

The Recovery, Transformation and Resilience Plan and its macroeconomic impact from a sectoral standpoint

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Rationale

The Recovery, Transformation and Resilience Plan (RTRP), linked to Next Generation EU, details an investment programme that represents a unique opportunity to facilitate the structural transformation of the Spanish economy, on account of both the plan's envelope (around €69.5 billion or 5.6% of GDP in 2019) and its emphasis on the challenges posed by digitalisation and the green transition. A sectoral classification of how those investments are allocated is therefore interesting in order to quantify their macroeconomic impact, taking into account the interplay between the different sectors of activity.

Takeaways

- According to the findings, fully absorbing the RTRP funds would have a direct impact on GDP of 1.15% in annual average terms over a five-year horizon, although this figure could rise to 1.75% when considering spillover effects between sectors.
- The estimated effects are heterogeneous across sectors; the sectors benefiting the most are those linked to the digitalisation process (information and communication, and professional and technical services) and the construction sector, owing to investment in public infrastructures related to the green transition.
- However, rigidities in the reallocation of resources between sectors of activity could limit the macroeconomic effect of the investments envisaged in the RTRP. These factors could reduce the estimated impact from 1.75% to 1.3% of GDP.

Keywords

Input-output models, industrial policy, public investment, Next Generation EU.

JEL classification

C67, O25, L16, H54, E65, O52.

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Introduction

On account of its sizeable envelope and structural approach, Next Generation EU (NGEU) offers a unique opportunity to boost the Spanish economy's growth and facilitate the transformation of its sectoral structure in light of the considerable challenges posed by, among others, growing digitalisation and the green transition. Specifically, the Spanish economy will receive funds totalling around €69.5 billion in the form of grants charged to the Recovery and Resilience Facility (RRF) – the key instrument at the heart of NGEU – which will be absorbed in accordance with the investment and reform programme detailed in the [Recovery, Transformation and Resilience Plan \(RTRP\)](#).¹

This article classifies expenditure by sector of activity and type of expenditure envisaged in the RTRP and estimates the plan's macroeconomic impact taking into account the spillover effects between sectors.² Based on the findings, fully absorbing the funds according to the RTRP would have a direct impact on GDP of 1.15% in annual average terms over a five-year horizon. Furthermore, this impact could rise to 1.75% when considering spillover effects between sectors. However, the estimated effects are particularly heterogeneous across sectors; the sectors benefiting the most are those more closely linked to the digitalisation process (information and communication, and professional and technical services) and the construction sector, owing to investment in public infrastructures linked to the green transition.

In any event, the estimated effects rest on the assumption that resources will be fully available to, and freely shifted between, the different sectors. However, labour and product market rigidities could limit the necessary reallocation of resources among firms and sectors and, therefore, significantly reduce the aggregate impact.³ For example, the shortage of skilled labour in certain sectors could reduce the estimated impact by approximately 25%, from 1.75% to 1.3% of GDP in annual average terms.

Type and sectoral classification of the spending plans envisaged in the RTRP

The RTRP is structured around ten levers comprising 30 components and 110 investments and includes a detailed description of the different projects to be executed in each case. Using this

¹ Note that the RTRP contains the plans to absorb the grants initially allocated to Spain totalling €69,528 million which are analysed in this article. However, on 30 June 2022 the European Commission updated the amounts to be allocated to Spain under the RRF owing to the revision to the definitive data on GDP growth recorded in the European countries in 2020 and 2021. Spain would thus be allocated a further €7,706 million, increasing the funds to be received from €69,528 million to €77,234 million. Spain may also request around €70 billion in the form of loans.

² For more details on the methodology, see Fernández-Cerezo, Moral-Benito and Quintana, 2023.

³ Another factor that could limit the programme's estimated impact is the increase in capital and investment goods prices owing to higher energy prices and the limited availability of such goods as a result of the emergence of bottlenecks in global value chains.

information, first we identified the type of spending that each investment project involves. Subsequently, we identified the sectors of activity benefiting directly in each case.

