

# Portugal 2020 Macroeconomic Impact Assessment

## Executive Summary

August 31, 2021

AGENCY FOR DEVELOPMENT AND COHESION



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## General framework: object, objectives, and methodology of evaluation

- §ES.1 **Portugal 2020** is the **Partnership Agreement** between Portugal and the European Commission setting the programming principles for the implementation of the **European Structural and Investment Funds** (ESIF) for the 2014-2020 period and enshrining the economic, social, and territorial development policy to be promoted in this period in Portugal.
- §ES.2 The ESIF comprise five funds – the European Regional Development Fund (ERDF), the Cohesion Fund (CF), the European Social Fund (ESF) including the specific allocation of the Youth Employment Initiative (YEI), the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF).
- §ES.3 The Portugal 2020 Global Evaluation Plan (PGA PT2020) and the Portugal 2020 Operational Programme Evaluation Plans set out the guiding principles for programme evaluations, with the possibility of evaluations to address strategic issues and identify global impacts of Portugal 2020. The **Portugal 2020 Macroeconomic Impact Assessment**, promoted by the Agency for Development and Cohesion, I.P. (AD&C), is part of this set of global assessments.
- §ES.4 The **Portugal 2020 Macroeconomic Impact Assessment** aims to identify and measure the impact of the implementation of Portugal 2020, for the 2014-2020 period and with execution/projection in the 2015-2023 period, regarding the main macroeconomic aggregates and their short-term and medium- and long-term dynamics, as well as their reflection at the level of the country regions.
- §ES.5 The evaluation exercise was structured around two **Research Questions**: What is the macroeconomic impact of Portugal 2020? (**QA1**) What is the macroeconomic impact of Portugal 2020 on the Portuguese NUTS II regions? (**QA2**).
- §ES.6 This evaluation exercise thus seeks to assess the impacts of Portugal 2020 on the main macroeconomic aggregates and related variables of interest. The exercise was conducted at the national and at the regional level (NUTS II regions), focusing both on short-term effects (with emphasis on the demand side and essentially considering a period of up to 5 years) and in the medium- and long-term (interaction between demand and supply effects, considering horizons of 5 to 50 years after the ESIF intervention period). The evaluation also took into account the previous programming period (QREN), with the objective of conducting a combined and comparative analysis of the macroeconomic impacts of the two programming periods.

- §ES.7 For the accomplishment of this project, we relied on the **information provided** by AD&C on the amounts executed and projected of the ESIF – CF, EAFRD, EMFF, ERDF and ESF – for the programming cycle of Portugal 2020, as well as on the amounts executed for the QREN period was used.
- §ES.8 The public funding (total public expenditure) executed/projected for all ESIF under Portugal 2020 amounts to **EUR 30.6 billion**, with a **European** funding of **EUR 26 billion (85.1% of the total value)**. The greatest relative importance of the ERDF and ESF, which together capture almost **71%** of public funding, stands out. By region, Norte and Centro capture most of the public funding (**37.9%** and **26.6%** respectively), although, in terms of public funding per *capita*, the Região Autónoma dos Açores (RAA) shows the highest value.
- §ES.9 As for the evaluation **methodology**, the estimation of the macroeconomic impacts of the ESIF – following the approach developed by the **European Commission** – was based on the results of the numerical simulation of two **general equilibrium dynamic macroeconomic models**: the QUEST III model, for the analysis at national level, and the RHOMOLO model, for the analysis at regional level (and, in addition, at the sectoral level). As a step prior to the simulation, the categories of ESIF intervention domains or measures/submeasures were converted into **intervention fields** that, in turn, were mapped into **policy shock instruments** (as described in Table ES1 below). The ESIF intervention, mapped into these shock instruments, constituted the set of exogenous shocks applied to each of the models in the simulation exercise. The reaction of the models to these exogenous shocks allows, in turn, the measurement of the macroeconomic impact of the ESIF, comparing the values of the variables of interest in the scenarios with and without the shocks resulting from the intervention of the ESIF.
- §ES.10 The policy shock instruments are associated with the following **exogenous** variables or parameters of the model: public investment (**IG**); public consumption (**G**); efficiency of human capital, considering all levels of human capital or only human capital of higher level (respectively, **TRAIN** and **TRAINH**); (4) intangible capital risk premium (**RPREMA**); tangible capital risk premium (**RPREMK**); fixed costs of companies producing goods and services (**FCY**). In the case of the **RHOMOLO model**, the FCY shock instrument is excluded because it is not considered in the analytical structure of this model, and an additional exogenous variable linked to transport costs (**TCOST**) is included.

