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## **Estimation of the Medium-Term Macroeconomic Impact of the Cyprus Recovery and Resilience Plan**

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December 2022

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# Estimation of the Medium-Term Macroeconomic Impact of the Cyprus Recovery and Resilience Plan \*

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December 2022

## Abstract

This paper estimates the medium-term macroeconomic impact of the fiscal stimulus of the Cyprus Recovery and Resilience Plan (RRP) under various scenarios, by using the CYMCM, a semi-structural macroeconometric model of the Cyprus economy developed by CBC staff. Scenarios differ in their assumptions about the extent to which the expenditure measures included in the RRP are additional to the ones planned or expected prior to the agreement for a recovery plan for Europe. The analysis takes into account the data of the published Cyprus RRP and makes prudent assumptions on the additivity of RRP expenditure measures. In the scenario in which all RRP-related spending is used for additional measures to the ones planned (“full additivity” scenario), the simulations show that the expected impact on real GDP level is around 0.71 percent and for HICP inflation 0.08 percentage points. The expected impact on employment is 0.22 percent, while public debt-to-GDP is expected to decrease by 0.75 percentage points. In the scenario in which spending under the RRP is partially used for additional measures (“partial additivity” scenario), which is considered a more realistic scenario in this paper, the simulations show that the expected impact on real GDP level is around 0.58 percent and for inflation 0.06 percentage points. The impact on employment is 0.18 percent and the reduction in public debt-to-GDP ratio is expected to be around 1.25 percentage points. The results are based only on the fiscal stimulus of the Cyprus RRP, as the analysis does not incorporate spillover effects of NGEU measures in other EU countries or additional productivity gains due to reforms. Nevertheless, the analysis indicates that implementation of the RRP will have a meaningful impact on the Cyprus economy in the medium-term. Overall, the results of this paper are comparable to the results of other studies.

**Keywords:** Next Generation EU (NGEU); Recovery and Resilience Facility (RRF); National Recovery and Resilience Plan (NRRP); Macroeconomic impact; Fiscal policies

**JEL classification:** C54, E17, E62, F45

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## Non-technical summary

The 2020 agreement between EU leaders on Next Generation EU (NGEU), a €750 billion temporary recovery package to supplement the long-term EU budget for 2021-2027, was an exceptional fiscal response to the crisis caused by the COVID-19 pandemic. The Recovery and Resilience Facility (RRF) constitutes the main instrument of the NGEU, since the entire loan portfolio and 80 percent of the grants will be assigned through it. It aims to help the transition to a more resilient and sustainable European economy, by supporting green and digital investments, as well as dealing with country-specific vulnerabilities. In the context of the RRF, Cyprus is set to receive grants initially estimated at around €1 billion and loans amounting to a maximum of €200 million. This creates the question of whether the RRF is expected to have a meaningful macroeconomic impact on Cyprus economy.

This paper estimates the medium-term macroeconomic impact of the fiscal stimulus of the Cyprus Recovery and Resilience Plan (RRP) under various scenarios, by using the CYMCM, a semi-structural macroeconometric model of the Cyprus economy, developed by Central Bank of Cyprus (CBC) staff ([Aristidou and Papadopoulou, 2022](#)). Scenarios differ in their assumption about the extent to which the expenditure measures included in the Cyprus RRP are additional to the ones planned or expected prior to the NGEU agreement. Scenario results are presented in deviations from a baseline that assumes non-existence of the NGEU package (“no NGEU” scenario) and, therefore, no NGEU funds are provided to Cyprus. In addition, the analysis takes into account the data of the published Cyprus RRP, therefore, it incorporates a relatively realistic variety of fiscal instruments and timeline of expected implementation. Last, the focus of the analysis is on the macroeconomic impact through the RRF fiscal stimulus channel alone.

The results indicate that, if all measures financed by RRF were additional to prior-to-NGEU government plans, the expected impact on real GDP level is 0.71 percent in the medium-term and for HICP inflation is only marginal, at 0.08 percentage points. The impact on employment is around 0.22 percent, while public debt-to-GDP ratio is expected to decrease by 0.75 percentage points.

Furthermore, a more realistic scenario is considered in which RRF-related expenditure measures exhibit some degree of substitution for prior government plans, therefore, they are partially additive. Under this scenario, the expected impact on real GDP level is 0.58 percent in the medium-term and for inflation is only 0.06 percentage points. The impact on employment is 0.18 percent, while public debt-to-GDP ratio is expected to decrease by 1.25 percentage points. The results of this paper are comparable to the results of other studies, including those conducted by the European Commission, IMF staff and ECB staff.

This paper indicates that RRF is expected to have a meaningful impact on the Cyprus economy in the medium-term. Nevertheless, Cyprus authorities face an important challenge ahead regarding the effective implementation of investment projects and reforms included in the Plan, as well as meeting the goals of the digital and green transition. The latter will require additional funding from national resources. The successful implementation of structural reforms and the green and digital agenda will be key for transforming our economy to a sustainable and more resilient one. This would probably imply an even more substantial impact in the longer-term, than the medium-term impact estimated in this paper.

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# 1 Introduction

The 2020 agreement between EU leaders on Next Generation EU (NGEU), a €750 billion temporary recovery package to supplement the long-term EU budget for 2021-2027, was an exceptional fiscal response to the crisis caused by the COVID-19 pandemic. The Recovery and Resilience Facility (RRF) constitutes the main instrument of the NGEU, since the entire loan portfolio and 80 percent of the grants will be assigned through it. In the context of the RRF, Cyprus is set to receive grants initially estimated at around €1 billion and loans amounting to a maximum of €200 million.<sup>1</sup> The disbursement of funds will reflect progress on reforms and investments as set out in the milestones and targets of the Cyprus Recovery and Resilience Plan (RRP). This creates the question of whether the NGEU package is expected to have a meaningful macroeconomic impact on EU countries, and, as far as this paper is concerned, on the Cyprus economy.

This paper estimates the medium-term macroeconomic impact of the fiscal stimulus of the Cyprus RRP under various scenarios, by using the CYMCM, a semi-structural macroeconometric model of the Cyprus economy, developed by Central Bank of Cyprus (CBC) staff ([Aristidou and Papadopoulou, 2022](#)). The analysis takes into account the data from the published Cyprus RRP (on expenditure categories, timeline, etc.). Scenarios differ in their assumption about the extent to which the expenditure measures included in the Cyprus RRP are additional to the ones planned or expected prior to the NGEU agreement. Scenario results are presented in deviations from a baseline that assumes non-existence of the NGEU package (“no NGEU” scenario) and, therefore, no NGEU funds are provided to Cyprus.

The simulation results indicate that, if all RRP-related spending is used for additional measures to the ones planned (“full additivity” scenario), the expected impact on real GDP level is 0.71 percent in the medium-term and for inflation is only marginal, at 0.08 percentage points. The impact on employment is 0.22 percent, while public debt-to-GDP ratio is expected to decrease by 0.75 percentage points. If measures are financed by grants alone (“full additivity without loans” scenario), the impact on real GDP is slightly smaller, whereas the expected decrease on public debt-to-GDP ratio is slightly larger.

Furthermore, a more realistic scenario is considered in which RRF-related expenditure measures exhibit some degree of substitution for prior-to-NGEU government plans. This scenario is based on CBC staff assessment on the composition of additive and non-additive measures. Under this scenario (“partial additivity” scenario), the expected impact on real GDP level is 0.58 percent in the medium-term and for inflation is only 0.06 percentage points. The impact on employment is 0.18 percent, while public debt-to-GDP ratio is expected to decrease by 1.25 percentage points. Results based on the “partial additivity without loans” scenario, where new measures are financed only by grants, are very close to the “partial additivity” scenario.

The results are based on certain assumptions, which renders them being considered as a lower bound of the expected macroeconomic impact of the fiscal stimulus under the Cyprus RRP. First, the analysis captures the impact due to fiscal stimulus of the Cyprus RRP alone and does not incorporate spillover effects of NGEU measures in other EU countries or additional productivity

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<sup>1</sup>The final allocation of grants, published by the European Commission on 30 June 2022, contributes around €90 million less to Cyprus, or around 9 percent lower, compared to the initially estimated allocation. The results in this paper take into account the data in the published Cyprus Recovery and Resilience Plan, which reflect the initially estimated allocation of RRF grants. Nevertheless, Appendix C shows results that incorporate the final allocation of grants to Cyprus and use different assumptions on RRP-related expenditures.

gains due to reforms or extra-productive investments.<sup>2</sup> Furthermore, some implementation risks are considered as regards the execution of ambitious projects funded by RRF loans. Finally, this paper considers various assumptions on the additivity of expenditures.

The estimated impact in this paper is comparable to those of other studies. IMF staff estimate an increase close to 0.5 percent in GDP level of Cyprus by 2026 via fiscal stimulus, through an impact on government investment spending (IMF, 2022). The European Commission estimates that the NGEU has the potential to increase the GDP of Cyprus by between 1.1 and 1.8 percent by 2026, which “would translate into up around 3,000 additional jobs” (European Commission, 2021).<sup>3</sup> The European Commission’s simulations assume 100 percent additive government investment and incorporated trade spillovers and additional productivity gains. On the other hand, the estimates by the Economic Research Centre of the University of Cyprus (Andreou et al., 2021), on behalf of the Cypriot Authorities, show a significantly higher impact on real GDP, around 6.8 percent until 2026, implying an additional 1.2 percentage points average annual contribution to GDP growth during 2021-2026, compared to the non-plan baseline scenario.<sup>4</sup> During the same period, they estimate an increase in employment by more than 2.5 percent cumulatively (around 11,000 new jobs). Their assumptions also included 100 percent additivity of expenditure. Furthermore, their method accounts for reforms, assumed to have a significant impact on productivity. ECB staff estimate the expected impact of NGEU on the euro area GDP level to be around 1.5 percent by 2026 (Bankowski et al., 2022). This impact takes into account the fiscal stimulus channel as well as the impact of structural reforms and sovereign risk premia. Around a quarter to one third of this impact is due to the fiscal stimulus channel.

The remainder of this paper is organized as follows. Section 2 describes the basic characteristics of the NGEU package with emphasis on the Cyprus program. Section 3 lays down the scenario assumptions. Section 4 explains the modelling approach with a brief description of the CYMCM model and how the fiscal stimulus scenarios are designed for model-based simulations. Section 5 presents the estimates of the medium-term macroeconomic impact, while Section 6 concludes.

## 2 NGEU, RRF and the Cyprus RRP

### 2.1 Next Generation EU funds

On 21 July 2020, the European Council agreed on NGEU as an exceptional temporary recovery instrument. NGEU aims to promote a coordinated fiscal response to support the post-pandemic recovery in Europe, as well as to build a more resilient and sustainable European economy in the longer-term. The Multiannual Financial Framework (MFF) 2021-2027 and NGEU combined, constitute the largest stimulus package ever financed in Europe.<sup>5</sup> As seen in Figure 1, together with the regular MFF, NGEU is expected to have a meaningful volume in macroeconomic terms, with an overall envelope of around 5.5 percent of EU GDP. NGEU funds can be used to provide grants

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<sup>2</sup>The analysis does not incorporate the effect of NGEU packages of other EU countries, except Cyprus. Therefore, it does not embed any positive externalities from stimulus of the external environment.