Four different types of spending can be classified: (i) current public expenditure (e.g. spending on consultancy services and that associated with advertising campaigns); (ii) grants for non-production oriented investments (e.g. the renovation of housing buildings and the restoration of ecosystems); (iii) investment in public infrastructures (e.g. the construction of railway lines and ports); and (iv) capital transfers to firms (e.g. investments to electrify the automotive industry and digitalise firms). Based on this classification, capital transfers are the most used type of expenditure (40% of the total), followed by investment in public infrastructures (31%), grants for non-production oriented investments (16%) and, lastly, current public expenditure (13%).

Under the multi-sectoral approach adopted in this article, the macroeconomic impact of the different types of expenditure may arise through different channels: i.e. on the supply side or on the demand side (see Table 1). Current public expenditure and the grants for non-production oriented investments have an impact on the demand side, as they only affect economic activity by boosting a certain sector's demand at the time of the expenditure, without increasing the productive capacity of any sector. For example, the building renovation programmes will increase the construction sector's demand. However, capital transfers and investment in public infrastructures have an impact not only on the demand side but also on the supply side. In other words, leaving to one side the impact on the demand of supplier sectors, the productive capacity (capital stock and/or productivity) of certain sectors increases as a result of these investments. For example, the construction of a railway line or of a battery factory will not only increase the construction sector's demand (demand channel), but also the productive capacity of the transportation and automotive sectors (supply channel).

Turning to the beneficiary sectors, the different RTRP projects and expenditure items are allocated to specific sectors⁴ from both a demand (increases in each sector's production) and a supply (increases in each sector's productive capacity (capital stock and/or productivity)) perspective. Thus, the demand-side classification applies to all the expenditure categories identified, whereas the supply-side classification can only apply to the capital transfers and investment in public infrastructures.

By way of example, the sectoral allocation of the spending plans for Component 1 ("Action plan for safe, sustainable and connected mobility in urban and metropolitan areas") is summarised below. This is one of the RTRP's most sizeable components, mobilising up to €6,536 million. Specifically, this component's key investment ("Low emission zones and transformation of urban and metropolitan areas") will mobilise up to €2,916 million earmarked mostly for investment in public infrastructures across three major projects. The first allocates €900 million to the transformation of urban mobility (bus lanes, improvements to the metro system, public transport

⁴ A total of 21 sectors, based on the NACE Rev. 2 sections, are considered, given the detail of the projects described in the RTRP. Furthermore, although this allocation refers to the direct impact, it should be noted that the other sectors will also benefit indirectly via the spillover effects linked to production chains.

Table 1

Classification of spending under the RTRP

Type of spending	Impact channel	Examples	Total spending (€bn)	% of total
Current expenditure	Demand	Consultancy, advertising campaigns	9.0	13
Grants for non-production oriented investments	Demand	Housing renovation and restoration of ecosystems	13.2	16
Investment in public infrastructures	Demand and supply (via productivity)	Roads, railways	19.5	31
Capital transfers to firms	Demand and supply (via capital stock)	Electric vehicle manufacturing plant, digitalisation of firms	27.9	40

SOURCES: Government of Spain and Banco de España.

accessibility, park and ride facilities, bike lanes, pedestrian routes), the second allocates €1.5 billion to digital control systems for low emission zones (LEZs) and to the acquisition of zero-emission buses, and the third allocates €500 million to subsidies to renew fleets and to improve the State road network. Thus, the main beneficiary of these projects on the supply side will be the transportation sector due to the boost to its productive capacity, while, on the demand side, the beneficiary sectors will mainly be construction, manufacturing and information and communication.⁵

Mention should also be made of several components that include cross-cutting projects whose allocation, on the supply side, requires some assumptions to be made. For example, the sectors benefiting from investments under Component 13 – “Fostering the growth of SMEs” (funds totalling €4,894 million) – are determined based on the share of small and medium-sized enterprises (SMEs) in each sector.⁶ Likewise, investments in Component 7 – related to the integration of renewables (funds totalling €3,165 million) – and Component 16 – related to artificial intelligence (funds totalling €500 million) – are distributed by allocating the expenditure among the different sectors according to the share of their gross value added (GVA) in the overall economy. Lastly, for the investments in education in Components 19 and 20 (funds totalling €3,593 million and €2,076 million, respectively), the expenditure is distributed according to each sector’s share of total employment, while investments in Component 23 – related to active labour market policies (funds totalling €2,363 million) – are allocated based on the sectoral distribution of unemployed workers. The annex to this article maps all the RTRP components and all the beneficiary sectors, on both the supply and demand side.