**Table ES1: Summary of the mapping of intervention field into shock instruments**

Intervention field	Instrument-shock in model		Shock calibration
	QUEST	RHOMOLO	
INFR Infrastructure	$\Delta^+ \text{IG}$ <i>(infrastructure directly related to production processes, e.g., ICT, energy efficiency, water treatment, health, education)</i>		Increase in public investment by the amount of the ESIF public expenditure (% GDP)
	$\Delta^+ \text{G}$ <i>(infrastructure related to quality of life, e.g., protection of nature and biodiversity)</i>		Increase in public consumption by the amount of the ESIF public expenditure (% GDP)
INFR-TRNSP Transport Infrastructure	$\Delta^+ \text{IG}$ <i>(infrastructure directly related to transport, e.g., roads)</i>	$\Delta^- \text{TCOST}$ <i>(infrastructure directly related to transport, e.g., roads)</i>	Increase in public investment by the amount of the ESIF public expenditure (% GDP)
HC Human Capital	$\Delta^+ \text{G}$ <i>(expenditure related to sustainable services, e.g., health care and social services, social entrepreneurship and social and solidarity economy, local development strategies)</i>		Increase in public consumption by the amount of the ESIF public expenditure (% GDP)
	<b>TRAIN / TRAINH</b>		Increase in human capital efficiency of human capital promoted by the ESIF public expenditure (per worker)
RTD Research and Development	$\Delta^- \text{RPREMA}$ <i>(expenditure related to research and innovation processes that reduces the risk premium of intangible capital)</i>		Investment subsidy that reduces the user cost of capital by the amount of the ESIF public expenditure (% GDP), modelled through a reduction in the risk premium of intangible capital
AIS Aid to Private Business Sector and to Specific Public Initiatives	$\Delta^- \text{RPREMK}$ <i>(expenditure related to business support services and general productive investment in SMEs; support through financial instruments)</i>		Investment subsidy that reduces the user cost of capital by the amount of the ESIF public expenditure (% GDP), modelled through a reduction in the risk premium of tangible capital
	$\Delta^- \text{FCY}$ <i>(expenditure related to business support services and general productive investment in SMEs; support through grants)</i>	$\Delta^+ \text{G}$ <i>(expenditure related to business support services and general productive investment in SMEs; support through grants)</i>	Production subsidy by the amount of the ESIF public expenditure (% GDP)
	$\Delta^+ \text{G}$ <i>(expenditure related to protection, development and promotion of public tourism, cultural and heritage assets)</i>		Increase in public consumption by the amount of the ESIF public expenditure (% GDP)
TA Technical Assistance and Other Interventions	$\Delta^+ \text{G}$		Increase in public consumption by the amount of the ESIF public expenditure (% GDP)

§ES.11 It should be noted that the macroeconomic effects of the ESIF intervention are necessarily indirect and of an eminently unobservable nature. This is because, on the one hand, transmission mechanisms tend to be relatively complex and diffuse and, on the other hand, economic variables are subject to the

influence of several factors beyond those strictly attributable to ESIF. In this sense, any evaluation exercise will only be able to lead to **estimates of the impact** of the ESIF.

- §ES.12 As this evaluation exercise is based on the simulation of macroeconomic analytical models, the above mentioned estimates will naturally be influenced by the respective **assumptions of analysis** – related both to the inner structure of the models and to the identification and quantification of the shocks in the context of the ESIF intervention.
- §ES.13 It should also be noted that the analytical differences between the QUEST III model and the RHOMOLO model imply that **their results are generally not directly comparable**. In particular, the structure of the RHOMOLO model tends to expand the effects of the aggregate demand side, which, together with the consideration of spatial interaction effects, leads to the estimation of quantitatively more significant and/or more persistent impacts than in the QUEST III model as regards several macroeconomic variables. Given the close relationship between the differences found in the results of the two models and the differences in their set of assumptions, the impact estimates generated by the two models can be interpreted as corresponding to alternative scenarios of analysis. In this case, the results of the RHOMOLO model will correspond to a 'high' scenario and the results of the QUEST III model to a 'low' scenario of the Portugal 2020 macroeconomic impact.
- §ES.14 On the other hand, it should be noted that, in practice, the different dimensions of the ESIF intervention contain **complementarities and synergies** which, however, are not entirely accommodated in the context of the simulation of the models. These complementarities and synergies imply, from an overall perspective, that all dimensions are relevant to the effectiveness of the ESIF, even if the efficiency indicators associated with the intervention of the funds (e.g., multiplier effect measuring indicators) calculated with the models may point to the existence of negative net benefits from the individual perspective of certain instruments, intervention groups or funds.

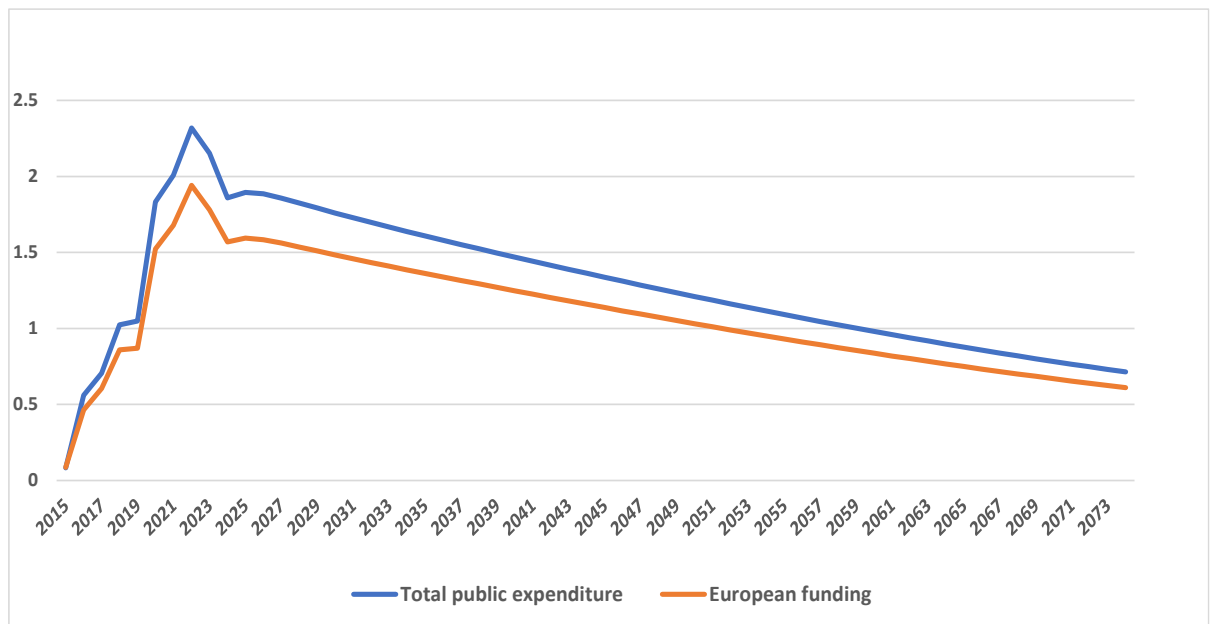
## **Key conclusions in response to the Research Questions**

