public investment on the private sector

Whether public investment stimulates private investment (crowding in effect) or suppresses it (crowding out) has been the subject of debate for some time.[4] It is not clear which of the two effects is most common. Those in favor of crowding in argue that public investment improves the investment conditions for the private sector and could stimulate investment activity there. A state-financed expansion of the road network, for example, can simplify and accelerate the transport and trade of goods, which leads to gains in the production process' efficiency and raise private companies' profit expectations in turn. They are willing to invest more when the marginal product or marginal productivity of private capital increases.

In the crowding out effect, on the contrary, an increase in public investment leads to higher user capital costs in the short term because the state demands a large quantity of financial resources. Rising interest rates also make it more expensive for companies to borrow, making investment less profitable and easier to postpone. During upswings or recessions in particular, the crowding out effect can grow stronger if country-specific risk surcharges are raised in reaction to an increase in public debt.

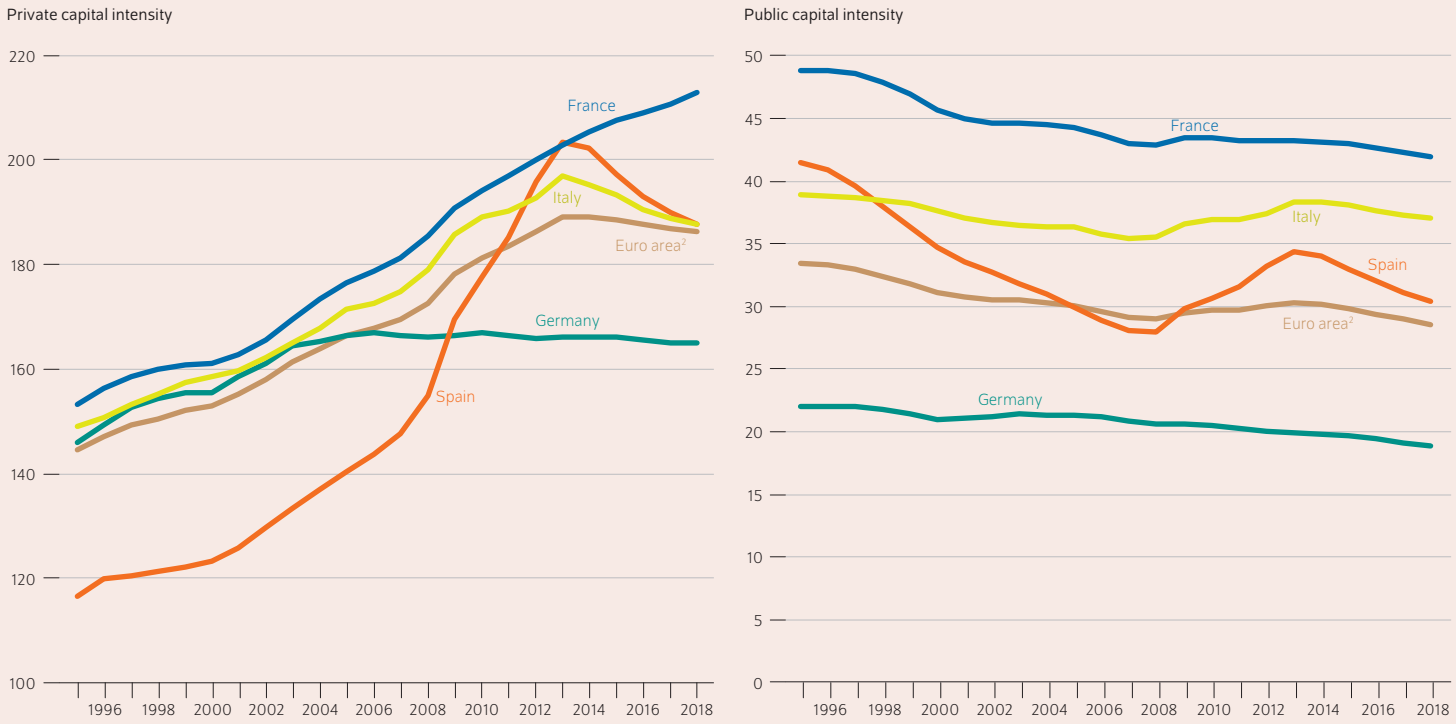
Both financing public investment by borrowing and financing via tax revenue can be harmful to the public sector. Additional public investment leads to a higher expected tax burden for companies in the future, which can also encourage private investment bottlenecks. When interest rates are low, however, this channel is weakened because financing costs remain on a very low level for both the state and companies.