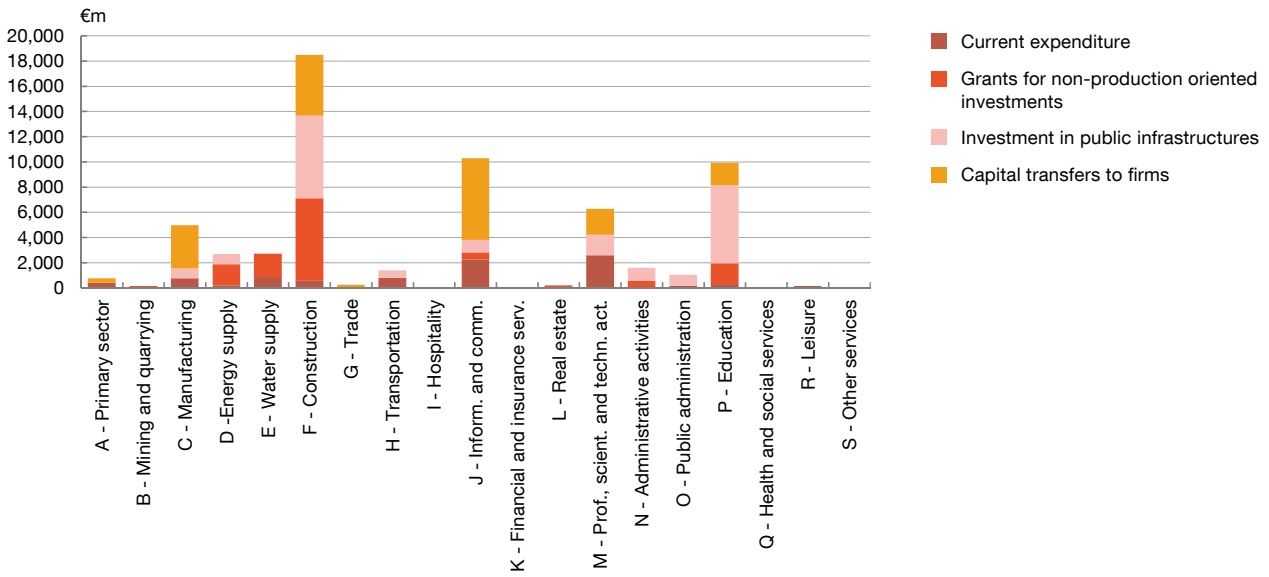
⁵ This sectoral distribution of the expenditure is obtained by analysing in detail the investments and tasks involved in each project. On the supply side, transportation is the sector benefiting from this component because several investments are explicitly earmarked for increasing the capital stock of enterprises in the sector, such as Adif. On the demand side, the following assumptions are considered: (i) construction production will be boosted by the urban mobility transformation programme and the work geared towards controlling access to LEZs; (ii) manufacturing production will be increased by the transport fleet transformation programme, which will require vehicles to be manufactured; and (iii) information and communication will be driven by the digitalisation of the systems to control access to the LEZs.

⁶ This information, corresponding to 2018, was obtained from the Central Balance Sheet Data Office of the Banco de España.