<sup>3</sup>The simulations were based on the European Commission’s QUEST model. For more information, see Box 2 (page 54) of the European Commission Staff working paper (European Commission, 2021) and Pfeiffer et al. (2021).

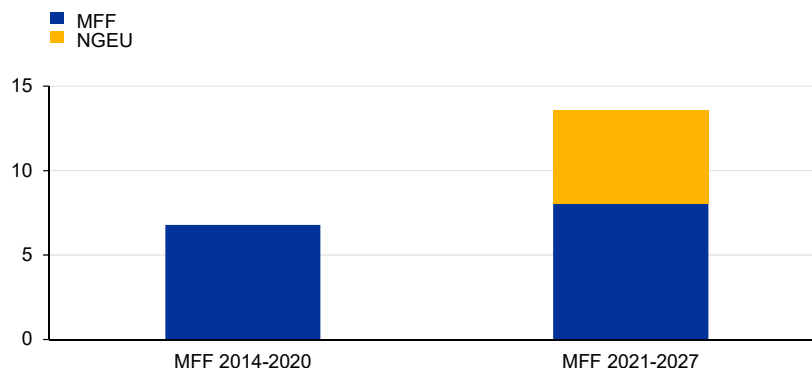
<sup>4</sup>The quantification used a production function approach and several complementary methods (econometric models and an input-output framework). For more information, see Chapter 4 (page 540) of the Cyprus RRP (Cyprus Government, 2021) or Andreou et al. (2021).

<sup>5</sup>It is noted that the overall ceiling of the current seven-year MFF (MFF 2021-2027) will reach the same level as the previous MFF (MFF 2013-2020), despite UK’s departure from the EU.



of up to €421.1 billion and loans of up to €385.8 billion. These will be disbursed up to the end of 2026 and repaid by 31 December 2058 at the latest. The uniqueness of the NGEU is that it provides stronger financial support for those euro area countries that face the biggest economic challenges.<sup>6</sup>

Figure 1: MMF and NGEU funds



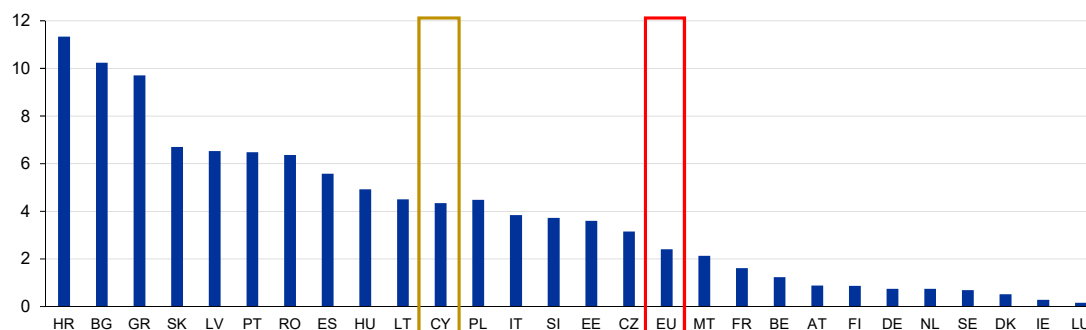
Source: European Commission, CBC staff calculations.

Notes: Vertical axis: In percent of 2018 GDP. The MFF 2014-2020 corresponds to €1083 billion (EU 28, including UK), while the MFF 2021-2027 to €1085 billion (EU 27, excluding UK) with an additional €750 billion coming from NGEU (yellow bar).

## 2.2 Recovery and Resilience Facility

The RRF constitutes the main instrument of the NGEU, since the entire loan portfolio and 80 percent of the grants will be assigned through it. Figure 2 shows the initially estimated allocation of RRF grants to each Member State. Each EU Member State needed to prepare a National Recovery and Resilience Plan (NRRP) and request its approval by the European Commission.<sup>7</sup> The plans should feature coherent packages of reforms and public investment projects and address the challenges identified in the context of the European Semester and the country specific recommendations, in line with the EU policy objectives, particularly with respect to the green and digital transitions.<sup>8</sup>

Figure 2: RRF grants allocation by Member State



Source: European Commission, Eurostat and CBC staff calculations.

Notes: Vertical axis: In percent of 2019 GDP. Calculations are based on European Commission's initial estimates.

<sup>6</sup>For more information, see the relevant webpage of the European Commission: [Recovery plan for Europe](#).

<sup>7</sup>The European Commission approved the plans of all Member States. However, the NRRPs of Hungary and Poland were approved under conditions that the countries will implement judicial reforms.

<sup>8</sup>The European Commission's guidelines include a minimum of 37 percent of expenditure related to climate and a minimum of 20 percent of expenditure related to digital transition.

The RRF financial support will be disbursed in installments when milestones and targets are reached. The assessment and approval process occurs every six months, starting in December 2021 and ending in 2026. Payments are made on the basis of progress achieved with respect to pre-agreed milestones and targets.<sup>9</sup>

On 30 June 2022, the European Commission published the updated, final allocation of RRF grants to Member States. Therefore, amendments in the Member States' RRFs should be expected by 2023. More information on the changes in the distribution of grants among Member States due to the updated calculations can be found in Appendix C.

### 2.3 Cyprus Recovery and Resilience Plan

Cyprus submitted its RRF on 17 May 2021 and the European Commission approved it on 8 July 2021. Cyprus will receive EU grants through the RRF initially estimated at around €1 billion and loans amounting to a maximum of €200 million. A pre-financing of €157 million has already been disbursed to Cyprus, which equals 13 percent of the total envelope (grant and loan component).<sup>10</sup> Subsequent disbursements of funds will reflect progress on reforms and investments, as set out in the milestones and targets of the RRF.

Loans constitute around 17 percent of the total envelope of the Cyprus RRF. As seen in the left-hand side panel of Figure 3, Cyprus has requested €200 million in loans, which is around 13.4 percent of its total loan entitlement. The deadline for additional NGEU loan requests is in August 2023.<sup>11</sup> It should be noted that the scenario assumptions of this paper exclude around €100 million of expenditure financed through RRF loans compared with the measures included in the Cyprus RRF, implying an even lower share of loans in the total RRF envelope (9 percent). This relates to measures assessed to be very ambitious, therefore it can be considered that the analysis in this paper takes into account certain implementation risks.<sup>12</sup>

The Cyprus RRF is composed of 13 components grouped in five policy axes. It devotes 41 percent of the total allocation to measures that support climate objectives and 23 percent to measures that support digital transition. Furthermore, it includes reforms and investments that address “all or a significant subset of the economic and social challenges outlined in the country-specific recommendations”.<sup>13</sup> Appendix A provides a more detailed description of these policy axes and examples of the largest expenditure measures within each one of it.

The RRF-related stimulus is tilted towards investment. According to CBC staff assessment and as seen in the right-hand side panel of Figure 3, around half of the total envelope is dedicated to government investment and nearly a quarter to capital transfers. The remaining quarter is split between current transfers and government consumption. The distribution of the RRF-related expenditure measures through time is bell-shaped, with the peak occurring in 2024. According to

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<sup>9</sup>For more information, see the dedicated websites of the European Commission: [Recovery and Resilience Facility](#) and [Recovery and Resilience Scoreboard](#).

<sup>10</sup>The disbursement for the grant component is €131 million and for the loan component €26 million.

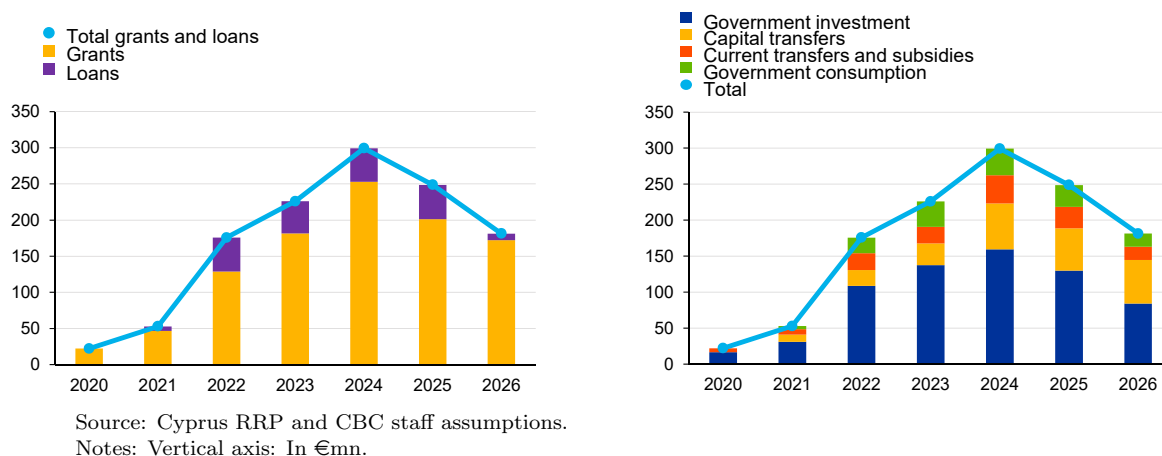
<sup>11</sup>Furthermore, at this point, it is not clear whether the Cyprus government will take advantage of the opportunity to amend the RRF to include a REPowerEU chapter, which aims at reducing dependency on Russian oil and gas by utilising RRF (unused) loans for investments on energy savings, renewable energy and diversification of energy supplies. For more information on REPowerEU, see the relevant website of the European Commission: [REPowerEU](#).

<sup>12</sup>Specifically, it relates to the construction of an electricity interconnector cable between Israel, Cyprus and Greece that has not yet started and is considered a very ambitious project.

<sup>13</sup>For more information, see the website of the Cyprus government: [Cyprus tomorrow \(in Greek\)](#).

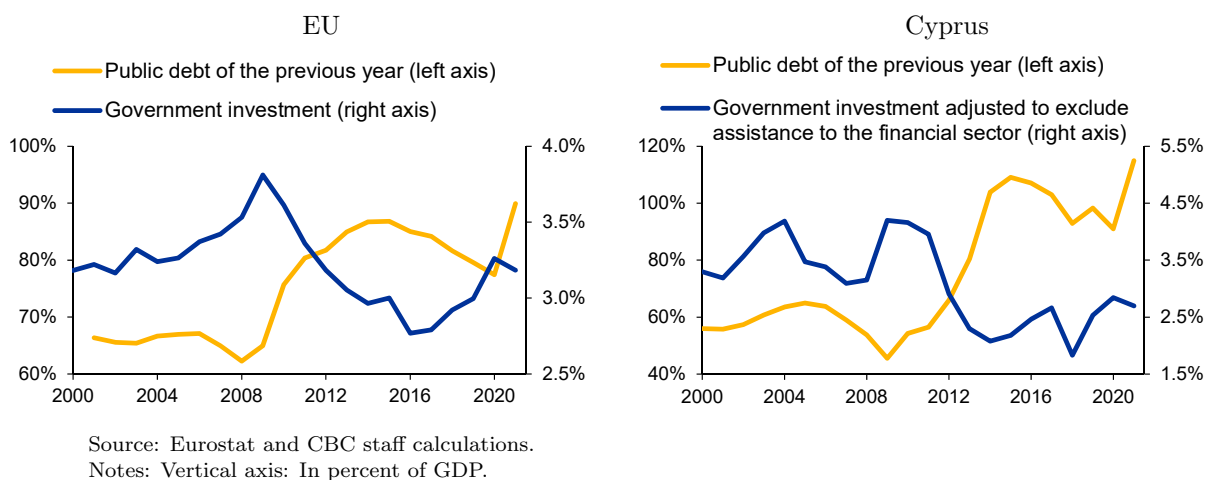
the milestones and targets set out in the RRP, grants will be disbursed in ten installments (every six months), while there will be four loan installments.