The effect of public investment on private investment demand is not the only unclarity; the direction of causality is also ambiguous. Insufficient private investment can be both the cause and effect of public investment. Conversely, private investment stimulates the growth of GDP, which results in higher tax revenue and therefore, a higher availability of resources for public activity.

4 Marianne Baxter and Robert G. King, "Fiscal policy in general equilibrium," *The American Economic Review*, (1993): 315–334.

Figure 2

Private and public capital intensity in euro area[1] and selected euro area countries
Real private and public gross capital stock[2] per employee in euro



1 The twelve euro area countries that implemented the euro by 2004
2 In constant prices at 2010

Sources: Author's own calculation, AMECO database

Capital endowment per employee in euro area reduces since 2013, in Germany it is a long-term phenomen since 2000.

The empirical literature has not reached a conclusion as to whether crowding in or crowding out is more common. Many studies see a positive effect of public investment on private activities in various countries.[5] Some studies also find in favor of crowding out;[6] but a significant correlation was not established for Germany.[7] However, the studies examined used different methods (SVAR, Panel-SVAR or SVECM models) and their databases.

Public and private investment anemic across Europe since the 2008 crisis

Private and public real net investment in the euro area has still not reached its pre-crisis level (see Figure 1).[8] A probable key reason for this is the generally high level of national debt and the credit constraints this entails. Germany is an exception: public and private net investment have bounced back to a level slightly higher than the pre-crisis values. The comparatively high public investment activity in Germany is due to a resurgence in municipal investment in the places that benefited from increasing tax revenue in the wake of the general economic recovery. However, this only applies to some cities and municipalities because in many regions, the debt burden and high social spending restrict freedom to invest.[9]

5 See David A. Aschauer, "Is public expenditure productive?" *Journal of Monetary Economics*, 23(2) (1989): 177–200; Isabel Argimon, José M. Gonzalez-Paramo, and José M. Roldan, "Evidence of public spending crowding-out from a panel of OECD countries," *Applied Economics*, 29(8) (1997): 1001–1010; Abdul Abidad, Davide Furceri, and Petia Topalova, "The macroeconomic effects of public investment: Evidence from advanced economies," *Journal of Macroeconomics*, 50 (2016): 224-240; António Afonso and Miguel St. Aubyn, "Economic growth, public, and private investment returns in 17 OECD economies," *Portuguese Economic Journal*, 18(1) (2019): 47–65; and Colin Hunt, "The interaction of public and private capital: a study of 20 OECD members," *Applied Economics*, 44 (2012): 739-764; Stefan Mittnik and Thorsten Neumann, "Dynamic effects of public investment: Vector autoregressive evidence from six industrialized countries," *Empirical Economics*, 26(2) (2001): 429–446.

6 Graham M. Voss, "Public and private investment in the United States and Canada," *Economic Modelling*, 19(4) (2002): 641–664; Jérome Creel, Paul Hubert, and Francesco Saraceno, "Une analyse empirique du lien entre investissement public et privé," *Revue de l'OFCE*, (8) (2015): 331-356; and António Afonso and Miguel St. Aubyn, "Economic growth."

7 Tobias Kitlinski, "The robustness of the effects of public investment in infrastructure on private output: Evidence for Germany," *Ruhr Economic Paper*, 560 (2015).

8 In accordance with the AMECO database, net investment is defined as gross investment minus amortization. Therefore, capital stock in gross accruals also contains amortization.