### **Impact of ESIF at the national level – simulation with QUEST III model**

- §ES.15 Overall, it has been estimated, based on the QUEST III simulation, that total public expenditure associated with ESIF will have a growing **impact on the GDP level** during the intervention period (as shown in Figure ES1 below), reaching a maximum of about **2.3%** in 2022 compared to the level that would occur in a stationary scenario without ESIF intervention (steady state). In average annual terms,

the impact of ESIF on GDP during the implementation period is **1.3%**, increasing to **1.56%** ten years after the end of that period. Considering only the amount of the European funds, the estimated impact is **1.09%** and **1.31%** respectively.<sup>1</sup>

**Figure ES1: Portugal 2020 - Impacts of the ESIF on GDP, 2015-2073 (percentage deviation with respect to the no-funds scenario)**



§ES.16 This path translates into a cumulative **multiplier effect** of public expenditure over the 50 years after the end of the ESIF intervention of **2.98** (considering only European funding) and **3.01** (considering total public expenditure). This means that, considering the accumulated impact in this time horizon, for every 1 euro of total public expenditure or European funding, GDP will have increased by around 3 euros, in present value and at constant prices.

§ES.17 Overall, there is an increase in **employment**, even if only during the period of intervention of the funds, with a maximum in 2020 (gain of **0.24%** compared to the steady state), also highlighting the sharp growth in employment of high skilled workers, reflecting the behaviour of its share allocated to the R&D sector. **Real wages** also show a positive trajectory in relation to the steady state for the three levels of human capital, both during the period of execution of the funds and on the 50-year horizon that follows. The average real wage of the economy peaks in 2025-2026 (gain of **1.72%** compared to the steady state).

<sup>1</sup> To guarantee the harmonization with the methodology used by the European Commission in assessing the macroeconomic impacts of cohesion funds, the analysis of the overall impact of ESIF in Portugal considers the contribution of the national government budget to the EU budget, in proportion to the weight of the ESIF in the total expenditure of the EU budget. However, when the impact by shock instrument, intervention group and fund is analysed, this contribution is not considered, since there is no breakdown into these dimensions.

- §ES.18 The **capital intensity** continuously strengthens as of the third year of ESIF implementation, reaching its maximum value about 15 years after the end of the implementation period. This contributes to the increase in **labour productivity** and **real wages** and explains some capital-labour substitutability and the eventual fading out of the boost regarding employment.
- §ES.19 It is estimated that the **Government budget balance-to-GDP ratio** slightly worsens over the intervention period of the ESIF, but which is reversed with the end of ESIF implementation. In turn, the **public debt-to-GDP ratio** falls back after the second year of intervention, first due to the effect of output growth on the ratio of the accumulated debt stock to GDP and then also reflecting the positive impact on the Government budget balance. Finally, the **trade balance-to-GDP ratio** deteriorates throughout the intervention period, but there is an improvement in the ratio of the **Net International Investment Position** due to both the increase in terms of trade and the net inflow of EU transfers.
- §ES.20 By discriminating the effects of ESIF by **shock instrument**, it is observed that the multiplier effect on **GDP** is clearly greater than **1** in the case of the instruments associated with *the efficiency of human capital* (TRAIN/TRAINH) and *public investment* (IG), but less than **1** in the case of the instruments associated with *the capital risk premium* (RPREMA, RPREMK) and, notably, *public consumption* (G).
- §ES.21 On the other hand, **real wages** observe a persistent positive effect under all instruments, except for G. **Total employment** benefits from positive (short-term) effects in the case of all instruments except FCY, under which employment contracts during the intervention period.
- §ES.22 Still regarding the estimated behaviour of **employment**, it should be noted that the shocks in the context of the ESIF intervention are, in general, a combination of stimuli of aggregate demand and productive efficiency or financing that induce a persistent increase in output, but do not change, structurally, the conditions of population participation in the workforce. For this reason, **they tend not to have effects on employment beyond the short term.**
- §ES.23 The **trade balance**, as a ratio of GDP, deteriorates with all instruments, always in a context of import boost. However, with G and RPREMK, there are falls in exports induced by competitiveness-price losses, while, under RPREMA, FCY, IG and TRAIN/TRAINH, there are increases due to competitiveness-price gains and productivity improvements. The **Government budget balance** as a ratio of GDP deteriorates with all instruments except TRAIN/TRAINH over much of the intervention period.
- §ES.24 Table ES2 summarizes the results described above, both globally and discriminated by shock instrument.