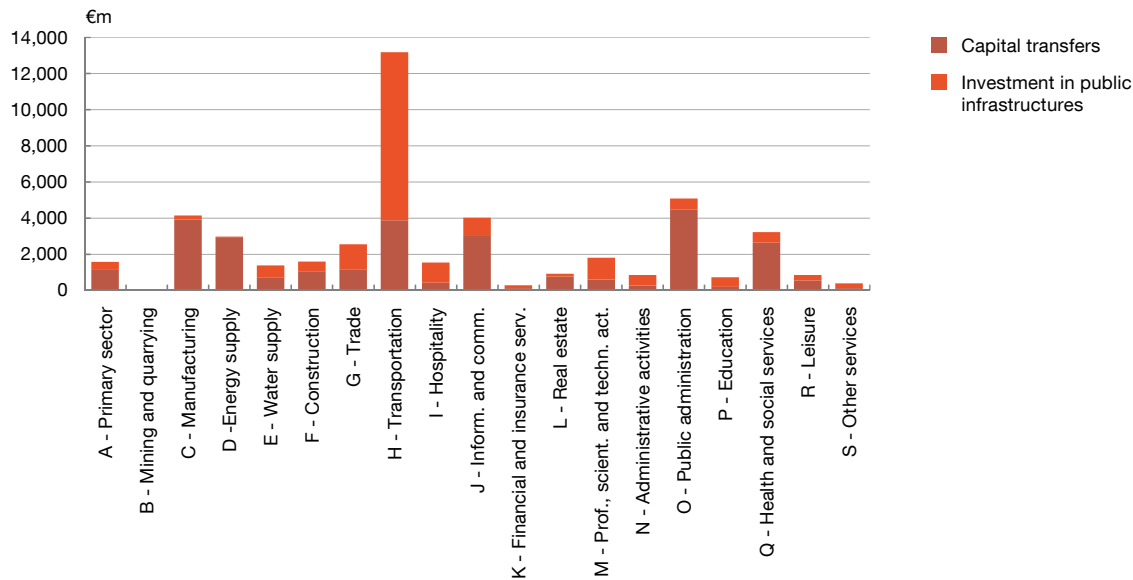
Chart 1

Sectoral distribution of total spending under the RTRP

1.a Demand-side sectoral distribution



1.b Supply-side sectoral distribution



SOURCES: Government of Spain and Banco de España.



Chart 1.a depicts the distribution of total RTRP expenditure on the demand side. Construction would be the main beneficiary, its production increasing by around €18 billion, followed by information and communication and education services, whose demand would increase by around €10 billion.⁷ In this regard, it should be noted that the sum total of the amounts in Chart 1.a is less than the €69.5 billion of total expenditure under the RTRP, as around 30% of the capital transfers and investment in public infrastructures will increase the demand of sectors abroad,

⁷ Bruegel provides a sectoral classification of the recovery plans for the European Union economies, but it is less exhaustive in terms of expenditure type, sectoral breakdown and impact channels.

i.e. a portion of the demand stimulus under the RTRP will be used to purchase goods and services outside Spain. For example, the projects aimed at electrifying the automotive sector entail importing specialist industrial machinery from other countries, according to the sectoral information on investment in capital goods from the capital input file in the EU KLEMS database (O'Mahony and Timmer, 2009, and Bontadini, Corrado, Haskel, Iommi and Jona-Lasinio, 2021) combined with information on capital goods trade contained in the World Input-Output Database (WIOD).

On the supply side, the capital transfers and investment in public infrastructures that will increase the sectors' productive capacity total €47.4 billion (see Chart 1.b). Here, transportation is the main beneficiary, due, above all, to the investment in public infrastructures that improve its productive capacity by increasing both its available capital stock and its productivity. Public administration and information and communication will also see their productive capacity increase, driven by the investments in digital capital. Manufacturing's productive capacity will also be boosted by the investments in some sectors such as the automotive industry (linked to the transition to electric vehicles) and the aerospace and shipbuilding industries (linked to fostering cleaner forms of propulsion).⁸ Conversely, the direct positive impact of these funds on other sectors, such as those most closely linked to tourism (hospitality, trade and leisure), will be smaller.⁹

Macroeconomic impact of the RTRP's expenditure plans

Given the classification of the RTRP's expenditure plans by type and the allocation of expenses by sector of activity, a multi-country sectoral model is considered to estimate their impact on the Spanish economy's GDP. This approach is particularly interesting in this setting to approximate possible NGEU spillover effects, because it allows us to capture interactions between sectors of activity in three different dimensions: through customer-supplier relationships in the purchase and sale of intermediate inputs, through the capital goods market when carrying out investments and through competition in labour markets.¹⁰