9 See Marcel Fratzscher, Alexander Kriwoluzky, and Claus Michelsen, "Gut investierte Schulden sind eine Entlastung in der Zukunft," *Wirtschaftsdienst* no. 05 (2019): 313–317 (in German only; available online); Martin Gornig und Claus Michelsen, "Kommunale Investitionsschwäche: Engpässe bei Planungs- und Baukapazitäten bremsen Städte und Gemeinden aus: Stärkung von Investitionen in Deutschland," DIW Wochenbericht, no. 11 (2017): 211–219 (in German only, available online); Expertenkommission im Auftrag des Bundesministers für Wirtschaft und Energie, "Stärkung von Investitionen in Deutschland," Abschlussbericht 2015 (in German only, available online).Abschlussbericht 2015 (in German only, available online).

Measured by capital per worker, the growth of capital intensity in the entire euro area shows that less capital has been used since 2013 (see Figure 2). This is primarily due to the weaker dynamic of capital intensity in the private sector. Despite its resurgence after 2013, public capital intensity has been declining for a while. In view of the future challenges the demographic shift and digitalization already pose, capital intensity could be expected to rise more sharply. After all, any structurally-caused labor market bottlenecks could be at least partially compensated for by using capital more intensively: investing in industrial robots, for example. In Germany, capital intensity has been on a plateau since 2006.

The authors' descriptive analysis shows a need for additional investment in the euro area and in particular, in Germany. The largely similar growth of private and public investment in most countries also indicates that higher public investment activity goes hand in hand with higher private investment.

Public and private investment have close ties

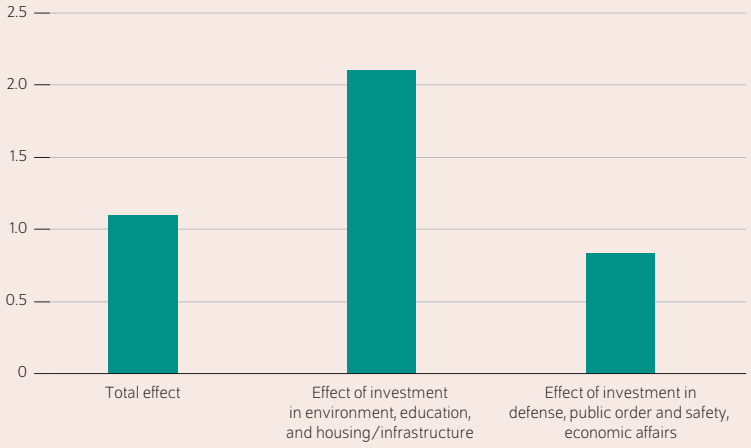
Based on a panel-SVEC model for the euro area, we examined the short- and medium-term effects of public investment on private investment (see box). In addition, we separately modeled the long-term relationship (cointegration) and short-term adjustment between the public and private capital stocks.[10] Further, additional macroeconomic influencing factors such as aggregate demand, the real interest rate, and the national debt level were considered.[11] The estimated overall effect can be interpreted as the average effect of public investment on private investment in the euro area over the short- to medium-term period.[12]

Using this model, we documented a crowding in effect for the entire euro area for the period between 1991 and 2018. An increase in annual public investment of one percent raised private investment by 0.2 percent in the medium term.[13] On average over all countries private investment is five times larger than public investment, such that an increase of public investment of one billion euro goes hand in hand with an increase of 1.1 billion euro of private investment after five years.[14]

Figure 3

Effect of increasing public investments[1] on private investments in euro area

In billion euros, effect after five years



1 Increase by one billion euro

Source: Author's own calculation.

One billion euro of public investment in euro area increases private investment by 1.1 billion euro after 5 years, in areas as education, environmental protection and housing even by 2.1 billion euro.

Additionally, the estimates show that modernization needs[15], such as public investment into education, housing, and protection of the environment, has an even stronger influence on private investment (see Figure 3).