**Table ES2: Portugal 2020 – Impacts of total public expenditure of the ESIF on selected variables, by shock instrument, annual average per period (deviation with respect to the no-funds scenario)**

		2015-2023	2015-2033	2015-2053	2015-2073
<b>GDP (PT_Y)</b>	<b>Total Expenditure</b>	1.38	1.58	1.48	1.29
	<b>G</b>	0.07	0.01	0.00	0.00
	<b>IG</b>	0.25	0.31	0.26	0.21
	<b>RPREMA</b>	0.05	0.09	0.06	0.05
	<b>RPREMK</b>	0.01	0.01	0.00	0.00
	<b>FCY</b>	0.22	0.14	0.08	0.06
	<b>TRAIN</b>	0.74	0.98	1.01	0.92
	<b>TRAINH</b>	0.04	0.04	0.04	0.03
<b>Total Employment (PT_L)</b>	<b>Total Expenditure</b>	0.18	0.03	-0.01	-0.02
	<b>G</b>	0.08	0.03	0.01	0.01
	<b>IG</b>	0.06	0.02	0.01	0.01
	<b>RPREMA</b>	0.03	0.01	0.00	0.00
	<b>RPREMK</b>	0.00	0.00	0.00	0.00
	<b>FCY</b>	-0.09	-0.04	-0.03	-0.02
	<b>TRAIN</b>	0.08	0.01	0.00	0.00
	<b>TRAINH</b>	0.01	0.00	0.00	0.00
<b>Average real Wage (PT_WR)</b>	<b>Total Expenditure</b>	0.90	1.29	1.28	1.14
	<b>G</b>	-0.01	-0.01	0.00	0.00
	<b>IG</b>	0.18	0.27	0.24	0.19
	<b>RPREMA</b>	0.07	0.09	0.07	0.05
	<b>RPREMK</b>	0.01	0.01	0.00	0.00
	<b>FCY</b>	0.04	0.05	0.05	0.04
	<b>TRAIN</b>	0.58	0.83	0.88	0.81
	<b>TRAINH</b>	0.02	0.03	0.03	0.03
<b>Government Budget Balance, % GDP (PT_GBY) (pp)</b>	<b>Total Expenditure</b>	-0.09	0.04	0.02	0.01
	<b>G</b>	-0.04	0.00	0.00	0.00
	<b>IG</b>	-0.02	0.00	0.00	0.00
	<b>RPREMA</b>	-0.03	0.01	0.00	0.00
	<b>RPREMK</b>	0.00	0.00	0.00	0.00
	<b>FCY</b>	-0.02	0.00	0.00	0.00
	<b>TRAIN</b>	0.02	0.03	0.02	0.01
	<b>TRAINH</b>	0.00	0.00	0.00	0.00
<b>Trade Balance, % GDP (PT_TBY) (pp)</b>	<b>Total Expenditure</b>	-0.53	-0.34	-0.23	-0.17
	<b>G</b>	-0.13	-0.07	-0.04	-0.03
	<b>IG</b>	-0.15	-0.09	-0.05	-0.04
	<b>RPREMA</b>	-0.05	-0.04	-0.03	-0.02
	<b>RPREMK</b>	-0.01	0.00	0.00	0.00
	<b>FCY</b>	-0.02	-0.03	-0.03	-0.03
	<b>TRAIN</b>	-0.15	-0.09	-0.06	-0.05
	<b>TRAINH</b>	-0.03	-0.01	-0.01	-0.01
<b>Average Productivity (PT_Y/PT_LY)</b>	<b>Total Expenditure</b>	1.29	1.59	1.51	1.31
	<b>G</b>	-0.02	-0.02	-0.01	0.00
	<b>IG</b>	0.19	0.29	0.25	0.20
	<b>RPREMA</b>	0.11	0.11	0.08	0.06
	<b>RPREMK</b>	0.01	0.01	0.01	0.00
	<b>FCY</b>	0.31	0.18	0.11	0.08
	<b>TRAIN</b>	0.67	0.97	1.02	0.93
	<b>TRAINH</b>	0.02	0.03	0.04	0.03

- §ES.25 The impacts of the ESIF are also different according to the **European fund**. Thus, the impact on GDP is more pronounced and more persistent in the case of the **ESF** (which represents **29.6%** of public expenditure), resulting in a cumulative multiplier over the 50 years after the end of the implementation of the funds **of 7.14**. This ESF impact dynamic is clearly related to the dynamics of the main shock instrument under this fund, TRAIN.<sup>2</sup> In turn, the **CF** (explaining **10.6%** of public expenditure) is the second in importance regarding the impact on GDP, with a cumulative multiplier of **2.54**, reflecting the dynamics of the dominant instrument, IG.
- §ES.26 As regards the **ERDF** and **EAFRD** (representing **40.9%** and **17.2%** of total public expenditure respectively), there is a cumulative multiplier of **1.12** in the first case and **1.01** in the second. The dynamics in the case of the ERDF is associated with the behaviour of the RPREMA, G and FCY instruments, while in the case of EAFDR it is associated with the behaviour of the G, FCY and GA instruments.
- §ES.27 The **EMFF** (which is equivalent to **1.6%** of total public expenditure) has a cumulative multiplier of **0.55**, reflecting the little persistent dynamics of the impacts generated under the shock instrument G.
- §ES.28 The comparative assessment of the effect of the ESIF implemented under the **Portugal 2020 and QREN programmes** shows that, in the case of the latter, the estimated impact of the total public expenditure associated with the ESIF during the period of implementation of the funds will have been, on average annual terms, **1.6%** above the steady state, increasing to **1.86%** ten years after the end of that period. Considering only the amount of European funds, the impact will have been **1.21%** and **1.43%** respectively. All figures are slightly higher than those estimated for the impact of the ESIF under Portugal 2020.
- §ES.29 The estimates described above translate, in QREN, into a cumulative **multiplier effect** of public expenditure on GDP over the 50 years after the end of the ESIF intervention of **2.89** (considering European funding only) and **3.09** (considering total public expenditure). Compared to the cumulative

