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The ex-post macroeconomic evaluation of the 2014-2020 European Social Fund, Youth Employment Initiative and REACT-EU labour market interventions

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Abstract. We provide a macroeconomic evaluation of the impact of the 2014-2020 European Social Fund, the Youth Employment Initiative and the labour market interventions of the REACT-EU programme, using data updated to the end of 2023. We use the spatial dynamic general equilibrium model RHOMOLO, modified to include endogenous labour force participation, to analyse the impact of nearly €110 billion in total, showing how GDP, employment, wages and various measures of inequality respond to the policies. The results suggest that the European labour market policy has a substantial positive impact on the regional economies of the Union and on the labour force, with long-lasting positive effects on GDP and employment, and a reduction in regional disparities and macroeconomic educational mismatches.

Disclaimer: The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission

1. Introduction

The European Social Fund (ESF) finances actions that contribute to employment, social inclusion, education, training and administrative capacity reforms. Together with the Youth Employment Initiative (YEI), it supports young people (aged over 16 and under 30) who are not in education, employment or training (NEETs). The total EU-funded ESF budget for 2014-2020 was almost €100 billion, plus around €8 billion for the YEI. Since its inception, the ESF has been the subject of a lively academic and policy debate (see, among others, Brine, 2002, and Tomé, 2013).

Article 57 of the Common Provision Regulation 2014-2020[1] requires the Commission to carry out an ex-post evaluation of the European Structural and Investment Funds (ESIF) by the end of 2024 and prepare a synthesis report by the end of 2025. The macroeconomic impact assessment of the policy presented in this working paper complements the qualitative and quantitative work carried out as part of the formal ex-post evaluation.

This analysis updates and complements the macroeconomic ex-ante impact assessment described in Sakkas (2018), which used data on planned expenditure, by using data on actual expenditure taking place between 2014 and 2022. In addition, this analysis includes the almost €3 billion of additional labour market interventions as part of the emergency response to the social and economic consequences of the COVID-19 pandemic under the Recovery Assistance for Cohesion and the Territories of Europe (REACT-EU[2]).

Evaluating the impact of policies is essential to determine effectiveness, improve efficiency, ensure transparency and accountability, and learn from past experience. This process allows for adjustments to current policies, informs the development of better future policies, and helps to mitigate unintended consequences. Ultimately, policy evaluation contributes to a more effective allocation of resources and improved well-being of the population.

In the context of the evaluation of labour market and human capital policies, there are three strands of literature: econometric analyses using micro data (Heckman, 1999), including counterfactual impact evaluations (Card et al., 2018)[3], econometric analyses using macroeconomic data (Calmfors et al., 2001), and applied general equilibrium models (Heckman et al., 1998). The analysis presented in this paper

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[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R1303.

[2] REACT-EU extends the crisis-response and crisis-repair measures delivered through the coronavirus response investment initiative (CRII) and the coronavirus response investment initiative plus (CRII+) and constitutes a bridge to the long-term recovery plan. See https://ec.europa.eu/regional_policy/funding/react-eu_en for additional details about REACT-EU.

[3] CIE defines effectiveness as the impact on individual well-being from a specific policy. While it helps answer whether policy changes are achieved, it has limitations in addressing large-scale program impacts, long-run effects, and complex general equilibrium effects on welfare, price, wages, and employment. Consequently, partial-equilibrium and treatment analysis in the evaluation of social programs can lead to different results from general equilibrium approaches.

belongs to the latter family of analyses (such as Van der Linden, 2005; Osuna, 2009; Cahuc and le Barbanchon, 2010; and Angelopoulos et al., 2017, among others).[4]

We use the well-established spatial dynamic computable general equilibrium (CGE) model RHOMOLO to assess ex-post the regional macroeconomic impact of the 2014-2020 ESF, YEI, and REACT-EU labour market measures across EU Member States and regions (note that the UK is included in the analysis, as it was in the EU at the time). The document illustrates the input data, the simulation strategy, and the simulation results focusing on the impact on regional Gross Domestic Product (GDP), GDP multipliers, employment, compensation of employees[5], labour supply, wage inequality, consumer welfare and macroeconomic education mismatch. The simulations use a version of RHOMOLO with endogenous labour participation (see Christensen and Persyn, 2022, and Christou et al., 2023 for more details), and the labour force is divided into three groups: low-educated individuals have education corresponding to ISCED levels 0-2; medium-educated individuals have education corresponding to ISCED levels 3-4; and high-educated individuals have education corresponding to ISCED levels 5-8.

