



Can the state be a good investor?

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Key numbers

Approx.
25 per cent

of total public expenditure is investment spending – if public investment in human capital is also included

3/4

of public investment in EU Member States is investment in human capital. In private investment, the share of investment in human capital is only 12 per cent

At least
10 per cent

is the annual rate of return on pre-primary education expenditure (as indicated by most research)

2 to 3

is the ratio of economic benefits to costs of investment in improving mental health in the population (based on investigations in selected countries)

1.2 per cent
of GDP

will be the share of public debt interest expenditure in the EU in 2022 (as forecast by the European Commission); it will be 0.3 pp lower than the pre-crisis level, despite a marked rise in public debt

Key findings

- **The state can be a good investor, which means that it can obtain high rate of returns on public expenditure.** This not only applies to investment in the traditional sense, e.g. spending on roads, motorways, the railways or buildings and equipment. Research shows that particularly high returns are obtained on expenditures on human capital: childcare, education, preventive healthcare or health improvement.
- **This study proposes to include investment in human capital in the official definition of public investment.** It comprises educational and part of healthcare spending (excluding hospital services). Defined in this way, public investment in human capital in the European Union accounts for nearly 9 per cent of GDP. It is triple the figure for traditionally understood public investment (covering only investment in physical capital).
- **The exclusion of expenditure on human capital from the definition of public investment may lead to an inappropriate allocation of resources.** Investment expenditure is one of the measures used to evaluate government activities. With the current definition, the outcome can be excessive concentration on the expansion and modernisation of physical capital at the expense of spending on areas related to human capital development.
- **This proposal is of particular relevance at the stage of designing post-crisis economic recovery plans.** These plans must not focus exclusively on the construction and modernisation of infrastructure. Investments in education and health are at least as vital for the wellbeing of future generations. Data indicates that responsibility for that part of investment is primarily assumed by the public sector – government investment in human capital is four times higher than the corresponding private investment.



Introduction

The years following the COVID-19 pandemic will probably be a period of changes in many fiscal policy dogmas. There has been a distinct shift in the fiscal policy approach in global mainstream economics. The essential change is giving priority to expansionary fiscal policy – including public investment – as the main economic recovery tool after the crisis. The shift has been favoured by historically low interest rates. Yet the new approach raises the following questions:

- I. Can the state invest the money well (is the investment productive)?
- II. What should government investment focus on?

This study attempts to answer these questions. The main outcome of this analysis is a proposal for extending the definition of public investment to cover human capital investment. The current definition, identifying public investment with spending on physical capital, excludes a significant share of public expenditure yielding long-term economic benefits, with significant consequences. It creates pressure to increase spending on expanding and upgrading

physical capital, probably at the expense of investment in the development of human capital. This is of particular importance in economies recovering from the crisis caused by the COVID-19 pandemic as many countries assign record funds to recovery plans. This study therefore proposes to include educational expenditure and part of health care spending in public investment. It must be remembered that the proposed method for measuring investment in human capital is a mere simplification, resulting from statistical data limitations.

This study is divided into four chapters.

Chapter 1 describes the shift in the fiscal policy approach observed during the COVID-19 crisis. Chapter 2 reviews the literature concerning returns on various types of government expenditure: education, preschool programmes, healthcare and infrastructure. Chapter 3 outlines the above-mentioned proposal for extending the description of public investment to include investment in human capital. Based on statistical data, Chapter 4 shows the possible changes in the value and significance of public investment if the proposed definition is adopted.

Chapter 1. A new approach to fiscal policy

The crisis caused by the COVID-19 pandemic triggered a marked shift in the fiscal policy approach in global mainstream economics. The essential change is giving priority to expansionary fiscal policy as the main economic recovery tool after the crisis. As advocated by economists, such tools should not only be used during the crisis, but also during the recovery from the recession, until economies return to the pre-pandemic trend (see Box 1 and Baldwin, Weder di Mauro, 2020). This stage is likely to last several years. The above approach is radically different from the measures taken a decade earlier when countries were recovering from the global financial crisis of 2008. At the time, a number of the EU Member States introduced contractionary fiscal policies, mostly aimed at reducing their debt-to-GDP ratios.