First, the direct impact of the government investments envisaged in the RTRP is estimated assuming that there is no interplay between sectors (beyond the direct increase in demand in the sectors that supply capital goods). Specifically, the RTRP's expenditure plans are incorporated into the model as an increase in the stock of capital for capital transfers, as an increase in productivity for investment in public infrastructures¹¹ or as an increase in current public expenditure. The results obtained show that the average annual impact on Spanish GDP would

⁸ For more details see: *Component 12 of the RTRP: Política Industrial España 2030* (only available in Spanish).

⁹ See, for example, Exceltur's January 2023 *Perspectivas Turísticas* (only available in Spanish) for an initial analysis of the allocation of funds linked to the tourism sector (*Component 14 of the RTRP: Plan de modernización y competitividad del sector turístico* (only available in Spanish)).

¹⁰ This conceptual framework is also very flexible. It enables the quantification of the effects of various shocks, such as bottlenecks in global value chains or the energy shock resulting from the war in Ukraine (Quintana, 2022).

¹¹ Investment in public infrastructures is incorporated into the model as a positive shock on the beneficiary sector's productivity (for more details, see Fernández-Cerezo, Moral-Benito and Quintana, 2023).

be 1.15% over a five-year horizon (see Chart 2.a).^{12, 13} This direct impact of RTRP investments is in line with those estimated by the Ministry of Economic Affairs and Digital Transformation¹⁴ and the Independent Authority for Fiscal Responsibility (AIReF, by its Spanish acronym).¹⁵

Second, the same exercise is considered, but taking into account the indirect effects of spillovers between sectors. A particularly significant interaction is that arising from productivity gains in sectors providing intermediate inputs and capital goods that are direct recipients of funds, resulting in gains for their customer sectors.¹⁶ When these spillovers are taken into account, the estimated impact rises to 1.75% of GDP in annual average terms (see Chart 2.a).

Third, this exercise enables us to analyse the cross-sectoral heterogeneity of the estimated impact. Thus, Chart 2.a also shows the annual average rate of change of GVA for the sectors considered, distinguishing between direct and indirect effects through spillover effects. As regards the direct effect, only a few sectors benefit significantly from the impulse of the RTRP funds. Noteworthy among these are information, professional and educational services, given the RTRP's focus on digitalisation and on modernising the economy, and the construction sector, owing to its key role in some RTRP components (such as the "Housing renovation and urban renewal plan") and because it is a major supplier of capital goods in demand by other sectors (such as the construction of railway lines). However, once the indirect effects are considered through customer-supplier relationships, most sectors see their GVA levels increase significantly. In particular, sectors such as professional services and administrative activities are the ones that most benefit through this channel, owing to the positive spillover effects derived from the expansion of information and communications. For other industries, such as manufacturing or construction, the main factor driving these indirect effects is the increase in productivity in the transport sector.

Lastly, a crucial assumption underlying these estimates is the smooth reallocation and investment of funds. One example of potential friction is the shortage of high-skilled workers, which could limit the positive effects of the RTRP by hampering the expansion of the sectors most linked to information technology, which particularly benefit from these funds and are high-skilled-labour intensive. This potential shortage is modelled through a lower elasticity in the supply of higher-skilled workers relative to those less qualified in a proportion of 4 to 1, because the unemployment rate of the former in Spain is four times lower than that of the

12 The estimated impacts are presented in annual average terms for two reasons: (i) because the purpose of this article is to highlight the role played by sectoral interactions in the funds' macroeconomic impact, and (ii) there is high uncertainty about the pace at which the funds are used year by year, at both aggregate and sectoral level.

13 This impact runs through channels including not only the effect on consumption but also the positive effect of spending and government investment on private investment. Thus, beyond the five-year horizon envisaged in this article, a positive effect on GDP would persist, owing to the increase in the stock of productive capital in the economy. It is also important to remember that approximately 30% of the capital transfers and investment in public infrastructures have a significant import content, which reduces the multiplier for the Spanish economy.