The remainder of the paper is structured as follows. Section 2 briefly describes the version of the RHOMOLO model used in the analysis. Section 3 presents the data and the simulation strategy used to introduce the policy interventions into the model. Section 4 presents the results and section 5 concludes.

2. A brief description of the model

The economic foundations of the spatial dynamic RHOMOLO model are based on the well-established literature on CGE models, and a full description of its functioning is beyond the scope of this paper (all model equations are presented in Lecca et al., 2018). The model is calibrated to a set of integrated EU regional social accounting matrices (SAMs) for the year 2017, which include the economic input-output linkages as well as the secondary distribution of income (García Rodríguez et al., 2023).

The model economies are divided into ten economic sectors (based on the NACE Rev. 2 industrial classification). Households consume a fixed proportion of their income and firms are assumed to maximise profits and produce goods and services according to a constant elasticity of substitution production function. Governments collect revenue and spend it on public goods and transfers (both tax rates and transfers are exogenous in the simulations presented in this paper). Capital and labour are used as factors of production (public capital also enters the production function as an unpaid factor, following Baxter and King, 1993, among others). Trade in goods and services – within and between regions – is modelled following Armington (1969) and is assumed to be costly, with transport costs increasing with distance (Krugman, 1991). The valuation of transport costs is based on a transport model by Persyn et al. (2022 and 2023). Regional economies are typically more open than national economies due to their smaller size, and this is accounted for in the model thanks to regional trade flows and the

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[4] There is a substantial literature analysing the various effects of the ESF. A non-exhaustive list includes Canova and Pappa (2024), who find that the ESF has positive effects on gross value added and employment in the medium term, Rodríguez-Pose and Fratesi (2004), Medeiros (2017), and Biedka et al. (2022) who find positive effects on human capital and labour productivity, and Fusaro and Scandurra (2023) who find positive employment impacts for the youth population.

[5] The compensation of employees by NUTS-2 regions are obtained by Eurostat's regional economic accounts, branch and household accounts dataset and consist of wages and salaries and employers' social contributions (European system of national and regional accounts (ESA 2010), paragraph 4.02).

relatively high elasticity of substitution between domestic and imported goods and services (Németh et al., 2011).

The model incorporates interregional spillovers through trade flows and capital mobility, resulting in endogenous firm location. Trade links cause economic shifts in one region to impact its trading partners' regions. In line with insights from the economic geography literature, the balance between agglomeration forces (due to increasing returns to firms' technology) and dispersion forces (due to competition between rival varieties) determines the location of firms and workers.

The standard version of the model is based on a static wage curve (Blanchflower and Oswald, 1994) and a fixed labour supply. This setup limits the potential use of the model for analysing labour market outcomes and policies, as it ignores the decisions of individuals who can respond to macroeconomic shocks and policies by deciding whether or not to participate in the labour market and how much time to supply. To address this shortcoming, in this paper we modify the model by introducing endogenous labour supply decisions, building on the work of Kleven and Kreiner (2006) and Boeters and Savard (2013). Thus, economic agents first determine the optimal number of hours worked, assuming that they enter the labour market and are employed. Then, they compare the costs of participation with the expected utility of working to decide whether or not to look for a job.

This set up still allows for the existence of involuntary unemployment, as does the static wage curve of the standard version of RHOMOLO. In fact, in the standard version of the model, the only possible adjustment in the labour market is through changes in the unemployment rate. The modification introduced here allows for an additional transmission mechanism through the change in hours worked (for a mathematical description of this version of RHOMOLO, see Christensen and Persyn, 2022).