Figure 3: RRP expenditure by funding source and statistical category



Given the recent past experience, the RRF can play an important role in preserving productive investment during the recovery. As seen in the left-hand side panel of Figure 4, the deterioration of public finances in the EU during the 2008/09 financial crisis, as depicted by the sharp increase in the aggregate public debt-to-GDP ratio, coincided with a significant drop in government investment as percent of GDP. As seen in the right-hand side panel of Figure 4, this was also the case for Cyprus during the 2013 banking and sovereign debt crisis. This negative relation between public debt and government investment, may be explained by the lower perceived political cost of decreasing investment to correct fiscal imbalances compared with the political cost of using other fiscal instruments, such as increasing taxes or decreasing social transfers. The rise in public debt-to-GDP levels after the 2020 pandemic crisis entails similar risks. Consequently, the link between the disbursement of RRF grants and implementation of investment projects in the national RRPs is key to preserve the level of investment in the EU in the next five years.

Figure 4: Government investment and lagged public debt



The final allocation of grants, published by the European Commission on 30 June 2022, assigns around €90 million less to Cyprus, or around 9 percent lower, compared to the initially estimated

allocation. The analysis in this paper takes into account the data in the official published Cyprus RRP, which reflects the initially estimated allocation of RRF grants. An updated RRP is not expected before 2023. Nevertheless, for completeness purposes, Appendix C gives an indication of the impact of the updated allocation of RRF grants, by showing results that incorporate this change and use different assumptions on RRP-related expenditures.

### 3 Scenario design of the RRF funds

Any analysis on the macroeconomic impact of the RRP fiscal stimulus depends on a number of scenario-based assumptions. Such assumptions include: the size of the available funding in grants and loans; the degree of substitution of nationally-funded measures with RRF-funded ones; the composition of expenditure; the time distribution of RRP-related measures; the impact of investment and reforms on productivity; the NGEU stimulus of the external environment (i.e. in other EU countries); and implementation risks.

Therefore, in this paper, the general equilibrium analysis of the macroeconomic impact of RRP, is centered on a number of scenario-based assumptions. *First*, it is argued that this paper incorporates a more realistic fiscal impulse of the Cyprus RRP compared to other studies, as it takes into account the data of the official published Cyprus Plan. Therefore, it incorporates shocks on a variety of fiscal instruments and for the agreed time schedule,<sup>14</sup> as well as explores different scenarios on the additivity of the expenditure measures.<sup>15</sup> A more detailed exposition of the scenarios is given in Sections 3.1 and 3.2. *Second*, the analysis in this paper does not incorporate any enhanced impact of investment and/or reforms on productivity, which is the case in the analysis in other studies. *Third*, the analysis does not incorporate spillovers from NGEU packages in the other EU countries. *Fourth*, regarding implementation risks, the analysis excludes around €100 million of expenditure financed by RRF loans and assumes small delays in the implementation schedule. The effective implementation of the remaining expenditure measures underpins the results in this paper.

#### 3.1 Definition of scenarios

Scenarios are mainly determined by the different assumptions on the degree of substitutability of expenditure measures. In other words, they differ on their assumption about the extent to which the expenditure measures included in the RRP are additional to the ones planned or expected prior to the NGEU agreement. In this respect, the analysis considers the following scenarios:

- “No NGEU” scenario, which assumes that there is no revenue disbursement from RRF, nor any associated expenditure measures.
- “Debt reduction” scenario, in which all RRF revenue are used to finance government measures planned, regardless of the NGEU funds, i.e. national funds are substituted by European funds.
- “Partial additivity without loans” scenario, which incorporates the CBC staff assessment on the composition of additive and non-additive measures financed by RRF *grants*. This scenario

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<sup>14</sup>This assumption does not match exactly the planned timeline in the RRP (as small “reasonable” delays are assumed), but it is very close to it.

<sup>15</sup>In this respect, the size of the shocks in the simulations are smaller compared to other studies, depending on the assumption on the additivity of expenditure measures.

assumes that all measures financed by RRF *loans* were planned or expected, regardless of the NGEU funds (i.e. RRF loans are 100 percent substitutive).<sup>16</sup>

- “Partial additivity” scenario, which incorporates the CBC staff assessment on the composition of additive and non-additive measures financed by both, grants and loans.
- “Full additivity without loans” scenario, which assumes that all RRF grants are used to finance additive expenditure measures. RRF *loans* are assumed to finance measures planned or expected, regardless of the NGEU agreement.
- “Full additivity” scenario, which assumes that all RRF revenues (grants and loans) are used to finance additive expenditure measures.

Table 1 outlines all scenarios. It also provides a comparison among them with respect to RRF grants, RRF loans and RRP expenditure.

Table 1: Scenario assumptions

Scenario	RRF grants	RRP expenditure	RRF loans
“No NGEU”	No	No	No
“Debt reduction”	Yes	no additive expenditure (100% substitutive)	no additional (100% substitutive)
“Partial additivity without loans”	Yes	on average 79% additive	no additional (100% substitutive)
“Partial additivity”	Yes	on average 76% additive	43% additive
“Full additivity without loans”	Yes	100% additive expenditure	no additional (100% substitutive)
“Full additivity”	Yes	100% additive expenditure	100% additive

Source: Cyprus RRP and CBC staff assumptions.

### 3.2 “Partial additivity” scenario

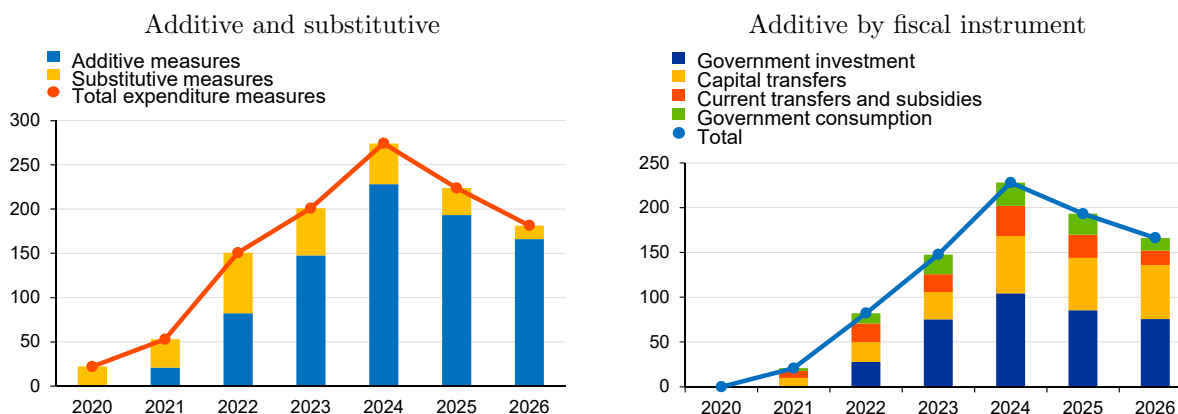
For the purpose of the analysis in this paper, the “partial additivity” scenario is considered the more realistic one. This scenario reflects the CBC staff best assessment on the composition of expenditure, execution timeline and degree of additivity of expenditure measures in the Cyprus RRP.<sup>17</sup> The expected macroeconomic impact of the RRP fiscal stimulus should depend on the measures that are additional to the ones planned in the absence of the NGEU package; that is, additional to the measures planned with national funding. If it is assumed that all RRP-related measures are additive, then it is explicitly assumed that the government would not have planned or implemented any of these measures in the absence of NGEU funding. On the other hand, if it is assumed that all measures included in the RRP would have occurred anyway, then the NGEU package will only have a direct impact on the government budget and debt. Therefore, this paper considers the “partial additivity” scenario as more realistic than the “full additivity” or “debt reduction” scenarios.

<sup>16</sup>Substitutive RRF loans have no impact on the results of this paper. The implicit assumption is that the State’s alternative (for financing expenditure measures now financed by RRF loans) would be to borrow the same amount by tapping the capital markets at the same interest rate.

<sup>17</sup>This is based on a bottom-up exercise that assesses one-by-one the measures included in the Cyprus RRP.

Overall, over 2020-2026, the “partial additivity” scenario assumes around 76 percent additive measures. The composition of additive expenditure measures by statistical category is close to the respective composition of the total measures (see right-hand side panel of Figure 5, in comparison with the left-hand side panel of Figure 3), with around three quarters dedicated to investment projects (either government investment or through capital transfers) and a quarter dedicated to current transfers and government consumption. The distribution of additive expenditure measures through time has a slightly fatter upper tail compared to the respective distribution of total measures, reflecting the assumption that more substitutive measures (i.e. measures already planned) occur in the more recent years of the RRP time horizon. The left-hand side panel of Figure 5 shows the assumptions on the additivity of RRP expenditure measures under the “partial additivity” scenario. The associated RRF revenue is recognized at the time of the incurred expenditure; thereby, ensuring the statistical neutrality of EU flows on the government budget balance.<sup>18</sup> As aforementioned, the simulations exclude around €100 million of expenditure financed through RRF loans compared with the measures included in the Cyprus RRP.

Figure 5: RRP additive expenditure assumptions, grants and loans



Source: Cyprus RRP and CBC staff assumptions.  
Notes: Vertical axis: In €mn in 2018 prices.

Table 2: RRP additive expenditure assumptions, grants and loans

	2020	2021	2022	2023	2024	2025	2026	2020-2026	% of total
Government investment	0	0	28	75	105	86	76	369	65.1
Capital transfers	0	10	22	30	64	59	61	245	100.0
Transfers and subsidies	0	8	21	20	34	26	16	125	84.9
Government consumption	0	3	11	22	26	23	14	100	67.9
Total	0	21	82	148	228	193	166	838	75.8
as % of GDP	0	0.1	0.3	0.6	0.8				
as % of total measures	0	39.4	54.5	73.5	83.2	86.4	91.7		

Source: Cyprus RRP and CBC staff assumptions.  
Notes: In €mn, unless otherwise indicated.