The main reason for the current change in the fiscal policy approach is the negative impact of the austerity policy of the 2010s. As suggested by academic research, government expenditure cuts and tax rises considerably hampered GDP growth in the eurozone countries in 2011–2013, resulting in an estimated aggregate loss of 5.5–8.4 per cent of GDP. Thus, fiscal consolidation contributed to the second wave of the economic slump (Heimberger, 2017; House, Proebsting, Tesar, 2020). During the double-dip recession, debt-to-GDP ratios did not decrease; on the contrary, some Member States recorded increases. Therefore, the objective of austerity policy was not achieved. Meanwhile, in addition to adverse economic effects, the policy

also had undesirable political consequences: it increased political polarisation and support for populist movements (e.g. proponents of Brexit) (Fetzer, 2019; Hübscher, Sattler, Wagner, 2020).

The fiscal policy based on expansionary government measures and public investment aims to ensure a strong and sustainable economic recovery after the crisis. In the past months, the issue has been repeatedly emphasised in publications and statements by representatives of key international institutions (Box 1 and IMF, 2020). It is reflected in the record-high economic recovery packages – the EU created a Recovery Fund worth EUR 750 billion and the US accepted a package of USD 1.9 trillion.

The new fiscal policy approach has been favoured by historically low interest rates. The rates affect interest paid on public debt, i.e. the debt servicing costs. It is those costs, rather than the debt levels, that represent the key constraint on increasing public debt. Yet due to falling interest rates, despite rising debt in the aftermath of the pandemic crisis, debt servicing costs have been declining. According to the European Commission forecast for 2019–2022, the debt-to-GDP ratio in the EU will rise by around one-fifth – from 79 to 93 per cent. At the same time, interest expenditure will drop, from 1.5 to 1.2 per cent of GDP (EC, 2020). Due to the low costs of servicing public debt, it will be possible to avoid the ‘fiscal cost’ of the commitments made today, i.e. cuts in public expenditure and/or tax rises in the future (for more see Box 2).

➤ **Box 1.** Selected statements on the new approach to fiscal policy

‘Countries should not repeat the mistakes we made after the last crisis, and try to cut spending or raise taxes too early’ – Angel Gurría, OECD Secretary-General

‘Continued expansionary fiscal policies are vital to avoid excessive job shedding and support household incomes until the economic recovery is more robust’ – Christine Lagarde, ECB President

‘Fiscal policy must play a leading role in the economic recovery by creating demand through cash transfers to support consumption and large-scale investment’ – Gita Gopinath, IMF Chief Economist

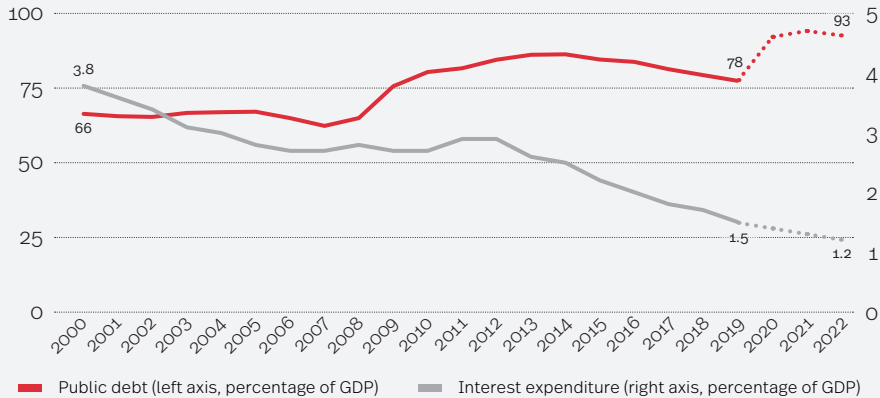
‘The mistake that we made was not a lack of stimulus during the trough in 2009. The mistake came later in 2010, 2011 and so on, and that was true on both sides of the Atlantic. The first lesson is to make sure governments are not tightening in the one to two years following the trough of GDP’ – Laurence Boone, OECD Chief Economist

‘First fight the war, then figure out how to pay for it’ – Carmen Reinhart, World Bank Chief Economist

‘Austerity policy is not a good idea for Europe. We must not repeat the mistake of introducing savings immediately after the crisis. Rather, we should first take care of restoring growth across Europe’ – Olaf Scholz, Minister of Finance of Germany

Source: “BusinessToday”, “Financial Times”, “Handelsblatt”, OECD, Reuters.

Chart 1. EU Member States' public debt has been increasing, but interest expenditure has been declining



Note: aggregate data for the 27 EU Member States.

Source: prepared by PEI based on Eurostat data and the European Commission's Spring 2021 European Economic Forecast.