The base year is assumed to correspond to a steady state that does not change unless perturbed by the introduction of exogenous shocks. RHOMOLO is used for scenario analysis: shocks mimicking the effects of policies are introduced to perturb the initial steady state, resulting in different values for the model's endogenous variables. The results are presented in terms of changes relative to the baseline, which can be interpreted as a no-policy scenario. This makes it possible to identify the sole effects of the policy, in isolation from any other macroeconomic developments that may be occurring simultaneously in the real world. The model is solved in a recursively dynamic process, where a sequence of static equilibria are linked by the law of motion of the state variables. This implies that economic agents are not forward-looking and their decisions are based solely on current and past information.

The RHOMOLO model is managed and developed by the Joint Research Centre (JRC). General equilibrium models like RHOMOLO must rely on simplifying assumptions because of the inherent complexity of the phenomena they seek to reproduce. The model simulations analyse a policy in isolation in order to identify its effects, without taking into account its interaction with other initiatives, national or European, even if in the same field. There is also a lack of detailed information on the typology of operations supported and on the characteristics of the participants in the programmes. The modelling results should therefore be interpreted with the following limitations in mind: (i) modelling assumptions have been used to incorporate information on the amount of money spent in the programmes into the scenario simulations; (ii) different typologies of interventions have been grouped into broader categories and economic channels in order to keep the analysis tractable; (iii) the model uses programme-related data on expenditure and types of participants as inputs, but then has to rely on assumptions (based on the

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scientific literature and additional data) to translate these inputs into outcomes; (iv) the modelling results are affected by the variation in modelling parameters and assumptions used to calibrate the shocks, i.e. the way in which the interventions are introduced into the model.

The implication is that the results should only be seen as an ex-post evaluation in the sense that the input data refer to actual money spent thanks to the policy programmes, not because the GDP, employment and other variables are those actually observed. Nevertheless, the work is informative for understanding the policy, in particular its transmission mechanisms, spatial distribution, macroeconomic cost-effectiveness and sustainability.

3. Description of input data and simulation strategy

The absolute ESF, YEI, and REACT-EU funding per region covering the period 2014-2022 is presented in Figure 1. The total funds per Member State are shown in Table 1 (also broken down by educational groups of workers). The allocation of the funds to each region was provided by Ismeri, using information on declared expenditure for each intervention by Member States.[6] The additional allocation of regional funds by education level is done using the SFC 2014 Information System[7] common output indicators that classify the treated population of each policy intervention by their education levels.

Table 1. ESF, YEI and REACT-EU funds by Member State and education level (million euros)

| Member State	Education level			
	Low	Medium	High	Total
AT	451.90	172.00	61.80	685.70
BE	793.80	632.20	310.50	1,736.40
BG	700.90	569.00	460.30	1,730.30
CY	127.10	162.80	70.70	360.60
CZ	525.30	2,504.80	915.10	3,945.20
DE	7,264.70	3,102.40	1,879.70	12,246.80
DK	141.90	90.10	127.90	359.90
EE	75.60	314.60	207.90	598.10
EL	1,685.60	2,159.30	937.20	4,782.10
ES	6,353.90	2,650.20	2,056.90	11,061.10
FI	197.70	368.70	379.20	945.70
FR	3,689.10	3,394.80	2,179.70	9,263.50
HR	712.90	599.30	124.20	1,436.50
HU	1,460.20	2,429.70	1,364.10	5,254.10
IE	338.90	308.40	214.00	861.30
IT	5,526.50	6,246.40	3,145.80	14,918.70
LT	171.10	712.00	470.70	1,353.90
LU	76.20	68.80	37.20	182.20
LV	95.90	264.40	285.80	646.10
MT	204.10	261.40	113.50	578.90
NL	626.40	326.80	96.40	1,049.70
PL	2,068.50	3,680.30	5,352.10	11,100.80

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[6] Ismeri collaborated with DG EMPL to produce the data as part of the consortium responsible for the supporting study on the ex-post evaluation of the 2014-2020 ESF and YEI. It should be noted that declared expenditure may differ from the final expenditure per Member State and funding facility. The breakdown by region is based on declared expenditure as of the end of 2022.

[7] For more information see https://sfc.ec.europa.eu/en/2014/about-sfc2014 .