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<sup>2</sup> The high persistence of the macroeconomic impact of increasing the efficiency of human capital results, in part, from the shocks related to TRAIN/TRAINH operating beyond the period of intervention of these instruments, reflecting the fact that the workers receiving the intervention remain in the working force beyond that period. On the other hand, it should be noted that the estimated impact of ESIF on the efficiency of human capital is based on two essential assumptions: (i) there is a certain equivalence between the training of workers (in broad sense) and years of formal schooling; (ii) there exists an adequacy of human capital to the firms' production process, i.e., there is a match between the qualifications of the worker and the functional characteristics of job vacancy in the firms.

impact of the ESIF in the context of Portugal 2020, we found that, in QREN, the impact is marginally higher when considering total public expenditure (**3.09 versus 3.01**), but it is slightly lower considering only European funding (**2.89 versus 2.98**).

§ES.30 Bearing in mind the **impacts on the main macroeconomic variables**, the evolution profile is very similar in the context of QREN and of Portugal 2020 (as shown in Table ES3). On annual averages, the impact on the case of QREN is slightly more intense, over the entire period under analysis, in terms of GDP, real wage, average productivity and trade balance (in this case the impact is slightly more negative). Yet, the magnitude of the impacts in terms of total employment and budget Government balance is very similar in both programmes.

**Table ES3: Portugal 2020 versus QREN – Impacts of total public expenditure of the ESIF on selected variables, annual average per period (deviation with respect to the no-funds scenario)**

		Period of intervention of the ESIF	Until 10 years after the end of intervention of the ESIF	Until 30 years after the end of intervention of the ESIF	Until 50 years after the end of intervention of the ESIF
<b>PORTUGAL 2020</b>	<b>GDP</b>	1.30	1.56	1.47	1.28
	<b>Total Employment</b>	0.09	0.00	-0.02	-0.02
	<b>Average real Wage</b>	0.90	1.30	1.28	1.13
	<b>Government Budget Balance, % GDP (pp)</b>	-0.07	0.04	0.02	0.01
	<b>Trade Balance (pp)</b>	-0.37	-0.25	-0.17	-0.13
	<b>Average Productivity</b>	1.30	1.60	1.51	1.31
<b>QREN</b>	<b>GDP</b>	1.60	1.86	1.74	1.51
	<b>Total Employment</b>	0.13	0.03	0.00	-0.01
	<b>Average real Wage</b>	1.25	1.61	1.55	1.36
	<b>Government Budget Balance, % GDP (pp)</b>	-0.05	0.04	0.02	0.01
	<b>Trade Balance (pp)</b>	-0.44	-0.31	-0.21	-0.16
	<b>Average Productivity</b>	1.56	1.87	1.76	1.53

§ES.31 Also discriminating the effects of ESIF by **shock instrument**, one observes that the impact, in terms of deviations vis-à-vis the scenario without intervention of the ESIF (steady state), is very similar in QREN compared to that of Portugal 2020. The overall behaviour of most of the selected variables is related to the impact of the shock instrument TRAIN and, to a lesser extent, the instrument IG, not only in terms of the short-term effect, but also its persistence over time.

§ES.32 In terms of the cumulative multiplier on GDP, the main conclusions are maintained when comparing the dynamics of QREN with those of Portugal 2020: (i) the instrument with the highest cumulative multiplier over the 50 years after the end of the ESIF intervention is TRAIN; (ii) in addition to TRAIN,

three more instruments have a cumulative multiplier greater than **1** – TRAINH, IG and FCY; (iii) the multiplier associated with instrument G is always clearly lower than **1**. The main differences between QREN and Portugal 2020 concern the multipliers associated with the instruments TRAIN and TRAINH: the cumulative multiplier of the TRAIN instrument is higher in the case of Portugal 2020 (**8.06 versus 7.43** in QREN); the multiplier associated with the TRAINH instrument is always higher in QREN (**2.89 versus 1.91** in Portugal 2020). These differences reflect the fact that, in the intervention period of QREN, there is a lower proportion of workers with higher qualifications in the population than in the period of Portugal 2020, which translates, for a given amount of expenditure associated with the TRAINH instrument, into a greater impact on the efficiency of workers with that level of qualification. By symmetry, the opposite occurs for the shock instrument TRAIN (which covers expenditure for all qualification levels).

§ES.33 As for the impacts by **European fund** under QREN, it is clear that, as is the case in Portugal 2020, the impact on GDP is more pronounced, and more persistent, in the case of the ESF, with a cumulative multiplier over the 50 years after the end of the implementation of the funds of **6.91 (7.14** in Portugal 2020). The **CF** is, in both programs, the second in importance, with a cumulative multiplier on GDP of **2.14** in QREN (**2.54** in Portugal 2020). As regards the **ERDF**, the cumulative multiplier is significantly lower than those for the ESF and CF, but still higher than **1** in the long term in both programmes (**1.39** in QREN and **1.12** in Portugal 2020), in contrast to the **EMFF**, whose associated multiplier is always less than **1** in both programmes. In the case of the **EAFRD**, the cumulative multiplier is lower but close to **1** in the case of QREN (**0.94**), which compares to the value marginally above **1** in the case of Portugal 2020 (**1.01**). The differences in the magnitude of fund multipliers between QREN and Portugal 2020 reflect both the differences in the incidence of the shock instruments by fund and the differences in magnitude of the multipliers at the instrument level (in particular, TRAIN and TRAINH, as mentioned above) in the two programmes.