How long will interest rates on public debt remain low? This will determine for how long expansionary fiscal policies may be safely used. Estimates of the natural rate of interest – the interest rate stabilising the economy – have shown its steady decrease globally. Importantly, that trend is not related to the pandemic crisis or the global financial crisis of 2008; it started earlier. As argued by Del Negro et al. (2017), the natural interest rate in advanced economies dropped from 2.5 to 0.5 per cent between 1998 and 2016.

One explanation of the falling natural interest rate is the secular stagnation hypothesis. The hypothesis postulates, that the global fall

in the natural interest rate is permanent as it results from the structural features of economies – a high propensity to save accompanied by a low propensity to invest. Technological changes are less dynamic, whereas the demand for secure assets is on the rise, also stimulated by ageing populations (IMF, 2014; King, Low, 2014; Summers, 2014; Eggertson, Mehrotra, 2014; Summers, Rachel, 2019). In these circumstances, natural rates of interest fall and may remain close to zero (or even negative) for years. According to the Fisher equation, low natural rates of interest combined with low inflation rates translate into low nominal rates of interest on public debt.

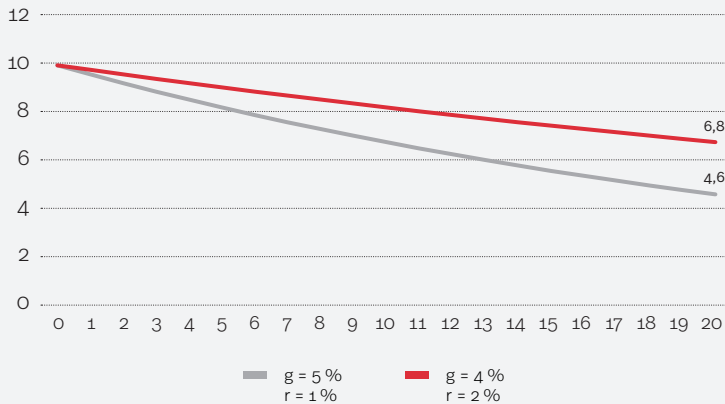
Box 2. Will future generations have to repay today's debt?

A common claim in the public debate is that public debt funds current consumption and will have to be paid for by future generations. It suggests that future generations will necessarily face increase in taxes and cuts in public spending (e.g. on education or healthcare). This is a common misconception.

In this example we analyse what happens when the state issues new public debt equal to 10% of GDP. For the next 20 years the government only rolls the debt over: it does not increase tax rates to service the debt, any interest payments are financed with new debt.

We consider a rate of interest on bonds at 1 per cent during the period in question. What will the level of public debt be after the two decades? Assuming that the economy grows at an annual rate of 5 per cent, public debt will drop from 10 per cent of GDP to 4.6 per cent of GDP. With more conservative assumptions – an economic growth of 4 per cent and a rate of interest of 2 per cent – the debt would amount to 6.8 per cent of GDP.

▸ **Chart 2. Public debt from year $t=0$ after 20 years, depending on the economic growth rate (g) and the rate of interest on debt (r)***



* the primary balance is assumed to be 0 throughout the period covered.

Source: prepared by PEI.

Why did public debt fall despite the fact that the government issued new debt to pay interest? In fact, the nominal value of the debt increased by 22 per cent in the first and 49 per cent in the second scenario. Yet the economic growth rate exceeded that of the interest on bonds, which decreased the debt-to-GDP ratio. Analyses of the nominal value of public debt make limited sense. A more important indicator is its relation to the size of the economy (for example GDP), as it determines the capacity to pay interest on debt.

Contrary to common claim, future generations will not necessarily have to carry the burden of today's debt. The government can endlessly 'roll over' its past debt until it approaches zero. It is the economic growth that repays the debt. The debt-to-GDP ratio keeps falling as long as the economic growth rate exceeds that of the interest on bonds.

The simulation above also assumes an inflation rate of zero. The debt stability condition in a world with inflation can be presented as follows: $\text{rate of interest} < \text{inflation} + \text{growth}$. As long as the condition is met, the government can even raise additional primary deficits every year and the debt-to-GDP ratio will keep decreasing. If the condition above is not met, the stabilisation of debt at a finite level requires generating primary surpluses (various textbooks contain detailed mathematical analyses of public debt stability, e.g. Wickens, 2008, pp. 96–105).

Therefore, the state should first concentrate on maintaining a robust economic growth rate, rather than reducing debt. The mistake of the austerity policy described in Chapter 1 and pursued in EU Member States after 2010 can be thought of as incorrect prioritization of these two goals.