PT	2,192.30	2,962.80	3,603.00	8,758.10
RO	1,171.30	1,731.60	1,100.60	4,003.50
SE	594.90	526.50	286.10	1,407.50
SI	211.70	342.00	289.80	843.50
SK	1,259.30	983.90	811.30	3,054.50
UK	2,916.40	3,076.10	674.30	6,666.80
Total	**41,634.00**	**40,641.40**	**27,555.90**	**109,831.30**
Source: DG EMPL (2023) and Ismeri (data extracted in November 2023).				

The allocation of funds to the population by level of education per Member State was provided by Ismeri (see footnote 6). According to the data in Table 1, 38% of the 109,831 million Euro in funding is for measures targeting people with a low level of education, 37% for those with a medium level of education, and 25% with for those with a high level of education.

Figure 1. ESF, YEI and REACT-EU funds (thousand euros)
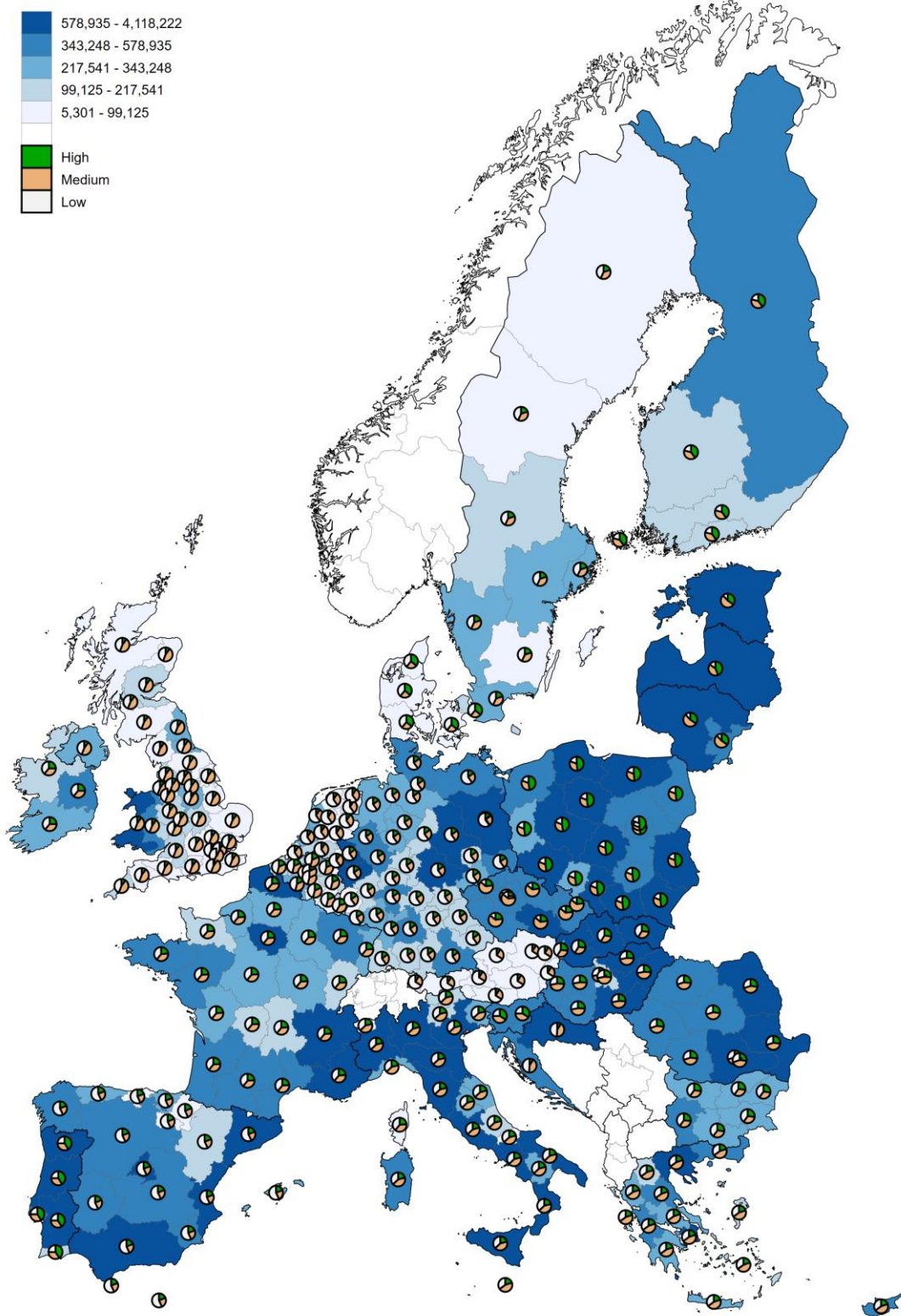
Source: DG EMPL (2023) and Ismeri (data extracted in November 2023). The pie charts show the distribution of the regional funds across education groups (data are classified into five quantiles).