Table 2 shows the “partial additivity” scenario assumptions on the additive measures through time, by statistical category. The last column of Table 2 shows the additive measures as percent of total

<sup>18</sup>Expenditures of around 0.1 of GDP percent incurred in 2020, qualified for and were included in the RRP. The analysis in this paper follows Eurostat’s recommendation (Eurostat, 2021) to exceptionally deviate from the EU flows neutrality principle and recognize the associated revenue at the time of the approval of the RRP (i.e. in 2021).

measures for the respective statistical category, over 2020-2026. It is assumed that around 65 percent of government investment is additive, while the respective share for capital transfers is 100 percent. On average, around 76 percent of the overall measures included in the RRP are assessed to be additive. The last row of Table 2 shows the additive measures as percent of total measures for each year. The increasing percentage over the years, from 0 percent in 2020 up to 91.7 percent in 2026, reflects the assessment for more substitutive measures materializing in the more recent years of the RRP time horizon and more additive measures in the later years.

## 4 Modelling approach

In addition to the scenario-based assumptions discussed in Section 3, when interpreting the results of this paper, someone should also acknowledge the underlying model-based assumptions characterizing the simulation results. *First*, model-based simulations are conducted with the use of the CYMCM, the traditional backward-looking semi-structural macroeconomic model of the Cyprus economy developed by CBC staff. A detailed discussion of the model, including assumptions relating to economic agents and conditions (e.g. fiscal instruments, households behaviour, firms' behaviour, price and wage rigidities, etc.) can be found in Section 4.1 and in the technical note [Aristidou and Papadopoulou \(2022\)](#). Simulations have been conducted on a baseline consisted of historical data up to 2021Q4, CBC June 2022 baseline forecasts up to 2024Q4 and projections towards long-run targets up to 2026Q4. *Second*, fiscal rules are assumed to remain inactive throughout the analysis, therefore, direct taxes to households and other private sector do not respond to fiscal imbalances, either through public debt-to-GDP or government net surplus. *Third*, monetary policy rules are assumed to remain inactive throughout the analysis, therefore, short- and long-term interest rates are constrained in the CBC June 2022 baseline forecasts.<sup>19</sup> *Fourth*, the model does not include sovereign, banking or corporate risk channels, since simulations do not consider any impact from possible reduction of such risk. *Fifth*, the model assumes that government investment is as productive as private investment. In this respect, the analysis focuses on the macroeconomic impact through the fiscal stimulus channel alone and does not account for any structural change in productivity due to either government investments or structural reforms. *Sixth*, the model represents a small open economy within the European monetary union, where the international environment and exchange rate are exogenous. Therefore, in order to be able to capture trade spillovers from stimulus packages in the rest of Europe, strong *ad hoc* assumptions should have been made on the evolution of exports from external stimulus.<sup>20</sup>

The fiscal multipliers of the CYMCM model provide an indication of the effectiveness of each fiscal instrument and the medium-term macroeconomic impact of the respective shock. Therefore, Section 4.3 provides an indication of the relevant estimates of the size of fiscal multipliers vis-à-vis other ECB models. Furthermore, to facilitate comparison between NGEU impact estimates from different studies, see Appendix B that includes a summary of the model types and scenario assumptions employed by the different sources.

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<sup>19</sup>For example, when monetary policy keeps nominal interest rates constant, multipliers are larger as the accommodative monetary policy reduces crowding-out effects. By contrast, if monetary policy is active, in line with a standard Taylor rule, nominal rates increase, implying an increase in real interest rates and crowding out of domestic demand.

<sup>20</sup>In order to capture the impact of trade spillovers from stimulus packages in the rest of Europe *in a more structural approach*, a multi-country model should have been used. For example, see [Papadopoulou \(2017\)](#), which represents a multi-country DSGE model of the Cyprus economy, constructed for policy analysis.

## 4.1 CYMCM model

Model-based simulations are conducted with the use of the CYMCM, the macroeconomic model of the Cyprus economy developed by CBC staff (Aristidou and Papadopoulou, 2022). It is a traditional backward-looking semi-structural macroeconomic model of the Cyprus economy, which is mainly used for policy analysis and forecasting. It represents a small open economy within the European monetary union, where the international environment and exchange rate are exogenous. The theoretical structure of the model is traditional, implying that only the supply side of the CYMCM is rigorously derived from optimizing neoclassical behavior. On the other hand, the demand side is not formally derived from a particular theory, in order to allow for a more flexible econometric specification. The demand side of the economy is given by separate equations for private consumption, gross fixed capital formation, changes in inventory stocks, exports and imports of goods and services. Government consumption and government investment are treated as being exogenous. The short-run is characterized by slow adjustments of real variables and prices towards their long-run steady state via error correction specifications. For all demand equations, long-run homogeneity has been imposed in order to ensure compatibility with a long-run steady-state. The model is backward-looking, implying that expectations are treated implicitly by the inclusion of lagged values of the variables in the equations. Furthermore, the model does not include a detailed banking or financial sector, implying that it does not incorporate sovereign, banking and corporate risk. In addition, monetary and fiscal policies can be considered either as endogenous or exogenous. The model has been re-estimated and calibrated in 2022, with data up to 2019Q4 (pre-COVID crisis).

The scenarios in CYMCM are conducted by introducing shocks mainly in the fiscal part of the model. Therefore, the remaining of this section outlines the part of the model that is related to how the scenarios are designed and conducted. The remainder of the model exposition can be found in the Aristidou and Papadopoulou (2022) technical note.

The gross income of the fiscal authority is the total of the income tax and social security contributions paid by households,  $PDN_t$ , the direct taxes paid by the other private sector,  $CDN_t$ , the total indirect taxes less subsidies,  $TIN_t$ , and any other sector transfers to/from government,  $OGN_t$ <sup>21</sup>. On the other hand, government spending is the total of other transfers from general government to households<sup>22</sup>,  $TRN_t$ , and interest payments on government debt,  $INN_t$ . Therefore, the government disposable income is given by the difference between its receipts and its expenditures, specified as follows

$$GYN_t = PDN_t + CDN_t + TIN_t + OGN_t - TRN_t - INN_t. \quad (1)$$

The government's gross savings is then the difference between its disposable income, as defined in equation (1) and its nominal government consumption,  $GCN_t$ , defined as follows

$$GSN_t = GYN_t - GCN_t \quad (2)$$

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<sup>21</sup> $OGN_t$  can be positive (transfers to government) or negative (transfers from government). However, transfers to household are captured by a different variable,  $TRN_t$

<sup>22</sup>In the model transfers from general government to households impact directly the private sector disposable income.



where nominal government consumption is defined as follows

$$GCN_t = GCD_t GCR_t + ZGCN_t \quad (3)$$

where  $GCD_t$  is the government consumption deflator<sup>23</sup> and  $GCR_t$  is real government consumption.  $ZGCN_t$  captures any exogenous increase in nominal government consumption.

In turn, government's net lending is defined in equation (4) as the difference between its savings, as calculated in equation (2), and investment,  $GIN_t$

$$GLN_t = GSN_t - GIN_t + ZGLN_t \quad (4)$$

where  $ZGLN_t$  captures any exogenous increase in net lending and  $GIN_t$  is defined as follows

$$GIN_t = GID_t GIR_t + ZGIN_t \quad (5)$$

where  $GID_t$  is the government investment deflator,  $GIR_t$  is real government investments and  $ZGIN_t$  captures any exogenous increase in nominal government investments.

Finally, government's gross debt<sup>24</sup> is calculated as the difference between government's net lending and last period's level of gross debt, defined as follows

$$GDN_t = GDN_{t-1} - GLN_t. \quad (6)$$

## 4.2 Scenario design for model-based simulations

The scenarios are designed and conducted by shocking, in various combinations, the corresponding variables in the model. In this respect, Table 3 outlines the mapping of the corresponding model variable, as introduced in Section 4.1, to the scenario assumptions, as indicated in Table 1. For the ‘‘partial additivity’’ scenario, the RRP additive expenditure assumptions are explained in more detail in Section 3.2.

Table 4 outlines the shocks applied to each variable for each year up to 2026 based on the ‘‘debt reduction’’ scenario. As it can be seen, the ‘‘debt reduction’’ scenario corresponds to the case where only net lending ( $ZGLN$ ), reflecting RRF grants, is shocked in the model. All other scenarios, with either partial additivity or full additivity assumptions, build on the ‘‘debt reduction’’ scenario by shocking, on top of  $ZGLN$ , the other variables accordingly.

Table 5 outlines the shocks applied to each variable for each year up to 2026 based on the ‘‘partial additivity without loans’’ scenario. On top of the shocks applied for RRF grants ( $ZGLN$ ), this scenario introduces simultaneous shocks for additive expenditures financed by RRF grants, as reflected by the shocks on government investment ( $ZGIN$ ), capital transfers ( $OGN$  and  $ITR$ ), transfers to households ( $TRN$ ) and government consumption ( $ZGCN$ ). This scenario assumes that RRF loans fully substitute other loans, hence, expenditure measures financed by RRF loans are not taken into

<sup>23</sup>As the model does not distinguish between private and public compensation per employee, it is assumed that government consumption deflator affects directly the overall level of compensation per employee, therefore incorporating supply side effects from an increase in government wages and salaries.

<sup>24</sup>In the model government's gross debt is positively and directly related to private wealth, which has an impact on the overall real private consumption.

account.

Table 3: Mapping of model variables/shocks to scenario assumptions

Variable	which captures any exogenous
<i>ZGLN</i>	increase in net lending, due to RRF grants
<i>ZGDN</i>	increase in government debt, due to RRF loans that fund additional expenditure measures
<i>ZGIN</i>	increase in nominal government investment
<i>OGN &amp; ITR</i>	increase in capital transfers; the former (negatively) affects government’s disposable income and the latter affects private investment
<i>TRN</i>	increase in total transfers from general government to households
<i>ZGCN</i>	increase in nominal government consumption, other than government wages and salaries
<i>GCD</i>	increase in gross government wages and salaries

Source: CBC staff assumptions.

Table 4: Shocks in “debt reduction” scenario

Year	<i>ZGLN</i>	<i>ZGDN</i>	<i>ZGIN</i>	<i>OGN &amp; ITR</i>	<i>TRN</i>	<i>ZGCN</i>	<i>GCD</i>
2021	68.9	0.0	0.0	0.0	0.0	0.0	0.0
2022	128.9	0.0	0.0	0.0	0.0	0.0	0.0
2023	181.5	0.0	0.0	0.0	0.0	0.0	0.0
2024	253.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	201.4	0.0	0.0	0.0	0.0	0.0	0.0
2026	172.1	0.0	0.0	0.0	0.0	0.0	0.0

Source: CBC staff calculations.  
Notes: In €mn.

Table 5: Shocks in “partial additivity without loans” scenario

Year	<i>ZGLN</i>	<i>ZGDN</i>	<i>ZGIN</i>	<i>OGN &amp; ITR</i>	<i>TRN</i>	<i>ZGCN</i>	<i>GCD</i>
2021	68.9	0.0	0.0	10.0	7.8	3.0	0.0
2022	128.9	0.0	22.9	22.0	21.1	11.2	0.0
2023	181.5	0.0	62.8	30.4	20.0	21.9	0.0
2024	253.0	0.0	96.0	63.8	33.8	26.0	0.0
2025	201.4	0.0	76.5	57.5	26.0	23.3	0.0
2026	172.1	0.0	69.7	59.5	16.0	14.1	0.0

Source: CBC staff calculations.  
Notes: In €mn.