14 See *Recuadro 5 del Plan Presupuestario 2023* (only available in Spanish).

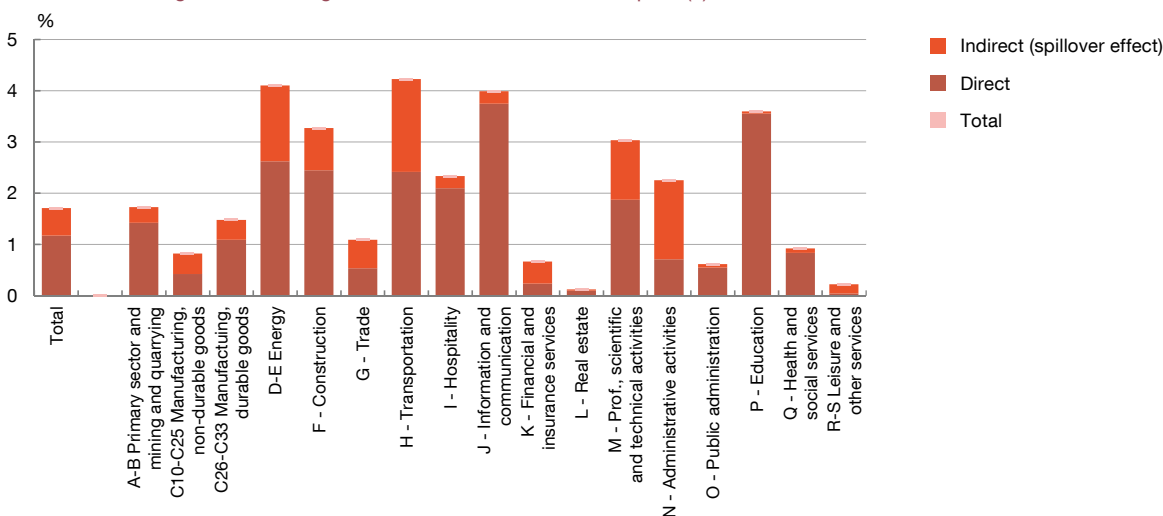
15 See *Report on the projects and fundamental lines of the budgets of public administrations: General State Budgets 2023*.

16 In the model, the sectors use other sectors' output as inputs for their own production processes. Thus, an increase in the productivity of sectors that are suppliers of inputs or capital goods lowers their selling prices, resulting in a productivity gain in customer sectors, since production can be increased at the same cost.