Crowding in effect stronger in Germany

Since the SVEC model used here permits conclusions for the euro area in general but not for each individual country, a SVAR model was also estimated to examine the effect in Germany. It used detailed quarterly data and took specific investment categories into consideration (see box). With it, we were able to document a significant medium-term crowding in effect for public investment in 2017. In Germany, a rise in public investment by one percent went hand in hand with an increase in private investment by 0.27 percent in the first

10 Based on the approach of Christian Dreger and Hans-Eggert Reimers as detailed in their 2014 paper "On the relationship between public and private investment in the euro area," a structural, panel model with vector autoregression and an error correction term was estimated. A panel model was appropriate because the time series for public investment for all countries in the euro area over the period between 1991 and 2018 exist in annual frequency only. Including several countries generated a higher number of observations, for which the model delivered robust results.

11 We assumed that aggregate demand, the real interest rate, and private investment do not have a direct influence on public investment. Further, we assumed that aggregate demand indirectly influences the real interest rate and private investment does not have a direct influence on any of the other variables. As a result of the exceptions, we gave the model an economic structure so that the shock to public investment could be clearly identified.

12 The short-term period consists of the first two years after the shock and the medium term takes five years into account.

13 However, the magnitude of crowding in or potential crowding also depends on the state of the business cycle. The estimate did control for the state of the business cycle, but the effect can be somewhat higher in the first year during a recession, for example, since capacity is not fully utilized. See Abdul Abidad, Davide Furceri, and Petia Topalova, "Macroeconomic effects of public investment."

14 The GDP multiplier effect is not analyzed, but he will be a bit higher, since direct consumption demand effects are not considered. Estimates with a similar methodology by Alan J. Auerbach und Yuriy Gorodnichenko (2012): Measuring the Output Responses to Fiscal Policy, *American Economic Journal*: Economic Policy, 4(2):1–27 show, that in case of public investement increases the medium-term (five years) GDP multiplier effect is around 2.4 in the USA. Tom Krebs und Martin Scheffel, "Lohnende Investitionen," *Perspektiven der Wirtschaftspolitik*, 18(3) (2017): 245–262 show in a calibrated dynamic general equilibrium model for Germany, that the five-year-effect of a permanent increase of public investment by 20 billion euro per year leads to an increase of the private investment-to-gdp ratio between 0.03 and 0.06 percentage points. Considering the real GDP of year 2017 private investment would increase between 19 and 40 billion euro per year.

15 Recent studies for Germany detect a considerable modernization need in housing, environment (climate and energy), knowledge (education and R&D) as well as mobility and infrastructure. See Expertenkommission zur Stärkung von Investitionen in Deutschland, "Stärkung von Investitionen in Deutschland,"; Tom Krebs und Martin Scheffel, "Quantifizierung der gesamtwirtschaftlichen und fiskalischen Effekte ausgewählter Infrastruktur- und Bildungsinvestitionen in Deutschland," Studie im Auftrag des BMWi (2015); DENA, "Integrierte Energiewende–Impulse für die Gestaltung des Energiesystems bis 2050," (2018); Martin Gornig und Claus Michelsen, "Kommunale Investitionsschwäche."

Box

Data and approaches to estimates

Before the relationship between public and private investment is actually estimated, in order to determine the optimal method unit root tests were run followed by cointegration tests. In the case of cointegration, a SVEC panel model (structural vector error correction model) was estimated and otherwise a SVAR model was used (structural vector autoregressive model). Based on impulse-answer functions using Cholesky ordering, the isolated effect of a public investment shock on private investment demand could be mapped.

SVEC panel model for the euro area

The authors estimated the relationship between public and private investment for a panel of euro area countries based on annual data for the period between 1991 and 2017.[1] The database for real public and private investment, real GDP, and the real interest rate, was the European Commission's AMECO database. To map the capital stocks in the public and private sectors, relevant gross investment minus amortization was cumulated. However, only the total net capital stock and not the relevant initial capital stock in the public and private sectors was available for 1990. For this reason, it was presumed that the proportion of public capital equals the ratio of cumulated public net investment to cumulated total net investment and the 1980s were used as the reference period.