Table 6 outlines the shocks applied to each variable for each year up to 2026 based on the “partial additivity” scenario. On top of the shocks applied for RRF grants (*ZGLN*), this scenario introduces shocks applied to the same variables as in the “partial additivity without loans” scenario, but at higher levels since it includes the additive measures financed by RRF loans. Furthermore, additive loans will have an impact on government debt, hence, an additional shock is applied to the relevant variable (*ZGDN*).

Table 7 outlines the shocks applied to each variable for each year up to 2026 based on the “full additivity without loans” scenario. This scenario introduces shocks applied to the same variables

Table 6: Shocks in “partial additivity” scenario

Year	<i>ZGLN</i>	<i>ZGDN</i>	<i>ZGIN</i>	<i>OGN &amp; ITR</i>	<i>TRN</i>	<i>ZGCN</i>	<i>GCD</i>
2021	68.9	0.0	0.0	10.0	7.8	3.0	0.0
2022	128.9	5.0	27.9	22.0	21.1	11.2	0.0
2023	181.5	12.6	75.4	30.4	20.0	21.9	0.0
2024	253.0	8.5	104.5	63.8	33.8	26.0	0.0
2025	201.4	10.0	85.5	58.5	26.0	23.3	0.0
2026	172.1	7.0	75.7	60.5	16.0	14.1	0.0

Source: CBC staff calculations.

Notes: In €mn.

as in the “partial additivity without loans” scenario, but at higher levels since it assumes 100 percent additive expenditure financed by grants. As it can be seen, it introduces one extra shock in government consumption deflator (*GCD*), in order to capture the increase in government wages and salaries.

Table 7: Shocks in “full additivity without loans” scenario

Year	<i>ZGLN</i>	<i>ZGDN</i>	<i>ZGIN</i>	<i>OGN &amp; ITR</i>	<i>TRN</i>	<i>ZGCN</i>	<i>GCD</i>
2021	68.9	0.0	25.6	10.0	7.8	3.0	0.4
2022	128.9	0.0	64.8	22.0	23.2	16.2	2.7
2023	181.5	0.0	96.7	30.4	23.1	27.9	3.4
2024	253.0	0.0	115.0	63.8	38.9	32.0	3.3
2025	201.4	0.0	84.5	57.5	30.1	26.3	3.0
2026	172.1	0.0	76.5	59.5	18.3	16.8	1.0

Source: CBC staff calculations.

Notes: In €mn.

Finally, Table 8 outlines the shocks applied to each variable for each year up to 2026 based on the “full additivity” scenario. This scenario introduces shocks applied to the same variables as in the “partial additivity” scenario, but at higher levels since it assumes 100 percent additive expenditure financed by both, grants and loans.

Table 8: Shocks in “full additivity” scenario

Year	<i>ZGLN</i>	<i>ZGDN</i>	<i>ZGIN</i>	<i>OGN &amp; ITR</i>	<i>TRN</i>	<i>ZGCN</i>	<i>GCD</i>
2021	68.9	6.0	30.8	10.0	7.8	3.7	0.5
2022	128.9	21.8	83.8	22.0	23.2	18.7	3.0
2023	181.5	19.4	112.3	30.4	23.1	31.4	3.7
2024	253.0	21.3	134.5	63.8	38.9	33.5	3.6
2025	201.4	22.3	105.0	58.5	30.1	26.8	3.3
2026	172.1	9.2	84.2	60.5	18.3	17.0	1.3

Source: CBC staff calculations.

Notes: In €mn.

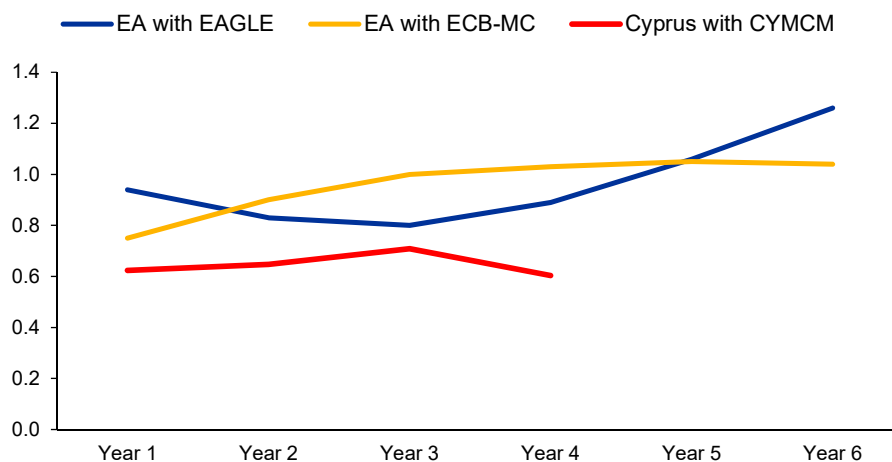
### 4.3 Model-based fiscal multipliers

The fiscal multipliers of the CYMCM provide an indication of the effectiveness of each fiscal instrument and the medium-term macroeconomic impact of the respective shock. Furthermore, their relative magnitude may help understand the differences in the results with those of other studies.

The multipliers are calculated for the four years following the fiscal stimulus shock. The government investment multiplier (*GIS*) is defined as the impact on real GDP level of a highly persistent 1 percentage point of GDP increase in government investment. Other fiscal multipliers are calculated accordingly.

Figure 6 depicts the multiplier for government investment predicted by the CYMCM compared to the respective multipliers predicted for the euro area by two ECB models, the EAGLE (DSGE model) and the ECB-MC (semi-structural model), as appeared in [Bankowski et al. \(2022\)](#). As shown in Section 2, around half of the total RRP envelope is dedicated to government investment (see left-hand side panel of Figure 3), which highlights the importance of the respective multiplier. As depicted in Figure 6, for most of the years following the fiscal stimulus shock, the multiplier of government investment for Cyprus is estimated to be lower than the respective multiplier for the euro area estimated by the ECB models. To some extent, this is expected as Cyprus is a more service oriented economy which does not depend on heavy manufacturing. Therefore, given the model’s interlinkages, a government investment shock is expected to have a lower impact on output in Cyprus compared to the euro area average. By the fourth year following the shock, the euro area multiplier of the ECB models is around 50 to 70 percent larger than the Cyprus multiplier estimated by CYMCM. It is noted that the European Commission’s QUEST model estimates the short-run multiplier for a temporary public investment shock, for the euro area, close to 0.9 ([Burgert et al., 2020](#)).

Figure 6: Fiscal multiplier for real government investment



Source: [Bankowski et al. \(2022\)](#), [Aristidou and Papadopoulou \(2022\)](#) and CBC staff calculations.

Notes: Vertical axis: In percentage point deviation from baseline. The shock corresponds to an unanticipated change in the share of nominal government investment in nominal GDP by 1 percentage point.

As regards the estimates of other fiscal multipliers, the government consumption multiplier of the CYMCM for Cyprus, is estimated at around 1 percentage point in the medium-term. Government consumption constitutes around 12 percent of the Cyprus RRP. The multiplier for current transfers is estimated to be close to 0.6 in the medium-term. Current transfers and subsidies make up for around 13 percent of the total RRP envelope. As regards capital transfers, which constitute a quarter of the total RRP envelope, they are introduced by shocking simultaneously private investment (*ITR*) and other sector transfers to/from government (*OGN*) that (negatively) affects the government budget balance. Therefore, the magnitude of the multiplier is strongly related to the one of private investment.

## 5 Model-based results

### 5.1 Macroeconomic impact

Table 9 presents the estimates of the medium-term macroeconomic impact of the fiscal stimulus of the Cyprus RRP under the alternative scenarios. Scenario results are presented in deviations from a baseline that assumes no NGEU funds are provided to Cyprus (“no NGEU” scenario). In the case where all RRF funds are targeted towards reducing public debt, and therefore not spent on any additional expenditure measures, the estimates show that GDP level is expected to remain almost unchanged compared to the “no NGEU” scenario, while public debt-to-GDP ratio is expected to decrease by around 2.77 percentage points. The minimal impact on GDP is due to the fact that, within the model, public debt may influence real economy only through its impact on private wealth and, thereafter, consumption, although this pass-through is not estimated to be strong, especially with inactive fiscal policy rules.

The estimates based on the “partial additivity” scenario, which is considered a more realistic scenario for the analysis in this paper (see Section 3), show that the expected medium-term impact on real GDP level is around 0.58 percent and for HICP inflation is only marginal, around 0.06 percentage points. The corresponding impact on employment is 0.18 percent. Public debt-to-GDP ratio is expected to decrease by around 1.25 percentage points. The estimates based on the “partial additivity without loans” scenario, which includes new expenditure measures financed only by RRF grants, show a slightly weaker macroeconomic impact compared to the “partial additivity” scenario.

The impact on real GDP is more pronounced in the “full additivity” scenario in which all RRF measures are considered as new. In particular, under this scenario, real GDP level is expected to increase by around 0.71 percent and inflation to increase by only 0.08 percentage points. The impact on employment is 0.22 percent, while the decrease of the public debt-to-GDP ratio is now lower, at only 0.75 percentage points compared to the “no NGEU” scenario. The results of the “full additivity without loans” scenario indicate, as expected (due to the exclusion of measures financed by loans), a weaker macroeconomic impact, while debt-to-GDP ratio is expected to decrease by 1.11 percentage points.