Chapter 2. Returns on public investment

Research shows that the state can obtain a high rate of return on investment. This applies not only to traditional investment in infrastructure, such as buildings, roads, motorways or energy infrastructure. In the scientific literature, an increasingly important role is played by studies estimating returns on expenditure not classified as investments in official statistics. Specifically, these studies address public spending that improves human capital. The relevant public policy evaluations rely on cost-benefit analysis, the calculation of the internal rate of return (IRR), the marginal value of public funds, etc. Each of these methods is based on a similar idea: economists seek to capture the economic effects (e.g. changes in wages, GDP or the scale of social transfers) of selected public policies and to compare them to the costs of those policies. Table 1 presents a review of the most relevant studies.

The most profitable public investments include spending on children's development – primarily education. As demonstrated by Hendren and Sprung-Keyser (2020), the rates of return on public expenditure are strongly correlated with age. The authors analysed 133 historical policy changes over the past 50 years in the US. The areas examined included social insurance, education, taxes and direct transfers. The highest estimated returns were found for measures targeting children.

Investment in children from low-income families exhibit particularly high returns within the education spending. Due to insufficient funds, time and parenting skills, these children are unable to acquire skills comparable

to those learnt by children from wealthy families. At the very beginning of their lives, they experience a gap that most of them cannot close later on (EBRD, 2016). Universal education can bridge a significant part of this gap. Children who benefit from it earn higher incomes (increasing the state's tax revenues) and are less likely to receive social transfers in the future – thus 'repaying' the investment with 'interest' (Hendren, Sprung-Keyser, 2020). In this context, various authors highlight the role of pre-primary education of children, i.e. nurseries and kindergartens (Heckman, 2006; García et al., 2020). While, for children from wealthy families, the benefits of pre-primary education are not always higher than its costs, various studies produced two-digit rates of return on this kind of spending for low-income children (Cascio, 2015).

Another area of effective public investment is healthcare. The economic benefits of improving citizens' health include increased productivity among workers, fewer people taking sick leave and longer working lives (higher labour inputs and lower transfers). A vital role is also played by preventive healthcare as it reduces future treatment costs, e.g. vaccination schemes or preventing childhood obesity. Masters et al. (2017) reviewed several dozen studies estimating returns on public health interventions in advanced economies. In most cases, the average benefit was a multiple of the costs. As concluded by the authors, cuts in spending on healthcare are erroneously perceived as austerity policy measures. In the long term, they may lead to additional economic and social costs, exceeding the amount of potential savings.

A number of studies suggest that a rising stock of infrastructure has a limited but positive effect on GDP. According to Bom and Ligthart (2014), who reviewed nearly 70 studies on the subject, the average output elasticity of public capital (roads, motorways, buildings, etc.) amounts to 0.106. This means that a 10 per cent increase in the stock of that capital increases GDP by slightly more than 1 per cent. However, the authors admit that many studies point to elasticity insignificantly above zero. The literature addressing

the effects of building new roads and motorways is of particular interest. For example, as indicated by Leduc and Wilson (2013), these investments boost GDP during their implementation and for a few more years, but long-term GDP growth remains unchanged. Other studies show that returns on investment in road infrastructure diminish as the stock of infrastructure increases – developing countries (characterised by poor infrastructure) obtain higher returns than advanced economies (Gibbons, et al., 2019).

↘ **Table 1.** Returns of public investment – review of studies

Pre-primary education	
Heckman et al., 2010	Overall social rate of return on preschool programmes is in the range of 7-10 per cent.
García et al., 2020	The internal rate of return from public investments in early childhood programmes for disadvantaged children is 13.7 per cent annually.
Reynolds et al., 2011	The preschool program for low-income families provided a total return to society of 18 per cent annually.
Chetty et al., 2011	Students randomly assigned to a Kindergarten teacher with more than 10 years of experience earn an extra \$1,093 (6.9 per cent of mean income) on average at age 27 relative to students with less experienced teachers.
Black et al., 2014	Being eligible for lower childcare prices at the age of 5 increases the grade point average and the grade on an oral exam in junior high school (13-16 years of age) by around 0.1-0.3 of the standard deviation.
Schochet, Johnson, 2019	Childcare subsidies increase mothers' educational attainment. Especially when: (I) mothers receive subsidies when their children are younger; (II) mothers have low baseline levels of education.