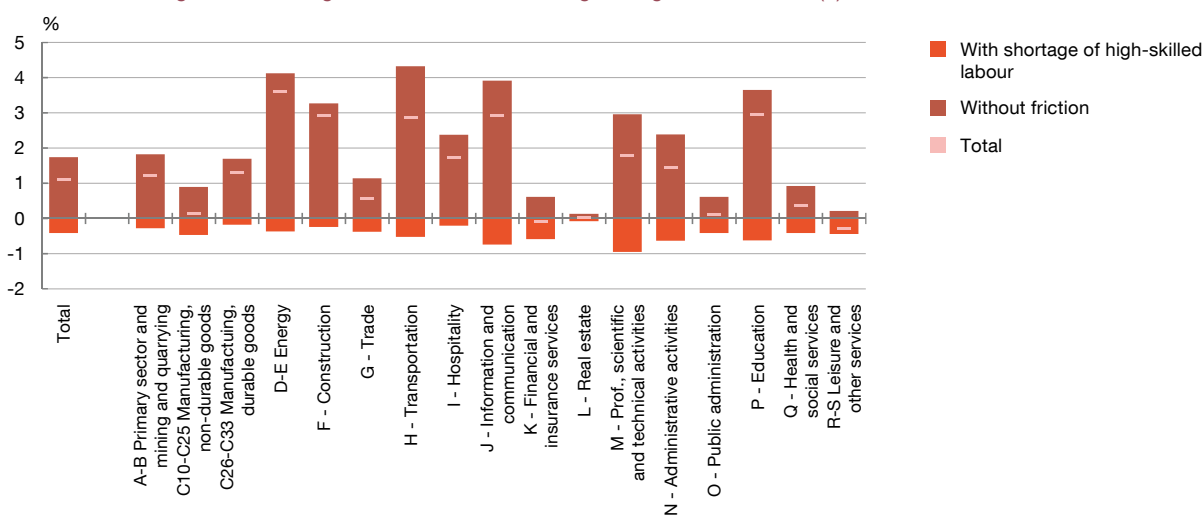
Chart 2

Impact on the Spanish economy of fully absorbing the RTRP funds

2.a Annual average rate of change in GVA. Direct and indirect impact (a)



2.b Annual average rate of change in GVA. Effect of shortage of high-skilled labour (b)



SOURCES: Government of Spain and Banco de España.

- a The direct impact takes into account all the types of expenditure included in Table 1, plus the demand-side shock induced on capital goods and services provider sectors. The indirect impact considers customer-supplier relationships between sectors.
- b The first bar depicts changes in GVA assuming that all employment types have a Frisch elasticity of 4. The second bar shows the additional change that arises when a Frisch elasticity of 1 is assumed for high-skilled workers.



latter.¹⁷ Indeed, the annual average impact on Spanish GDP over five years would decline from 1.75% to 1.3% if competition in the labour market between sectors of activity is considered and some shortage of high-skilled labour is assumed. This lower impact is particularly significant in

¹⁷ Given the historically high volatility of employment with respect to wages in the Spanish economy, a Frisch elasticity value of 4 is considered, which is in the upper range of the literature's estimates (Chetty, Guren, Manoli and Weber, 2011). In other words, employment reacts significantly to changes in wages in each sector. To simulate the impact of a potential skilled-labour shortage, this parameter is reduced from 4 to 1 in the case of skilled workers. This assumption intends to roughly capture that relatively few of these workers are unemployed and, therefore, the need for firms to raise wages in order to recruit these workers into their respective sectors of activity.

the case of high-skilled-labour intensive sectors (such as information and communication and education), although the GVA of other sectors would also be affected (see Chart 2.b).

Conclusions

This article classifies the RTRP by type of expenditure and sector of activity to quantify the macroeconomic effect of the NGEU funds, taking into account not only their direct impact but also their propagation through the production chains. The results obtained show that the spillover effects between sectors could amplify the impact of the NGEU funds on GDP from 1.15% to 1.75% in annual average terms over a five-year horizon. The sectors that would benefit the most would be information and communication, professional and technical activities, and construction. However, the existence of friction in the process of reallocating resources between sectors could reduce this impact by up to one-third.

This last result reflects the high degree of complementarity between the financing of investment projects, such as those funded by the NGEU programme, and the implementation of structural reforms to smooth the reallocation of resources among firms and sectors.¹⁸ It should be noted that it is not possible to quantify the impact of the structural reforms envisaged in the RTRP on the basis of the figures presented in this article, but their role is essential given that the disbursement of the funds is conditional upon compliance with the agenda of reforms and milestones established. This quantification is a priority line of work for the Banco de España.