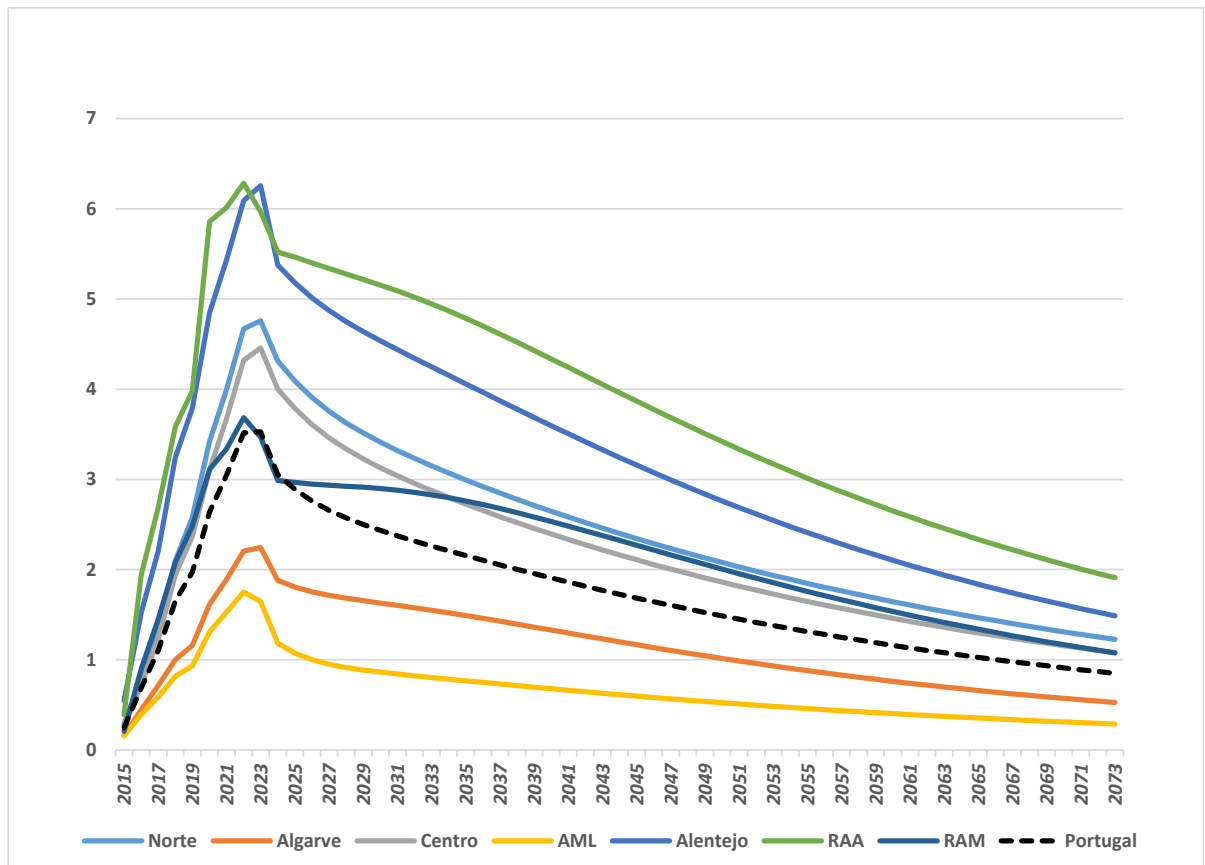
§ES.34 It was also evaluated how the ESIF implemented under Portugal 2020 allow **to mitigate the impacts of adverse external shocks** on the Portuguese economy. Considering, in particular, the negative external demand shock associated with the Covid-19 pandemic, the results show that, while in the absence of the ESIF the negative shock brings GDP about **3.1%** below the value of the scenario without the shock (steady state), when occurring at the same time as the implementation of the funds in 2020, or a few years after the end of the period of implementation of the funds, 2030, the product falls only about **1.3%** relative to the steady-state value. Even in the long term, the product would not fall more than

2% relative to that value. In other words, we conclude that the presence of ESIF tends to absorb at least about **36%** of the impact of the external shock.

### Impact of ESIF at region and sector level - simulation with RHOMOLO model

§ES.35 As for the impact of **ESIF at regional level (NUTS II)** under Portugal 2020, the estimates were obtained based on the simulation of the RHOMOLO model. Regarding the impact on **GDP**, the different regions of Portugal have a similar intertemporal profile, albeit with very different impact magnitudes (see Figura ES2). Four regions, among the group of the least developed, notoriously exceed the national average. They are, first of all, Região Autónoma dos Açores (RAA) and Alentejo, followed by Norte and Centro. Região Autónoma da Madeira (RAM) is only slightly above the average, while Algarve and Área Metropolitana de Lisboa (AML) perform clearly below.

**Figure ES2: Portugal 2020 – Impact of total public expenditure of the ESIF on GDP, by NUTS II region, 2015-2073 (percentage deviation with respect to the no-funds scenario)**



§ES.36 In addition to the positive impacts on GDP, which persist over the 50-year period after the implementation of the programme, there is an increase in **total employment** compared to the stationary scenario without ESIF intervention (*steady state*) in all regions. The regions with the greatest

impacts on the output in the national panorama are the ones that also have the greatest impacts in terms of employment (RAA, Alentejo, North and Centro).