Education	
Jackson, Johnson, Persico, 2016	A 10 per cent increase in per pupil spending each year for all 12 years of public school leads to 0.3 more completed years of education, about 7 per cent higher wages, and a 3.2 percentage point reduction in the annual incidence of adult poverty.
Sianesi, van Reenen, 2003	A one-year increase in average education raises the level of output per capita by 3-6 per cent and leads to an over one percentage point faster growth rate.
Hanushek et al., 2015	(I) On average, a one-standard-deviation increase in numeracy skills is associated with an 18 per cent wage increase among prime-age workers; (II) one additional year of schooling increases future wages by 7.5 per cent.
Égert, Botev, Turner, 2020	In countries with the worst educational practices: (I) increasing attendance at pre-primary education would boost GDP per capita by more than 3 per cent; (II) reducing the student-teacher ratio would increase GDP per capita by 1.5-3.0 per cent; (III) postponing the age of first tracking would increase GDP per capita by 1.5 per cent; (IV) greater school autonomy would boost GDP per capita by 2 per cent.
Hanushek, Woessmann, 2020	Students affected by school closures during the COVID-19 pandemic might expect 3 per cent lower career earnings, whereas countries affected by these learning losses will experience 1.5 per cent lower GDP throughout the remainder of the century.
Higher education	
Pfeiffer, Stichnoth, 2020	Public investment into college education in Germany yields a fiscal return of 6.6 per cent.
Nonneman, Cortens, 1997	Government investment in tertiary education yields a rate of return of 8-12 per cent.
Trostel, 2010	The average real fiscal internal rate of return on government investment in college students is conservatively estimated to be 10.3 per cent.

Health care	
Masters, i in., 2017	For every 1 pound invested in public health, 14 pounds will subsequently be returned to the economy.
Chisholm i in., 2016	The economic benefit-to-cost ratio of investment in improving mental health in the population in selected countries is between 2.3 and 3.0.
Hendren, Sprung-Keyser, 2020	1 dollar spent on extending health insurance for children increases public revenue by a total of 1.78 dollars.
Infrastructure	
Bom, Ligthart, 2014	A 10 per cent increase in the stock of public capital increases GDP by approx. 1 per cent on average.
Melo, Graham, Brage-Ardao, 2013	An increase of 10 per cent in public investment in transport infrastructure is associated with an increase in output of about 0.5 per cent.
Leduc, Wilson, 2013	Spending on motorways boosts GDP in the short- and medium-term (mainly during the implementation of the investment project), but the effect fades in the long term.

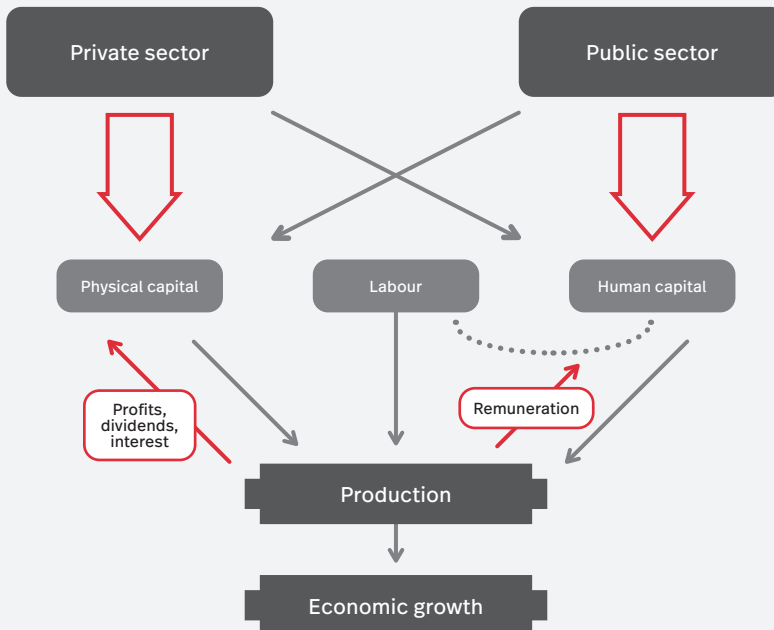


Chapter 3. Proposal for changing the definition of public investment

Official statistics only classifies investment in physical capital as investment. In the public sector, it is mainly expenditure on roads and motorways, public buildings (schools, hospitals, etc.), and other infrastructure facilities. As demonstrated in the previous chapter, investment in human capital, classified in the national accounts as part of (private or public) consumption, yields returns comparable to or higher than those on investment in physical capital.