SVAR model for Germany

The relationship between public and private investment was examined for Germany based on quarterly data from the period spanning the first quarter of 1991 until the fourth quarter 2018. The basis is the time series of private and public investment on various investment levels of the Federal Statistical Office. They were adjusted for season and converted into real values (2010 prices) to ensure comparability. To increase the robustness of the results, "the standard determinants of investment behavior that underlie many empirical works were included."[2] Companies' sales prospects and financing costs can be approximated using real GDP and real interest rates. The database of the Federal Statistical Office provided the GDP statistics, while the real interest rate as the difference between the long-term (short-term) nominal interest rate and inflation was taken from the Deutsche Bundesbank database. To take the zero interest phase in the euro area that has prevailed since around 2013 into account, a shadow interest rate was also included in the analysis.[3]

1 Based on the approach of Christian Dreger and Hans-Eggert Reimers as detailed in their 2016 paper "Does public investment stimulate private investment? Evidence for the euro area."

2 See Christian Dreger and Hans-Eggert Reimers, "On the relationship," 408; António Afonso and Miguel St. Aubyn, "Economic growth, public, and private investment returns in 17 OECD economies," *Portuguese Economic Journal*, 18(1) (2019): 47–65; and Jérome Creel, Paul Hubert, and Francesco Saraceno, "Une analyse empirique du lien entre investissement public et privé," *Revue de l'OFCE*, (8) (2015): 331–356.

3 See Jing Cynthia Wu and Fan Dora Xia, "Time-Varying Lower Bound of Interest Rates in Europe," *Chicago Booth Research Paper*, no. 17–06 (2017).

five years.[16] In Germany, private investments are seven times larger than public investment on average over time. Thus, an increase of public investment by one billion euro would increase private investment after five years by near two billion euro.[17] Differentiating by individual types of investment showed that in Germany, private investment is strongly stimulated by public construction investment (see Figure 4). In Germany, there was no significant evidence of public investment suppressing private investment.

Conclusions: more flexible expenditure rules will simplify public investment

The present empirical analysis shows that on average in the euro area countries, public investment has a positive effect on private investment activity. Public investment can increase the incentive for additional private investment and as a result, boost growth. Empirical evaluations have shown that investment in education, housing, and environmental protection and in German in particular, investment in construction and infrastructure bring about such crowding in effects.

In Germany, public investment activity was slightly stronger than in the total euro area over the last five years. The empirical results point to a crowding–in between public and private investment in Germany. However, the development of public and private investment was still too low, such that e.g. capital per worker remain constant over time. But in order to modernize Germany and make it sustainable for future developments, the public authority is requested to invest still more into public infrastructure and construction.

Accordingly, we call upon the public sector in Germany to increase its investment in construction and infrastructure in order to modernize it from the ground up. Although the recent medium-term financial budget plans already go in the right direction[18], recent development has shown that backlog can arise even additional financial sources are available. Insufficient capacities, missing competencies at public construction and planning authorities, and the high degree of capacity utilization within the construction sector are the

16 The lower 95-percent confidence interval gives a value at 0.24, the upper 95-percent confidence interval values of 0.4 percent.

17 After ten years one additional publicly invested billon euro would increase private investment by closely three billion euro, however the effect is not statistically significant in the long run.