- §ES.37 As the short-term demand-side effects resulting from the ESIF intervention fade and the effects associated with capital stock accumulation (either physical or intangible) gain intensity, **average productivity** shows gains compared to the steady state in all regions. Gains are more intense in less developed regions (RAA, Alentejo, Norte e Centro).
- §ES.38 **Real wages** show a positive evolution vis-à-vis the steady state in all regions, both during the period of implementation of the funds and over the 50 years that follow (albeit progressively smaller). The behaviour of wages closely follows the dynamics of average labour productivity after the intervention period of the ESIF, an evolution that allows the less developed regions to show the highest real wage gains relative to the steady state in the medium and long term.
- §ES.39 Table ES4, presented below, summarizes the results described above discriminated by region.
- §ES.40 The evolution already described translates into an accumulated impact over 50 years after the end of the intervention of the funds, assessed by the **multiplier** effect of public expenditure, that is quite different between regions. AML stands out with the highest cumulative multiplier (**6.54**), clearly above the national average (**4.19**). The remaining regions show multipliers lower than the national average, although with different magnitudes. Algarve and Norte show multipliers accumulated over the 50 years after the end of the intervention of funds very close to the national average (respectively, **4.09** and **4.07**). They are followed by Centro, Alentejo and RAM (respectively, **3.43**, **3.42** and **3.18**). RAA has the lowest multiplier of all NUTS II regions (**2.36**).
- §ES.41 The distinct values for the cumulative multipliers by region reflect both a **composition effect**, given the distinct incidence of shock instruments by region, and the different **magnitudes of multipliers per shock instrument** in the various regions. In turn, the different magnitudes per instrument reflect, inter alia, different sectoral compositions/intensities of the human capital factor (and, consequently, different average productivity), different structures of trade between regions, i.e., of import and export flows between regions and abroad, and the different positioning of each region as a net contributor/receiver of the EU budget. In general, these different aspects benefit AML in a salient way vis-à-vis the other regions and, to a lesser extent, Algarve and Norte.

**Table ES4: Portugal 2020 – Impact of total public expenditure of the ESIF on selected variables, by NUTS II region, annual average per period (deviation with respect to the no-funds scenario)**

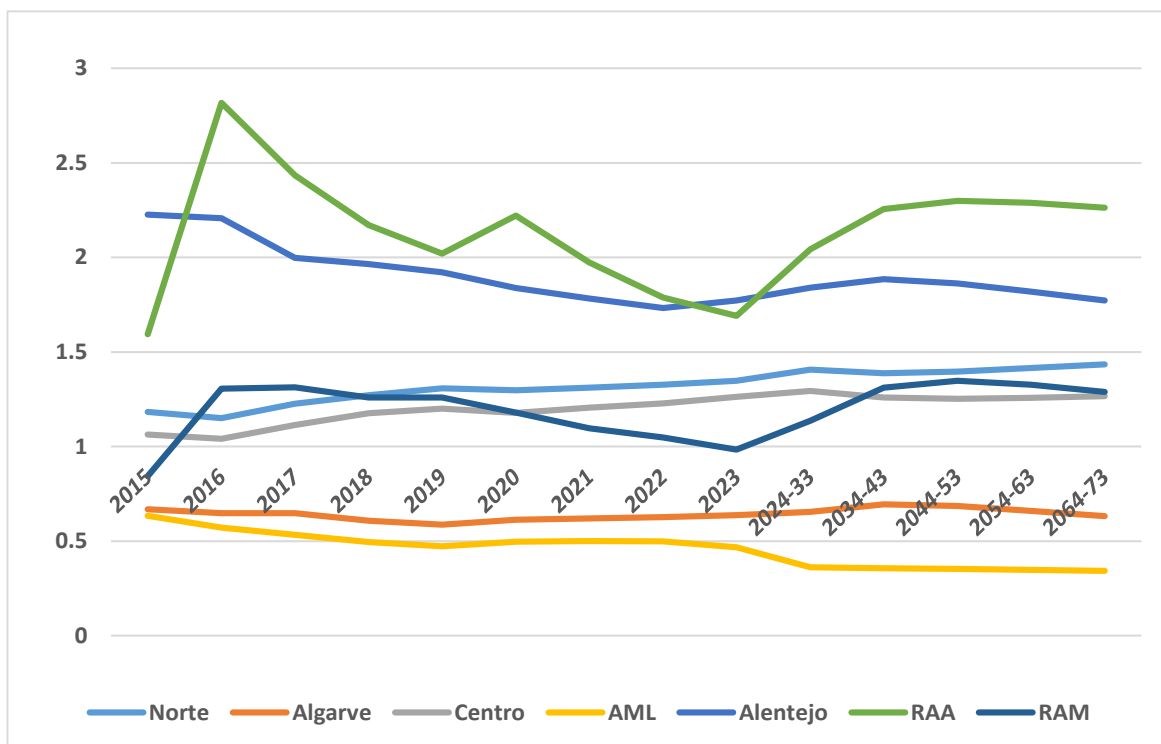
		2015-2023	2015-2033	2015-2053	2015-2073
<b>GDP</b>	<b>Portugal</b>	2.04	2.33	2.04	1.71
	<b>Norte</b>	2.66	3.17	2.81	2.37
	<b>Algarve</b>	1.27	1.49	1.35	1.13
	<b>Centro</b>	2.45	2.92	2.56	2.15
	<b>AML</b>	1.01	0.97	0.79	0.65
	<b>Alentejo</b>	3.77	4.28	3.78	3.16
	<b>RAA</b>	4.08	4.69	4.34	3.70
	<b>RAM</b>	2.30	2.62	2.48	2.12
<b>Total Employment</b>	<b>Portugal</b>	1.95	1.63	1.27	1.03
	<b>Norte</b>	2.26	2.01	1.60	1.31
	<b>Algarve</b>	1.30	1.09	0.90	0.73
	<b>Centro</b>	1.94	1.65	1.28	1.04
	<b>AML</b>	1.06	0.71	0.50	0.39
	<b>Alentejo</b>	3.34	2.77	2.19	1.77
	<b>RAA</b>	3.86	3.09	2.51	2.07
	<b>RAM</b>	2.49	2.00	1.67	1.39
<b>Average real Wage</b>	<b>Portugal</b>	1.16	0.91	0.69	0.55
	<b>Norte</b>	1.26	1.07	0.83	0.67
	<b>Algarve</b>	0.78	0.61	0.48	0.39
	<b>Centro</b>	1.64	1.35	1.03	0.82
	<b>AML</b>	0.54	0.35	0.24	0.18
	<b>Alentejo</b>	2.10	1.63	1.23	0.98
	<b>RAA</b>	3.50	2.45	1.80	1.44
	<b>RAM</b>	1.60	1.17	0.92	0.75
<b>Average Productivity</b>	<b>Portugal</b>	-0.37	0.50	0.70	0.64
	<b>Norte</b>	-0.12	0.91	1.10	0.99
	<b>Algarve</b>	-0.38	0.27	0.44	0.40
	<b>Centro</b>	-0.08	1.01	1.18	1.06
	<b>AML</b>	-0.24	0.21	0.30	0.28
	<b>Alentejo</b>	-0.59	1.01	1.38	1.26
	<b>RAA</b>	-1.20	0.81	1.42	1.35
	<b>RAM</b>	-1.02	0.21	0.63	0.62