This study proposes to include human capital investment in the definition of public investment. Investment involves the use of resources to obtain future economic benefits (Begg et al., 2014; Hirshleifer, 1965; Reilly, Brown, 2002). Part of government spending on human capital meets the criteria of this definition and is in fact necessary for improving the prosperity of future generations. The exclusion of those expenditures from public investment statistics leads to the misrepresentation of the public sector as an inefficient part of the economy.

↘ **Scheme 1.** The impact of private and public sector investments on economic growth



Source: own elaboration by PEI.

Human capital investment includes educational expenditure and part of healthcare expenditure. This approach draws on the research cited in the previous chapter. We exclude expenditures on hospital services from the definition, though. This item accounts for an average of 38 per cent of total healthcare expenditure in the EU (with most of it funded by the public sector). For the sake of simplification, we assume that hospital intervention is closer to the function of ‘saving’ human health than to ‘building’ human capital through health.

The proposed new approach to public investment is a simplification, resulting from statistical data limitations. Whereas invest-

ment in physical capital has been extensively described and reported using uniform international standards (as gross fixed capital formation), there is no comparable and uniform method for defining human capital investment. This proposal only provides a draft methodology allowing us to calculate and compare investments in physical capital and human capital in the public and private sectors (for a detailed description, see the ‘Methodological notes’ in the final section). It must be stressed that for the human capital investment to be officially included in the public investment statistics appropriate changes in data collection and classification would be required.

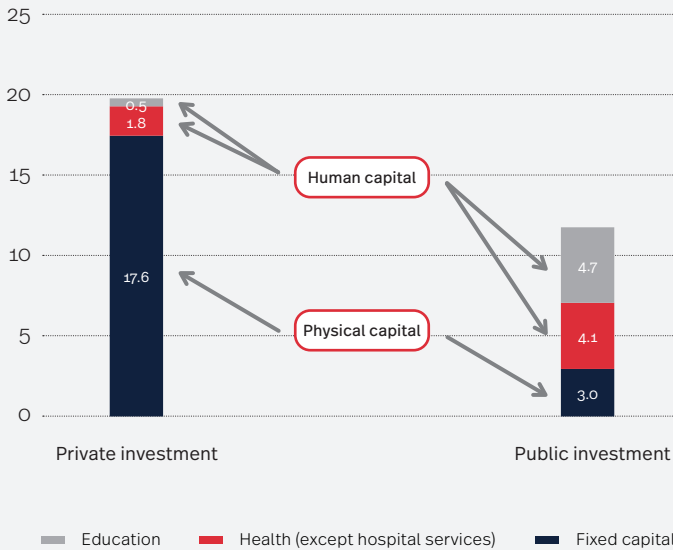


Chapter 4. Investment in physical capital and human capital in the public and private sectors

The private sector mostly invests in fixed capital, whereas the public sector mostly invests in human capital. In the EU Member States, investment in physical capital accounts for an average of 20.5 per cent of GDP. Most investment – 86 per cent – comes from the private sector. Human capital investment, calculated using the methodology proposed in previous chapter, is equal to 11.2 per cent of GDP. The dominant share of human capital investment (80 per cent)

comes from the public sector. Whereas the private sector tends to focus on investment in physical capital, human capital – which is at least as important for long-term development – is mostly financed by the public sector. In the structure of private investment expenditure, the share of spending on human capital is a mere 12 per cent. The corresponding figure for the public sector is as much as 75 per cent (Chart 3).

▼ Chart 3. Private vs. public investment structure in the EU (percentage of GDP, 2009–2019 average)



Source: prepared by PEI based on Eurostat data.

The EU Member States vary greatly in public investment as a share of GDP. The rate of public investment, including human capital invest-

ment, ranges from less than 9 per cent of GDP in Greece to over 16 per cent in Sweden (Chart 4). The Southern European countries (Greece, Italy,

Spain and Portugal) and the poorest EU Member States (Bulgaria and Romania) exhibit the lowest public investment rates. In contrast, public investment is highest in the Nordic countries (Sweden, Denmark and Finland) and in advanced Western European economies (the Netherlands, France, Belgium and Germany).

Around three-quarters of public investment in the EU goes to human capital development.