Table 9: Medium-term macroeconomic impact of Cyprus RRP based on alternative scenarios

Scenario	Real GDP	Inflation	Employment	Debt-to-GDP
“Debt reduction”	0.00	0.00	0.00	-2.77
“Partial additivity without loans”	0.56	0.06	0.17	-1.46
“Partial additivity”	0.58	0.06	0.18	-1.25
“Full additivity without loans”	0.65	0.07	0.20	-1.11
“Full additivity”	0.71	0.08	0.22	-0.75

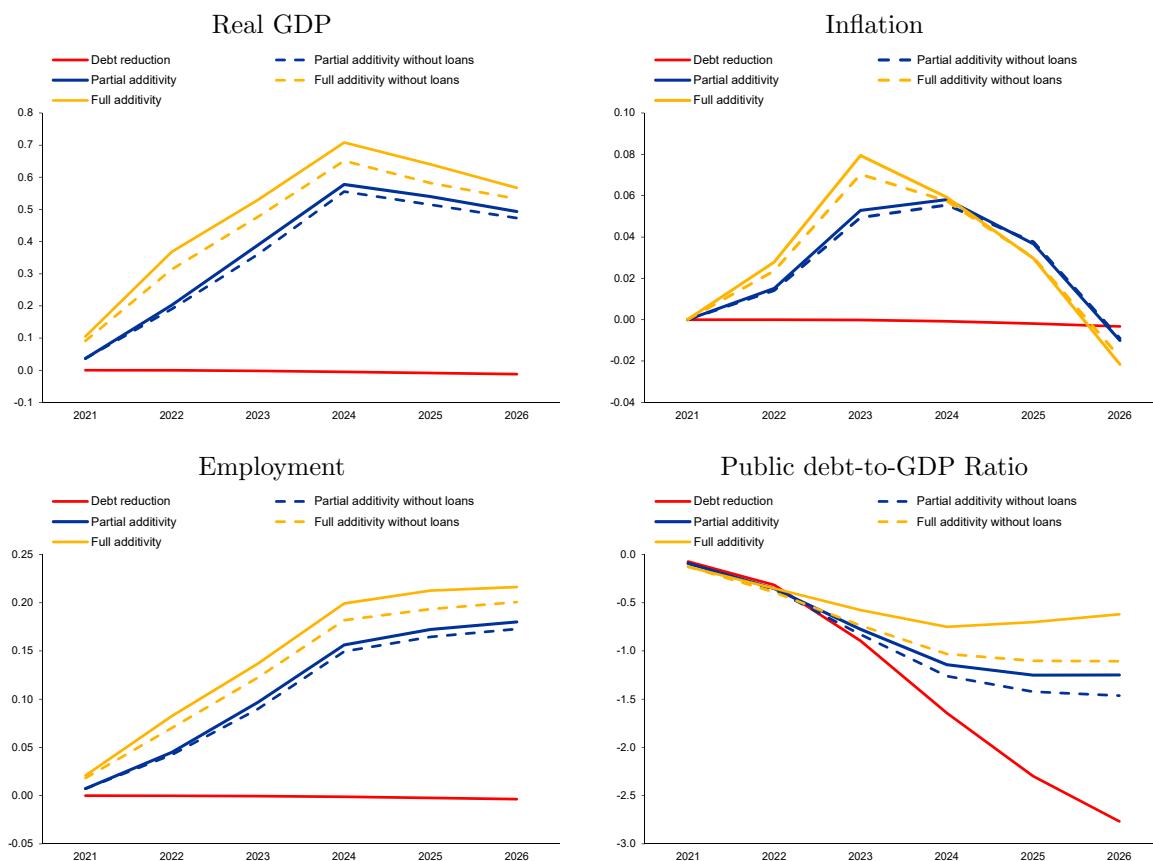
Source: CBC staff calculations based on CYMCM model.

Notes: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. The “debt reduction” scenario corresponds to the case where only *ZGLN* is shocked in the model. All other scenarios build on the “debt reduction” one by simultaneously shocking in addition *ZGDN*, *ZGCN*, *ZGIN*, *OGN*, *TRN*, *ITR* and *GCD* as indicated in Tables 4-8. The values correspond to the maximum impact up to 2026.

The dynamics of the macroeconomic impact of Cyprus RRP, as measured under the different scenarios considered, are clearly demonstrated in Figure 7, which shows the evolution of the main variables

through time. An important finding is that the impact on real GDP is shown to peak in 2024.

Figure 7: Macroeconomic impact up to 2026 of all scenarios



Source: CBC staff calculations based on CYMCM model.

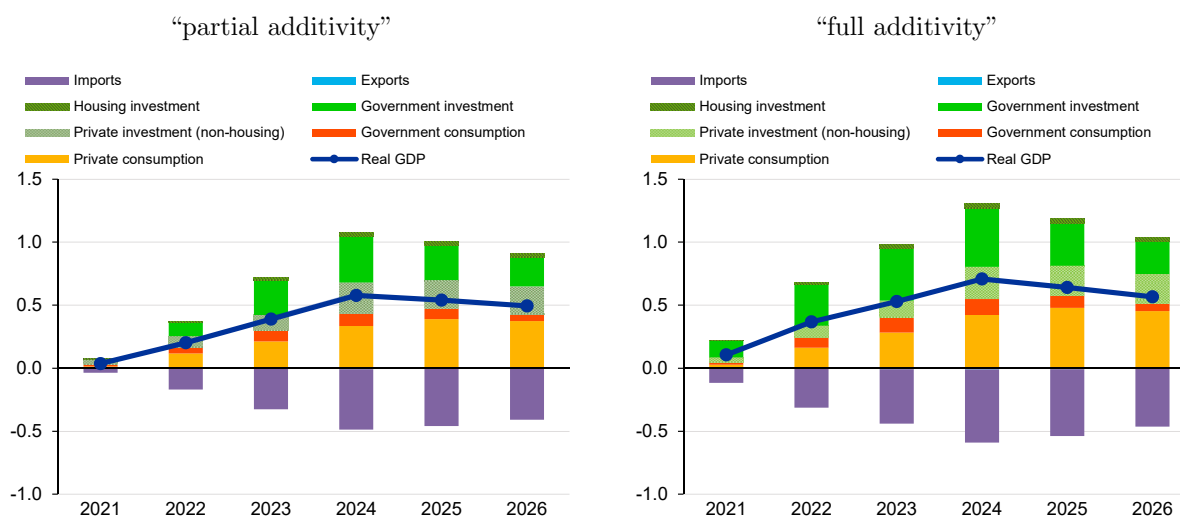
Notes: Vertical axis: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and public debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. The “debt reduction” scenario corresponds to the case where only *ZGLN* is shocked in the model. All other scenarios build on the “debt reduction” one by simultaneously shocking in addition *ZGDN*, *ZGCN*, *ZGIN*, *OGN*, *TRN*, *ITR* and *GCD* as indicated in Tables 4-8.

Finally, it should be noted that the official published Cyprus RRP, as it is the case with the published RRP of the other EU countries, is based on an initial estimation for the allocation of grants by the European Commission. As already indicated, the analysis in this paper takes into account the data from the official Cyprus RRP. However, the final allocation of RRF grants, published by the European Commission on 30 June 2022, assigns around €90 million less to Cyprus, or around 9 percent lower, compared to the initially estimated allocation. This is due to the differences between the outturn data and European Commission’s Autumn 2020 forecasts for Member States’ real GDP growth in 2020 and 2021, which has been one of the allocation criteria. This, in turn, implies that the currently published RRP does not incorporate the latest developments. For the purpose of completeness, Appendix C shows simulation results that incorporate the lower grants now allocated to Cyprus and use different assumptions on RRP-related expenditures.

## 5.2 Contributions to real GDP

As regards the contributions of the impact to real GDP, Figure 8 depicts the relevant decomposition by expenditure category, for the “partial additivity” and “full additivity” scenarios. The decomposition results from the endogenous model-based propagation of all RRP-related stimulus measures. Contributions reflect two effects: first, the speed with which a component changes and, second, the relative importance of the component in total GDP.<sup>25</sup> Furthermore, the propagation is based on the notion of fiscal multipliers, in which a certain percentage increase of a fiscal instrument impacts dynamically GDP via the immediate impact (first-round effect) and all subsequent effects due to the implicit and endogenous mechanisms of the economy (second-round effects). As it can be seen, the contribution of private consumption and government investment is the strongest compared to other expenditure categories over the RRP horizon.

Figure 8: Contributions to real GDP by expenditure category



Source: CBC staff calculations based on CYMCM model.

Notes: Vertical axis: In percentage deviation from the “no NGEU” scenario.

In the model, private consumption is affected by secondary effects due to the model’s endogenous dynamics of GDP on consumption, as well as via the immediate impact of the shock on government transfers ( $TRN_t$ ). These channels result in the strong contribution of private consumption on real GDP, as depicted in Figure 8. The contribution of government investment is also strong, as expected, as the RRP-related stimulus is tilted towards public investment. Specifically, government investment constitutes 44 percent of the total RRP package in the “partial additivity” scenario and 51 percent in the “full additivity” scenario. If the relevant multiplier was closer to the euro area average, then the impact of the government investment shock would have been higher and so would its contribution to the overall impact. However, as explained in Section 4.3, the relevant multiplier for Cyprus is weaker compared to the euro area average. The contribution of private investment is also significant, although smaller than the one of government investment, due to the smaller share of capital transfers (compared to government investment) in the RRP package. The contribution of government consumption is small, mainly reflecting its small size in the RRP package (around 12-13 percent).

<sup>25</sup>Contribution of a component to year-on-year GDP growth has been calculated as its growth rate, weighted by its share to GDP in the previous quarter.

The open economy aspect of the model allows for import leakages. In this respect, the improvement in economic activity as a consequence of the increase in consumption and investment components of GDP, has as a consequence an increase in imports of goods and services which dampens the overall positive effect on the economy. This is reflected in the relative strong negative contribution of imports on real GDP impact (purple bars in Figure 8).

Furthermore, the CYMCM model predicts a small positive impact on housing investment due to the positive expansion of the economy, while the impact of exports is negligible (mainly due to the fact that no measures/shocks are induced in the external sector). The latter could have been positive and substantial in case the simulations included a shock for the RRF stimulus packages in the rest of Europe. The European Commission (European Commission, 2021) estimates that spillovers from other EU countries can contribute around 0.5 percent to the real GDP level of Cyprus.

### 5.3 Disaggregated results by fiscal measures

The relative medium-term macroeconomic impact of RRP measures is further assessed on a disaggregated approach by estimating the impact of individual fiscal instruments. Measures are introduced in the model independently, on top of the shock on grants, in order to assess their relative strength in influencing the macroeconomy. Therefore, a shock on each single fiscal instrument is introduced across scenarios, building on the “debt reduction” scenario that only includes grants. In this respect, disaggregated estimates correspond to the case where nominal government consumption (*ZGCN*), nominal government investment (*ZGIN*), transfers to households (*TRN*), capital transfers (*OGN* and *ITR*) and government wages and salaries (*GCD*) are individually shocked (in addition to net lending, *ZGLN*) in order to assess their independent impact on the macroeconomy. As it can be inferred by the results in Tables 10-13, the macroeconomic impact depends on two factors; these being the magnitude of the shock, as described in Tables 4-8, and the corresponding fiscal multiplier, as partially described in Section 4.3.

Table 10: Disaggregated results for the “partial additivity without loans” scenario

Shock	Real GDP	Inflation	Employment	Debt-to-GDP
Loans	0.00	0.00	0.00	-2.77
Government consumption	0.09	0.01	0.03	-2.65
Government investment	0.22	0.02	0.06	-2.14
Total transfers to households	0.10	0.01	0.03	-2.61
Capital transfers	0.14	0.01	0.04	-2.35
Wage compensation	0.00	0.00	0.00	-2.77

Source: CBC staff calculations based on CYMCM model.

Notes: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. The values correspond to the maximum impact up to 2026. The shocks for this scenario are indicated in Table 5.

As observed in Tables 10-13, across all scenarios, the individual impact of government investment is the largest. A shock on government investment appears to affect real GDP the most, mainly due to the fact that government investment constitutes a large share (around half) of the total RRP package.