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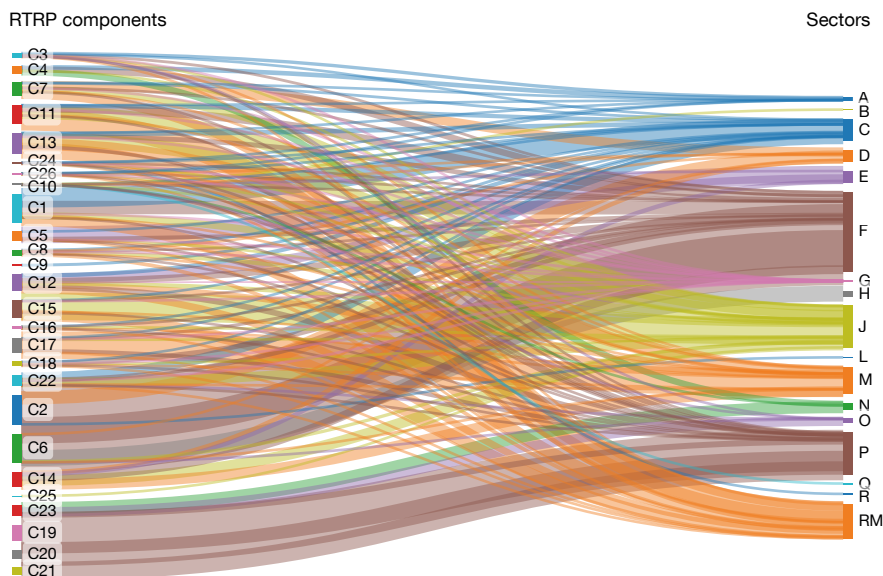
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¹⁸ Recent studies conducted by the Banco de España evidence that NGEU's transformative potential would be boosted if it were accompanied by various structural measures (see, for instance, Cuadrado, Izquierdo, Montero, Moral-Benito and Quintana, 2022).

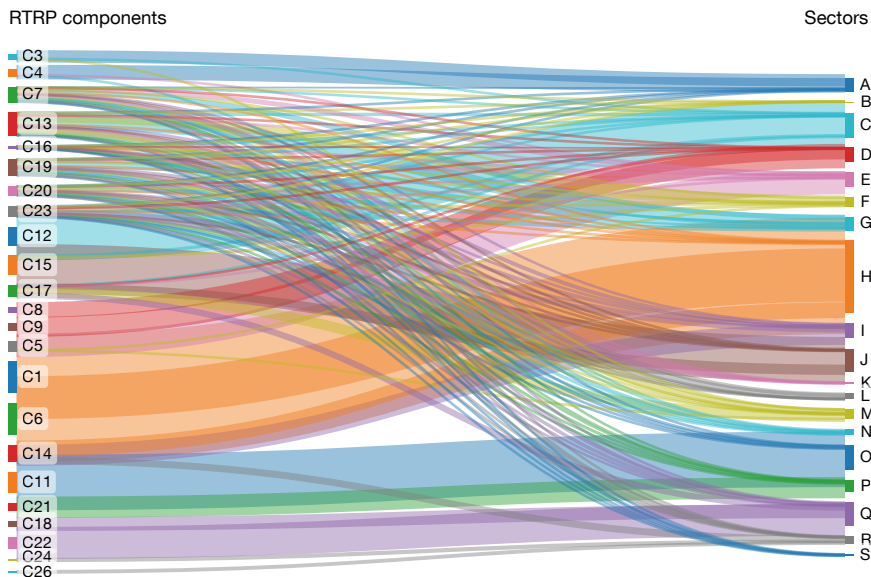
Annex

Chart A.1
Sectoral classification of RTRP components

A.1.a Demand side



A.1.b Supply side



SOURCES: Government of Spain, Banco de España and SankeyMATIC.

NOTES: RTRP component: C1 Urban mobility, C2 Housing renovation, C3 Transformation of the agrifood and fisheries sector, C4 Preservation of ecosystems, C5 Coastal and water resource preservation, C6 Sustainable mobility, C7 Renewable energies, C8 Electricity infrastructures and smart networks, C9 Renewable hydrogen, C10 Just transition, C11 Modernisation of public administration, C12 Industrial policy, C13 Boost to SMEs, C14 Tourism, C15 Cybersecurity and 5G, C16 Artificial intelligence, C17 National science, technology and innovation system, C18 National Health System, C19 Digital skills, C20 Vocational training, C21 Modernisation of the educational system, C22 Care economy, C23 Active labour market policies, C24 Cultural industry, C25 Audiovisual hub, C26 Sports. Sectors: A Primary sector, B Mining and quarrying, C Manufacturing, D Energy supply, E Water supply, F Construction, G Trade, H Transportation, I Hospitality, J Information and communication, K Finance and insurance, L Real estate, M Professional, scientific and technical activities, N Administrative activities, O Public administration, P Education, Q Health and social services, R Leisure, S Other services and RM Rest of the world (increase in the demand of sectors outside Spain).

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