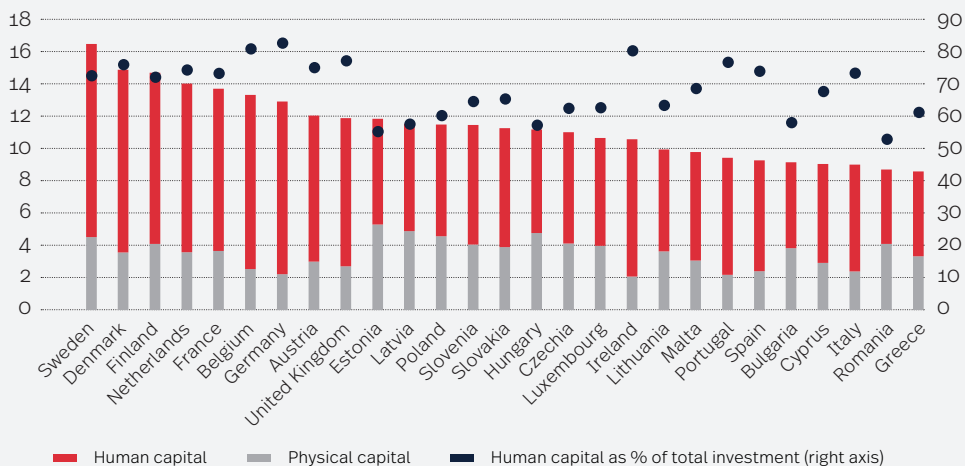
In individual countries, the proportion of human capital expenditure in total public investment ranges from 50 to 90 per cent (Chart 4). There is a clear divide between the Central and Eastern European countries and the other EU Member States. The former are characterised by a relatively large share of investment in physical capital: an average of 4.3 per cent of GDP, compared to 3.1 per cent on average in

the latter. The likely cause is the underdevelopment of infrastructure and a strong focus of inflowing EU funds on improving it. The other Member States spend much more public funds on the development of human capital – an average of 8.7 per cent of GDP, compared to the CEE average of 6.4 per cent.

At least one quarter of total public spending in the EU Member States is investment expenditure, according to the extended definition.

For comparison, according to the current definition of public investment limited to investment in physical capital, it represents a mere 8 per cent of total public spending (the EU average). Therefore, the current definition not only excludes a significant part of public spending that may yield high returns in the future, but it also misrepresents the public sector as excessively focused on consumption.

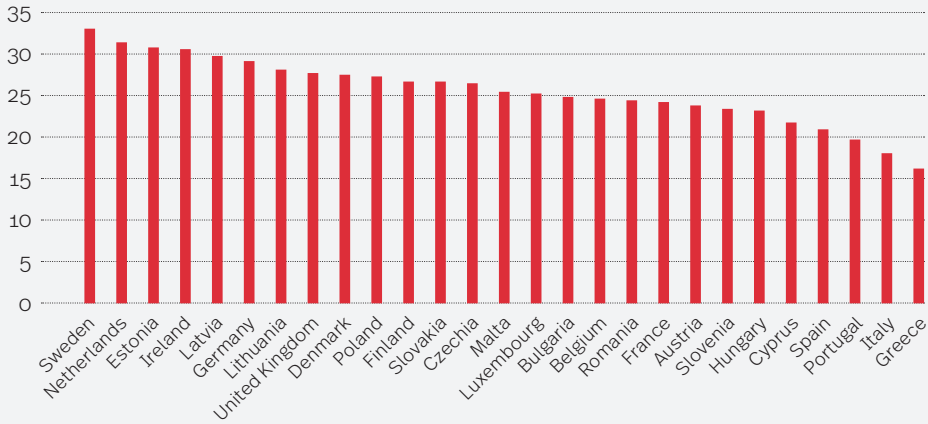
▼ **Chart 4. Public investment as a percentage of GDP in the EU Member States (2009–2019 average)**



Note: data not available for Croatia.

Source: prepared by PEI based on Eurostat data.

Chart 5. Public investment as a percentage of total public expenditure in the EU Member States (2009–2019 average)



Note: data not available for Croatia.

Source: prepared by PEI based on Eurostat data.

In particular, the analysed data show low values of public investment in Southern European countries, both in relative to GDP and relative to total public expenditure (Charts 4 and 5). Such a composition may hamper overcoming the structural problems of these economies and may reduce their long-term development potential. Among other factors, public investment

expenditure in the Southern European countries was heavily reduced by the austerity policies implemented in the 2010s. Research shows that contractionary fiscal policies may also lead to the reallocation of spending away from efficient policies (oriented towards long-term objectives) towards less efficient ones (with short-term objectives) (Ardanaz et al., 2020; Breunig, Busemeyer, 2012).