The second biggest share of the RRP is capital transfers, which constitutes around one quarter of the total envelope. As expected, once introduced independently in the model, its impact is the second



Table 11: Disaggregated results for the “partial additivity” scenario

Shock	Real GDP	Inflation	Employment	Debt-to-GDP
Loans	0.00	0.00	0.00	-2.64
Government consumption	0.09	0.01	0.03	-2.65
Government investment	0.24	0.03	0.06	-2.06
Total transfers to households	0.10	0.01	0.03	-2.61
Capital transfers	0.14	0.01	0.04	-2.35
Wage compensation	0.00	0.00	0.00	-2.77

Source: CBC staff calculations based on CYMCM model.

Notes: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. The values correspond to the maximum impact up to 2026. The shocks for this scenario are indicated in Table 6.

largest with its magnitude being comparable to the government investment one. This is due to the fact both investment multipliers operate in the same manner within the model, therefore, the main factors underpinning their corresponding multipliers, including investment import leakage, are the same.

Table 12: Disaggregated results for the “full additivity without loans” scenario

Shock	Real GDP	Inflation	Employment	Debt-to-GDP
Loans	0.00	0.00	0.00	-2.77
Government consumption	0.12	0.01	0.04	-2.62
Government investment	0.27	0.03	0.08	-1.87
Total transfers to households	0.11	0.01	0.04	-2.59
Capital transfers	0.14	0.01	0.04	-2.35
Wage compensation	0.00	0.00	0.00	-2.73

Source: CBC staff calculations based on CYMCM model.

Notes: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. The values correspond to the maximum impact up to 2026. The shocks for this scenario are indicated in Table 7.

Table 13: Disaggregated results for the “full additivity” scenario

Shock	Real GDP	Inflation	Employment	Debt-to-GDP
Loans	0.00	0.00	0.00	-2.48
Government consumption	0.12	0.02	0.04	-2.61
Government investment	0.32	0.04	0.09	-1.69
Total transfers to households	0.11	0.01	0.04	-2.59
Capital transfers	0.14	0.01	0.04	-2.35
Wage compensation	0.00	0.00	0.00	-2.72

Source: CBC staff calculations based on CYMCM model.

Notes: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. The values correspond to the maximum impact up to 2026. The shocks for this scenario are indicated in Table 8.

A striking result emerging from the disaggregated analysis is the impact of government consumption and transfers to households. Although RRP-related stimulus is not tilted towards them (i.e. jointly, they constitute around one quarter of the total envelope), their corresponding medium-term impact on the macroeconomy is relatively significant. This is due to the fact that their respective multipliers are higher than the investment multiplier. Comparison of disaggregated results to the contribution

to real GDP (see Figure 8) reveals that private consumption (together with government investment) is one of the major contributing factors to the overall impact on real GDP, as any aggregate impact on real GDP emerging from fiscal measures, is influencing back the macroeconomy through the model’s endogenous dynamics of GDP on consumption (feedback loops).

## 6 Conclusion

This paper estimates the medium-term macroeconomic impact of the Cyprus RRP fiscal stimulus channel. It is the first paper for Cyprus that considers various fiscal instruments, based on the data of the official published Cyprus RRP, and makes different assumptions on the additivity of expenditure measures. Therefore, it is argued that this paper incorporates a relatively realistic fiscal impulse of the Cyprus RRP. Model-based simulations are conducted with the CYMCM, a traditional backward-looking semi-structural macroeconometric model of the Cyprus economy developed by CBC staff (Aristidou and Papadopoulou, 2022). The focus of the analysis is on the macroeconomic impact through the RRF fiscal stimulus channel alone.

All assumptions included in the simulations imply that the results can more confidently be considered as a lower bound of the expected macroeconomic impact of the fiscal stimulus under the Cyprus RRP. This is due to the fact that they do not incorporate spillover effects of NGEU measures in other EU countries and take into account implementation risks with regards to the execution of ambition projects. In the scenario in which all RRP-related spending is used for additional measures to priority-NGEU government plans (“full additivity”), the analysis finds that the expected impact on real GDP level is around 0.71 percent, while the impact on HICP inflation is rather contained, at 0.08 percentage points. In the scenario in which spending under the RRP is partially used for additional measures (“partial additivity”), which is considered a more realistic scenario, the analysis finds that the expected impact on real GDP level is around 0.58 percent and for inflation is only marginal, at 0.06 percentage points. The results of this paper are comparable to results of other relevant studies, including those conducted by the European Commission, IMF staff and ECB staff. On the other hand, they differ considerably from the estimates by the Economic Research Center of the University of Cyprus that indicate significantly higher impact on real GDP.

A significant result of the model is that the medium-term impact of government investment and capital transfers are found to be smaller than the respective impact of government consumption and government transfers, provided that the size of the shock is the same. This does not imply that fiscal policy should reallocate funds from investment programmes to consumption measures, as the impact of the former may be significantly stronger in the longer-term. Given the aforementioned, further investigation should be conducted regarding the long-term impact of investment on the Cyprus economy. Nevertheless, this result suggests that no significantly higher short-term or medium-term impact on GDP should be expected, merely due to the fact that government investment and capital transfers constitute a large share of the RRP stimulus.

The analysis in this paper indicates that RRF is expected to have a meaningful impact on the Cyprus economy in the medium-term, but the results of the analysis depend on the implementation of the expenditure measures considered. Cyprus authorities face an important challenge ahead regarding the effective implementation of investment projects and reforms included in the Plan, as well as meeting the goals of the digital and green transition. The latter will require additional funding from

national resources. The successful implementation of structural reforms and the green and digital agenda will be key for transforming our economy to a sustainable and more resilient one. This would probably imply an even more substantial impact in the longer-term, than the medium-term impact estimated in this paper.

## References

- Andreou, E., N. Empora, E. Giannakis, T. Mamuneas, G. Syrichas, and T. Zachariadis (2021). Report on the Impact Assessment of the Recovery and Resilience Plan of Cyprus Preliminary. Economics Research Centre Working Paper 04, University of Cyprus.
- Angelini, E., N. Bokan, K. Christoffel, M. Ciccarelli, and S. Zimic (2019). Introducing ECB-BASE: The Blueprint of the New ECB Semi-Structural Model for the Euro Area. European Central Bank, Frankfurt am Main. 2315, ECFIN.
- Aristidou, C. and N. Papadopoulou (2022). CYMCM: A Traditional Semi-Structural Macroeconomic Model of the Cyprus Economy. Mimeo, Central Bank of Cyprus.
- Bankowski, K., O. Bouabdallah, J. D. Semeano, E. Dorrucchi, M. Freier, P. Jacquinot, W. Modery, M. Rodriguez-Vives, V. Valenta, and N. Zorell (2022). The Economic Impact of Next Generation EU: A Euro Area Perspective. Occasional Paper Series 291, European Central Bank.
- Burgert, M., W. Roeger, J. Varga, J. in 't Veld, and L. Vogel (2020). A Global Economy: Version of QUEST: Simulation Properties. European Economy Discussion Papers 126, European Commission.
- Cyprus Government (2021). Cyprus Recovery and Resilience Plan 2021-2026. Report.
- European Commission (2021). Analysis of the Recovery and Resilience Plan of Cyprus. Working Paper accompanying the document “Proposal for a Council Implementing Decision on the Approval of the Assessment of the Recovery and Resilience Plan for Cyprus”, European Commission.
- Eurostat (2021, September). Guidance on the Statistical Recording of the Recovery and Resilience Facility. Methodological Note, Eurostat.
- Giannakis, E. and T. P. Mamuneas (2018). Sectoral Linkages and Economic Crisis: An Input-Output Analysis of the Cypriot Economy. Paper 1, Cyprus Economic Policy Review.
- Gomes, S., P. Jacquinot, and M. Pisani (2012). The EAGLE: A Model for Policy Analysis of Macroeconomic Interdependence in the Euro Area. Paper 5, Economic Modelling.
- IMF (2022). Staff Report for the 2022 Article IV Consultation with Cyprus. Country Report 151, International Monetary Fund.
- Papadopoulou, N. (2017). CY-EAGLE: A Multi-Country DSGE Model of the Cyprus Economy for Policy Analysis. Mimeo, Central Bank of Cyprus.
- Pfeiffer, P., J. Varga, and J. in 't Veld (2021, July). Quantifying Spillovers of Next Generation EU Investment. Discussion Papers 144, European Commission.
- Taliotis, T., E. Giannakis, M. Karmellos, N. Fylaktos, and T. Zachariadis (2020). Estimating the Economy-Wide Impacts of Energy Policies in Cyprus. Paper 100495, Energy Strategy Reviews.
- Varga, J., W. Roeger, and J. in 't Veld (2021). E-QUEST - A Multi-Region Sectoral Dynamic General Equilibrium Model with Energy: Model Description and Applications to Reach the EU Climate Targets. Discussion Paper 146, ECFIN.

# Appendices

## A Explanatory on policy axes of the Cyprus RRP

This section outlines the Cyprus RRP (see Table 14) and its policy axes, and provides examples of the largest expenditure measures within each axis. As explained in [European Commission \(2021\)](#), the Cyprus RRP consists of 13 components grouped in five policy axes. It devotes 41 percent of the total allocation to measures that support climate objectives and 23 percent to measures that support the digital transition. Furthermore, it includes reforms and investments that address “all or a significant subset of the economic and social challenges outlined in the country-specific recommendations”.<sup>26</sup>

Table 14: Policy Axes of the Cyprus RRP

Policy axis / Component	Estimated budget	Percentage
<b>1. Public health, civil protection and lessons learned from the pandemic</b>	74.1	6.1
1.1. Resilient and effective health system, enhanced civil protection	74.1	6.1
<b>2. Accelerated transition to a green economy</b>	447.7	37.1
2.1. Climate neutrality, energy efficiency and renewable energy penetration	269.1	22.3
2.2. Sustainable transport	91.3	7.6
2.3. Smart and sustainable water management	87.3	7.2
<b>3. Strengthening the resilience and competitiveness of the economy</b>	422.3	35.0
3.1. New growth model and diversification of the economy	166.4	13.8
3.2. Enhanced research and innovation	64.0	5.3
3.3. Business support for competitiveness	51.4	4.3
3.4. Modernising public and local authorities, making justice more efficient and fighting corruption	96.0	8.0
3.5. Safeguarding fiscal and financial stability	44.5	3.7
<b>4. Towards a digital era</b>	89.4	7.4
4.1. Upgrade infrastructure for connectivity	53.0	4.4
4.2. Promote e-government	36.4	3.0
<b>5. Labour market, social protection, education and human capital</b>	172.9	14.3
5.1. Educational system modernization, upskilling and retraining	94.0	7.8
5.2. Labour market, social protection, social welfare and inclusion	78.9	6.5
<b>Total</b>	1206.4	100.0

Source: [European Commission \(2021\)](#).

Notes: Estimated budget in €mn. Percentage in total estimated budget.

Policy axis 1 contains investments and reforms that strengthen the resilience and effectiveness of the health and long-term care sectors (e.g. enhancement, modernisation and upgrade of Cyprus State Hospitals).