18 Until 2023, additional funds of 159 billion euro should be invested.

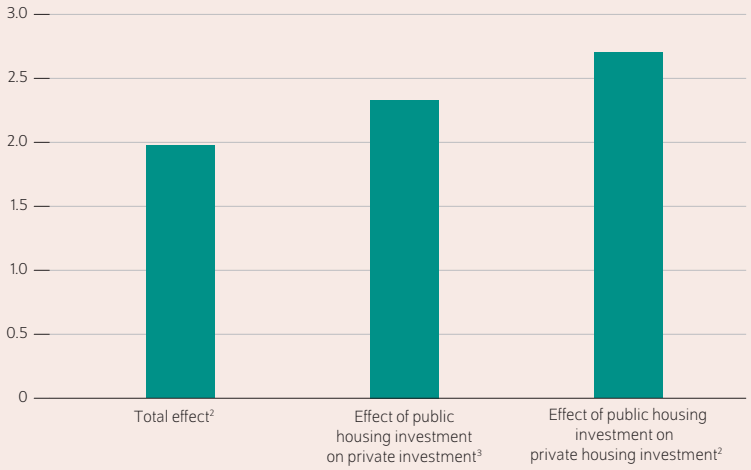
reasons mentioned by state and municipality authorities. Here, it is necessary to establish appropriate instruments to not only remove bottlenecks, but also to support municipalities more intensively by providing an easy and less bureaucratic access to financial sources of the federal government. The German balanced budget amendment has become a too-stiff corset to permit the state to react to the coming economic challenges. For the benefit of stronger public investment activity, which would also stimulate private activity, more flexible expenditure rules should be implemented. A prerequisite for stronger investment activity would be the ability to raise public expenditure by a maximum of the nominal potential growth rate on an annual basis.[19]

19 See Marcel Fratzscher, Alexander Kriwoluzky, and Claus Michelsen, "Neue Fiskalregeln für Europa," *DIW Wochenbericht*, no. 18 (2019): 310–311 (in German; available online).

Figure 4

Effect of increasing public investments[1] on private investments in Germany

In billion euros, effect after five years



1 Increase by one billion euro
2 significant at the 95 percent confidence interval
3 significant at the 90 percent confidence interval

Source: Author's own calculation.

If Germany increases its investment in construction and infrastructure it will have a strong effect on private investment.

Marius Clemens is a research associate in the Forecasting and Economic Policy department at DIW Berlin | mclemens@diw.de

Marius Goerge was an intern in the Forecasting and Economic Policy department at DIW Berlin

Claus Michelsen is head of the Forecasting and Economic Policy department at DIW Berlin | cmichelsen@diw.de

JEL: E22, E62, H54

Keywords: Investment, crowding in, public finance

LEGAL AND EDITORIAL DETAILS

DIW Berlin — Deutsches Institut für Wirtschaftsforschung e. V.
Mohrenstraße 58, 10117 Berlin
www.diw.de
Phone: +49 30 897 89–0 Fax: –200
Volume 9 July 31„ 2019

Publishers
Prof. Dr. Pio Baake; Prof. Dr. Tomaso Duso; Prof. Marcel Fratzscher, Ph.D.; Prof. Dr. Peter Haan; Prof. Dr. Claudia Kemfert; Prof. Dr. Alexander S. Kritikos; Prof. Dr. Alexander Kriwoluzky; Prof. Dr. Stefan Liebig; Prof. Dr. Lukas Menkhoff; Dr. Claus Michelsen; Prof. Karsten Neuhoff, Ph.D.; Prof. Dr. Jürgen Schupp; Prof. Dr. C. Katharina Spieß; Dr. Katharina Wrohlich

Editors-in-chief
Dr. Gritje Hartmann; Mathilde Richter; Dr. Wolf-Peter Schill

Reviewer
Dr. Marius Clemens (1. report),
Dr. Heike Belitz and Dr. Geraldine Dany-Knedlik (2. report)

Editorial staff
Dr. Franziska Bremus; Rebecca Buhner; Claudia Cohnen-Beck; Dr. Daniel Kemptner; Sebastian Kollmann; Bastian Tittor; Dr. Alexander Zerrahn

Sale and distribution
DIW Berlin Leserservice, Postfach 74, 77649 Offenburg
leserservice@diw.de
Phone: +49 1806 14 00 50 25 (20 cents per phone call)

Layout
Roman Wilhelm, DIW Berlin

Cover design
© imageBROKER / Steffen Diemer

Composition
Satz-Rechen-Zentrum Hartmann + Heenemann GmbH & Co. KG, Berlin

ISSN 2568-7697