Conclusion

The study offers three major conclusions for the debate on the role of fiscal policies in post-crisis economies:

1. **Austerity policies should not be implemented during the recovery from an economic crisis** – this observation seems to be becoming increasingly strong in global economic, political and public debates. It mostly stems from the adverse effects of the austerity policies of the 2010s.
2. **It is not necessary to raise taxes and/or cut spending to reduce the debt-to-GDP ratio** – whereas this conclusion has been long present in economics textbooks, the misconception that public debt involves burdening future generations is still present in the public debate. However, public policy should first concentrate on maintaining robust economic growth, rather than reducing public debt. Stable economic growth accompanied by a falling natural interest rate will automatically lead to a lower debt-to-GDP ratio. That growth can be stimulated by productive government investment.
3. **Public sector achieves high rates of return on investment in human capital** – the extensive research referred to in this study demonstrates that investment in human capital

can generate high returns. Today's spending translates into higher wages, GDP, well-being and tax revenue in the future. As indicated by the data presented, the public sector accounts for more human capital investment, whereas investment in physical capital is dominated by the private sector.

This study proposes a new understanding of the term 'investment' so that it includes both traditional investment in physical capital and outlays on human capital. This proposal should be treated as a contribution to the debate on the role of investment and the state in the economy, as well as that on economic development models. Each of these areas offers research that can and should be used in economic policy design. A number of issues require further study, as highlighted in this report. At present, there is no uniform and widely-accepted methodology for systematic calculations and comparisons of returns on investments in physical and human capitals. Any such methodology should also take into account the effects of those investments on the prosperity and wellbeing of future generations. It is highly desirable to develop such a methodology, but it would also involve far-reaching changes in the collection, aggregation and analysis of statistical data.

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Methodological notes

The data used in Chapter 4 comes from Eurostat databases. Investment in physical capital is well-described and reported (as gross fixed capital formation) in accordance with uniform international standards (ESA 2010) in the main national accounts, in addition to GDP, consumption, imports, exports, etc. The available data (the [NAMA_10_GDP] database) allows us to break down gross fixed capital formation by origin into private and public spending.

Data on countries' spending on healthcare and education is collected by Eurostat based on uniform methodologies (the [EDUC_UOE_FINEo1] and [HLTH_SHA11_HPHF] databases), divided by the source (including private and public) and function of the spending (in education: by education level; in healthcare: by healthcare provider). Human capital investment is defined here as total private and public spending on education. With regard to healthcare expenditure, we adopt a conservative assumption that excludes all spending by hospitals from human capital investment.

The database used in the report covers the 28 European Union Member States (including the United Kingdom) in the years 2009–2019. Data availability varies widely between categories, years and countries. The uniform aggregate categories (e.g. gross fixed capital formation) have the best coverage, while more detailed categories (e.g. private expenditure on hospitals), data for smaller EU Member States, and data for the early years of the sample period have the lowest.

Three categories are created in the report: investment in physical capital (gross fixed capital formation), investment in education, and investment in healthcare. In each category, spending is divided by source into public and private. In the categories of investment in

physical capital and education, general government spending is classified as public, while all other items are regarded as private. In the category of healthcare expenditure, we define public spending as that financed by the general government institutions (including social security funds), whereas we define private expenditure as all other items (in accordance with the System of Health Accounts – SHA2011).

Each category is calculated as a percentage of the Member State's current GDP, followed by the calculation of the average value for the years with data availability for every EU Member State. There has been limited variation in human capital investment – both public and private expenditure – and investment in physical capital in the public sector over time at the national level. In contrast, private investment in physical capital is among the most variable macroeconomic categories over time. In the sample used in the report, the standard deviation of private investment in physical capital is 9 per cent of the mean value. The Ireland has the highest variation (38 per cent) and Czech Republic has the lowest (2 per cent).

Whereas the methodology for creating each of the three categories is uniform across Member States, the data is not fully comparable across categories. The most significant difference concerns classification. In national accounts ([NAMA_10_GDP]), investment is defined by type of expenditure (on fixed capital). The report approximates human capital expenditure with the use of data concerning the function of expenditure (healthcare, education). As a result, both classifications may include certain common elements, such as spending on the construction of school buildings (investment by type, education by function). The healthcare category has less overlaps: expenditure on the construction

of hospitals is only contained in investment in physical capital, as total hospital expenditure is excluded from the human capital investment category.

Full data availability would enable us to clear the investment in physical capital category of expenditure already included in human

capital category and to significantly extend the human capital investment category to cover relevant items of healthcare expenditure at the hospital level. The calculations in the report can be treated as the upper bound estimate of investment in physical capital and the lower bound estimate of investment in human capital.



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