Policy axis 2 represents the main lever of the green transition in the plan. It includes measures that contribute to Cyprus’ transition to climate neutrality through (i) energy efficiency (e.g. energy

<sup>26</sup>For more information, see the website of the Cyprus government: [Cyprus tomorrow \(in Greek\)](#).

efficiency of buildings and other infrastructure), (ii) renewable energy (e.g. incentives for the use of renewables), (iii) promotion of sustainable transport (e.g. promotion of widespread use of Electric Vehicles) and (iv) improved water management (e.g. smart water and sewerage networks). The largest measure is the loan support for the construction of the EuroAsia Interconnector (€100 million). The project is part of a larger investment (at least €1.5 to €2 billion), which comprises the electricity interconnection between the grids of Israel, Cyprus and Greece with a total capacity of 2000MW.

Policy axis 3 is focused on achieving smarter and more sustainable growth, through diversification, innovation, improved access to funding and a simplified and investment friendly business environment. It includes measures that support (i) economic diversification (e.g. related to agriculture, manufacturing and tourism sector on the countryside and mountains), (ii) competitiveness (e.g. digital upgrade of businesses), (iii) research and innovation (e.g. schemes for start-ups, innovative firms and SMEs), (iv) the modernisation of the public sector and infrastructure (e.g. smart cities), including the judicial system, and (v) fiscal sustainability (e.g. improving tax collection).

Policy axis 4 represents the main lever of digitalisation in the plan. It includes measures related to (i) connectivity infrastructure (e.g. expansion of high-capacity networks, such as 5G) and (ii) e-governance (e.g. digitalisation in various central ministries/services).

Policy axis 5 plans to support social resilience and social protection, as well as improve educational quality, inclusiveness and readiness for the digital transition. It includes measures for (i) the modernisation of education (e.g. digital transformation of schools), upskilling (e.g. enhancing digital skills) and retraining, (ii) the modernisation of the labour market (e.g. flexible work arrangements/teleworking), and (iii) enhancing social protection and inclusion (e.g. enhancing the effectiveness of the PES, home structures for people in need of long-term care).

## B Key assumptions in different studies

Table 15: Model types and scenario assumptions in different studies

Model	UCY-ERC (2021)	EC: QUEST	ECB: EAGLE & ECB-MC	CBC: CYMCM
Model type	Supply-side model: Production function growth accounting model with different types of capital inputs <sup>1,5</sup>	DSGE multi-country model <sup>2</sup>	(i) DSGE model (EAGLE) <sup>3</sup> (ii) Semi-structural multi-country <sup>4,6</sup>	Semi-structural model of Cyprus economy
Country coverage	Cyprus	27 MSs of the EU	EA and 4-5 largest countries	Cyprus
Stimulus via grants <sup>8</sup>	-	1006+	N/A for CY	1006
Stimulus via loans <sup>8</sup>	-	240	N/A for CY	100
Total stimulus <sup>8</sup>	1160 (1234 minus 6% reforms)	1479	N/A for CY	1106
Additivity	100%	100% for grants; 50% for loans	EA: 77%	Various scenarios from 72% to 100%
Instruments/Shocks	Various types of investment including human capital	Government investment	Various fiscal instruments reflecting EA countries' RRFs	Various fiscal instruments reflecting Cyprus RRP
Time dimension	No reference	Even allocation across years	Reflects EA countries' RRFs	Reflects Cyprus RRP
Trade linkages	No	Yes	Yes	No
Productivity	Enhancing impact of structural reforms exogenously	Enhancing impact of investments <sup>7</sup>	EAGLE: Through high productivity of government investment in the production of private capital stock. ECB-MC: Government investment is effectively as productive as private investment.	Government investment is as productive as private in the production of total capital stock.
Structural reforms	Yes, explicit assumption on TFP growth	No	Yes, separate estimates with EAGLE	No
Monetary rules	No	Active (Taylor rule)	Deactivated for first 3 years; thereafter, active Taylor rule	Deactivated
Fiscal policy rules	No	Active (debt rule)	Deactivated	Deactivated

Source: (1) Giannakis and Mamuneas (2018) and Taliotis et al. (2020); (2) Varga et al. (2021); (3) Gomes et al. (2012); (4) Angelelli et al. (2019).

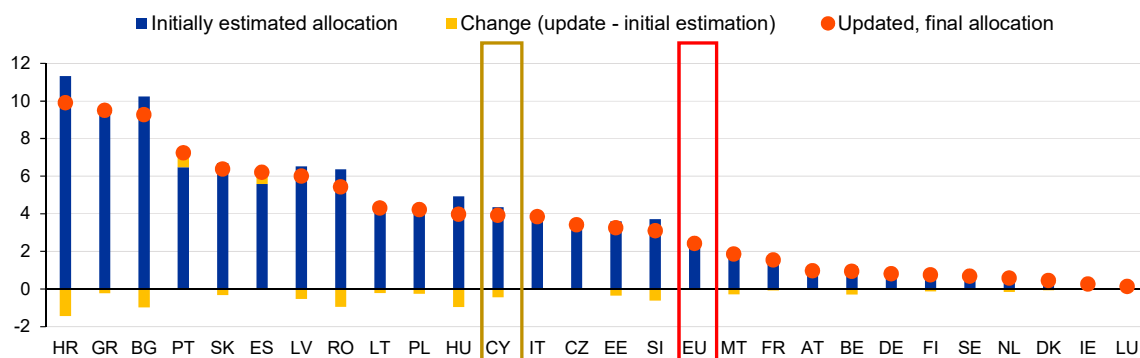
Notes: (5) Complemented by VAR methods and an Input-Output model; (6) The effects on public debt are assessed via the ECB DSA tool; (7) Public capital is an input to private sector's output with calibrated output elasticity of 0.12 or 0.05. (8) Expressed in €mn.

## C Simulation results based on assumptions that reflect the updated allocation of grants

According to the RRF Regulation (Regulation (EU) 2021/241), published on 12 February 2021, 70 percent of the RRF grant component should be distributed to EU countries according to the following allocation criteria: population, inverse of GDP per capita, and past unemployment developments. The remaining 30 percent should be calculated with a small change in the allocation criteria; past unemployment developments are replaced by the change in real GDP in 2020 and the aggregated change in real GDP during the period 2020-2021 (in equal proportion). The relevant regulation specified that this remaining 30 percent would be initially estimated by the European Commission Autumn 2020 forecasts, but the final allocation would be updated with actual out-turns by 30 June 2022.<sup>27</sup>

The results of the aforementioned update were published by the European Commission on 30 June 2022.<sup>28</sup> Figure 9 depicts the changes in the distribution of the total grant component between the final calculation and the initial estimation.

Figure 9: RRF grants allocation by Member State, update vs initial estimate



Source: European Commission, Eurostat and CBC staff calculations.  
Notes: Vertical axis: In percent of 2019 GDP.

The final allocation of the grant component implies Cyprus will receive around €90.4 million less, or around 9 percent lower, compared to the initial estimate. Therefore, the question arises as to what is the impact of the aforementioned change on the results of this paper. The answer is not clear and will depend on the amendments of the Cyprus RRP, which is expected to occur in 2023.

Nevertheless, this section provides results that incorporate the final allocation of grants to Cyprus under two different assumptions on the RRP-related expenditures. The first assumption replaces the reduction in RRF grants with RRF loans; therefore, leaving each expenditure measure unchanged. The second assumption scales down all expenditure measures funded by RRF grants by the same proportion, subject to a decrease of €90.4 million in total expenditure measures. The two different assumptions are applied to each of the “partial additivity” and “full additivity” scenarios; therefore, Table 16 includes four set of results, reflecting the following simulation exercises:

- “Partial additivity” scenario with replacement of grants with loans
- “Full additivity” scenario with replacement of grants with loans

<sup>27</sup>For more information on the allocation, see Article 11 and Annexes II and III of the relevant regulation: [RRF Regulation](#).

<sup>28</sup>The relevant publication can be found in the [RRF update of the maximum financial contribution](#).



- “Partial additivity” scenario with scaling down of expenditures
- “Full additivity” scenario with scaling down of expenditures

The estimates under the assumption of replacement of grants with loans, show that the expected medium-term impact on real GDP level remains the same for both; “partial additivity” or “full additivity scenarios” (Table 16). The impact on HICP inflation and employment level also remains the same. This is expected, as the shocks on expenditure measures are the same as the ones based on the official published Cyprus RRP. The only shocks that change compared to the data from the Cyprus RRP are the ones on net lending (reflecting lower RRF grants) and on government debt (reflecting higher RRF loans), which mainly affect the estimate of the impact on government debt-to-GDP ratio. Specifically, the favourable impact on government debt-to-GDP is smaller by 0.3-0.4 percentage points compared with the estimates using data on the published RRP.<sup>29</sup>

The estimates under the assumption of scaling down all expenditure measures funded by RRF grants by the same proportion (calling off), show that the medium-term impact on real GDP level is reasonably smaller compared with the estimates using data based on the published RRP. Specifically, under the assumption of lower expenditure measures, the impact on real GDP is smaller by 0.06-0.07 percentage points.<sup>30</sup> Similarly, the impact on HICP inflation and employment level is smaller by 0.01 and 0.02 percentage points, respectively, compared with the estimates using data based on the published RRP.

Table 16: Medium-term macroeconomic impact under assumptions that reflect the updated allocation of grants

Scenario	Real GDP	Inflation	Employment	Debt-to-GDP
“Partial additivity (replacement)”	0.58	0.06	0.18	-0.85
“Full additivity (replacement)”	0.71	0.08	0.22	-0.46
“Partial additivity (calling off)”	0.51	0.05	0.16	-1.15
“Full additivity (calling off)”	0.65	0.07	0.20	-0.66

Source: CBC staff calculations based on CYMCM model.

Notes: Real GDP and employment are expressed in percentage deviations from the “no NGEU” scenario, in levels. Inflation (HICP) and debt-to-GDP are expressed in percentage point deviations from the “no NGEU” scenario. All scenarios simultaneously shock *ZGLN*, *ZGDN*, *ZGCN*, *ZGIN*, *OGN*, *TRN*, *ITR* and *GCD*, as indicated in Tables 4-8, amended by the assumptions explained in this appendix. The values correspond to the maximum impact up to 2026.

The results in Table 16 are indicative, as the estimated impact will depend on the actual data of the future revised RRP. The two assumptions can be viewed as the two extreme cases. The assumption on the replacement of grants with loans considers that expenditure measures are unchanged; therefore, the impact on real GDP remains unchanged. On the other hand, the assumption of scaling down the expenditure measures by the full revision in the grant component results in a reduced impact on real GDP level, which can be considered as the largest possible change (or close to the largest).<sup>31</sup>

<sup>29</sup>For the “partial additivity” scenario, the difference is 0.4 percentage points and for the “full additivity” scenario, the difference is around 0.3 percentage points.

<sup>30</sup>For the “partial additivity” scenario, the difference is 0.07 percentage points and for the “full additivity” scenario, the difference is 0.06 percentage points.

<sup>31</sup>Theoretically, the change in the impact can be even larger than the difference estimated here, since the composition of expenditure measures in the actual data of the future revised RRP may be even less effective than the proportional decrease assumed here.