§ES.42 Comparing the deviations of GDP from the steady state for each region with the deviations obtained for the national average, that is, calculating the regional relative effectiveness rate of total public expenditure executed/projected in terms of impact on GDP, it is noted that the regions classified as less developed exhibit greater impacts of ESIF on the level of GDP compared to the steady state without shocks. RAA stands out (on average, in the 60 years under analysis, with gains about **2.2** times higher than the national average), followed by Alentejo (**1.8**), Norte (**1.4**) and Centro (**1.3**). RAM, classified as most developed region, also presents gains above the national average (**1.3** times the

national average), while AML, also classified as most developed, shows gains that are only about **40%** of the values observed for the national annual average. Algarve is also below the national average (less than **70%**).

§ES.43 Therefore, with the exception of RAM, the ESIF seem **to contribute to regional convergence**. Very similar conclusions can be drawn if we analyse the impacts only during the ESIF implementation period (2015-2023) (see Figure ES3).

**Figure ES3: Portugal 2020 - Impact of total public expenditure of the ESIF on GDP, by NUTS II region, 2015-2073 (ratio between the percentage deviation with respect to the no-funds scenario by region and the national average)**



§ES.44 The results reveal a significant pattern regarding the role of the different **shock instruments** in the impact of ESIF on the main macroeconomic variables in each region. In terms of effects on GDP relative to the steady state, in **Centro, RAA and AML**, the TRAIN instrument plays a leading role, followed by IG. In Centro, the instruments RPREMK and RPREMA are also relevant, in RAA the RPREMK and in AML the REPREMA. The relevance of TRAIN and IG extends to total employment, real wages and average productivity.

§ES.45 In **RAM, Alentejo and Algarve**, in terms of accumulated effects on GDP, there is a preponderance of IG, followed by TRAIN. The RPREMA instrument is also important, especially in Alentejo. In this region, it should also be noted that the TRAIN instrument becomes, in cumulative terms, more relevant than



IG over about a decade after the end of the implementation of the funds. The relevance of IG and TRAIN extends to total employment, real wages and average productivity.

- §ES.46 Finally, in **Norte**, it is noteworthy the role played by the TRAIN instrument, followed, in importance, by RPREMA and IG. These instruments are also predominant in terms of the impacts on total employment, real wages and average productivity.
- §ES.47 Regarding **the multiplier effect** of each **shock instrument**, it should be noted that, although there are large differences between regions, in all of them the impact of TRAIN and IG instruments is greater than the impact of total public expenditure (ranging, in the case of IG, between **17%** higher in AML and **63%** higher in RAA and, in the case of TRAIN, between **53%** higher in Norte and **144%** higher in RAA, in the accumulated 50 years after the end of fund intervention). In parallel, the impact of instrument G is always lower (oscillating between **66%** lower in AML and **89%** lower in AAR). Concerning the more relevant impacts, we also highlight those of the RPREMA instrument in Algarve, RAA, and RAM, the RPREMK instrument in AML, and the TCOST instrument in Algarve.
- §ES.48 As for the impacts broken down by **fund**, the results show a different **multiplier effect** in terms of GDP between regions, although the common points are the fact that in all of them the impact of ESF is greater than the impact of total public expenditure (ranging from **144%** higher in RAA to **57%** higher in Norte, in the accumulated 50 years after the end of the fund intervention). The impacts of EMFF and ERDF are always lower (varying, in the case of the EMFF, between **32%** lower in Norte and **74%** lower in AML, and, in the case of ERDF, between **9%** lower in RAA and **42%** lower in RAM). In terms of the most relevant impacts, the impact of CF in Norte, Algarve, Centro, Alentejo and RAM and EAFRD in AML are also noteworthy.



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