The policy amounts are distributed over the programming period with an average annual regional share per country as shown in Table 2.

Table 2. ESF, YEI and REACT-EU funds time profile (proportion of the total interventions allocated per year), simple regional means by Member State

Member State	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
AT	0.00	0.00	0.00	0.08	0.24	0.12	0.23	0.16	0.18	1
BE	0.00	0.00	0.01	0.12	0.20	0.16	0.16	0.17	0.17	1
BG	0.00	0.00	0.05	0.09	0.16	0.14	0.16	0.23	0.17	1
CY	0.00	0.00	0.04	0.01	0.23	0.05	0.05	0.35	0.28	1
CZ	0.00	0.01	0.05	0.09	0.14	0.14	0.16	0.21	0.20	1
DE	0.00	0.03	0.09	0.12	0.16	0.15	0.18	0.14	0.13	1
DK	0.00	0.01	0.05	0.08	0.14	0.11	0.17	0.22	0.22	1
EE	0.00	0.01	0.06	0.10	0.16	0.18	0.16	0.13	0.20	1
EL	0.00	0.03	0.10	0.10	0.10	0.13	0.20	0.16	0.17	1
ES	0.00	0.00	0.01	0.10	0.27	0.15	0.11	0.19	0.19	1
FI	0.00	0.01	0.09	0.14	0.17	0.16	0.15	0.15	0.13	1
FR	0.00	0.00	0.10	0.09	0.22	0.10	0.19	0.15	0.15	1
HR	0.00	0.00	0.01	0.04	0.16	0.12	0.18	0.30	0.17	1
HU	0.00	0.00	0.01	0.09	0.17	0.15	0.19	0.24	0.14	1
IE	0.00	0.00	0.00	0.00	0.41	0.21	0.09	0.29	0.00	1
IT	0.00	0.00	0.05	0.09	0.18	0.15	0.14	0.22	0.17	1
LT	0.00	0.00	0.10	0.07	0.09	0.15	0.27	0.19	0.14	1
LU	0.00	0.00	0.02	0.07	0.07	0.06	0.05	0.68	0.06	1
LV	0.00	0.00	0.08	0.11	0.14	0.15	0.15	0.17	0.20	1
MT	0.00	0.00	0.01	0.03	0.08	0.04	0.05	0.33	0.47	1
NL	0.00	0.00	0.13	0.26	0.10	0.08	0.26	0.08	0.10	1
PL	0.00	0.01	0.06	0.11	0.15	0.18	0.15	0.20	0.15	1
PT	0.00	0.05	0.09	0.14	0.14	0.12	0.12	0.16	0.19	1
RO	0.00	0.00	0.00	0.01	0.21	0.17	0.24	0.17	0.21	1
SE	0.00	0.01	0.07	0.12	0.17	0.15	0.12	0.16	0.21	1
SI	0.00	0.00	0.05	-0.03	0.28	0.11	0.15	0.19	0.25	1
SK	0.00	0.00	0.05	0.08	0.11	0.12	0.31	0.19	0.15	1
UK	0.00	0.00	0.01	0.05	0.24	0.14	0.17	0.17	0.22	1
Source: DG EMPL (2023) and Ismeri (data received in November 2023).										

The regional distribution of the labour force in RHOMOLO is shown in Figure 2 (as explained by García Rodríguez et al., 2023, the source for this type of data is the European Labour Force Survey, LFS).

Figure 2. Labour force and education level distribution, thousands of individuals, RHOMOLO baseline year
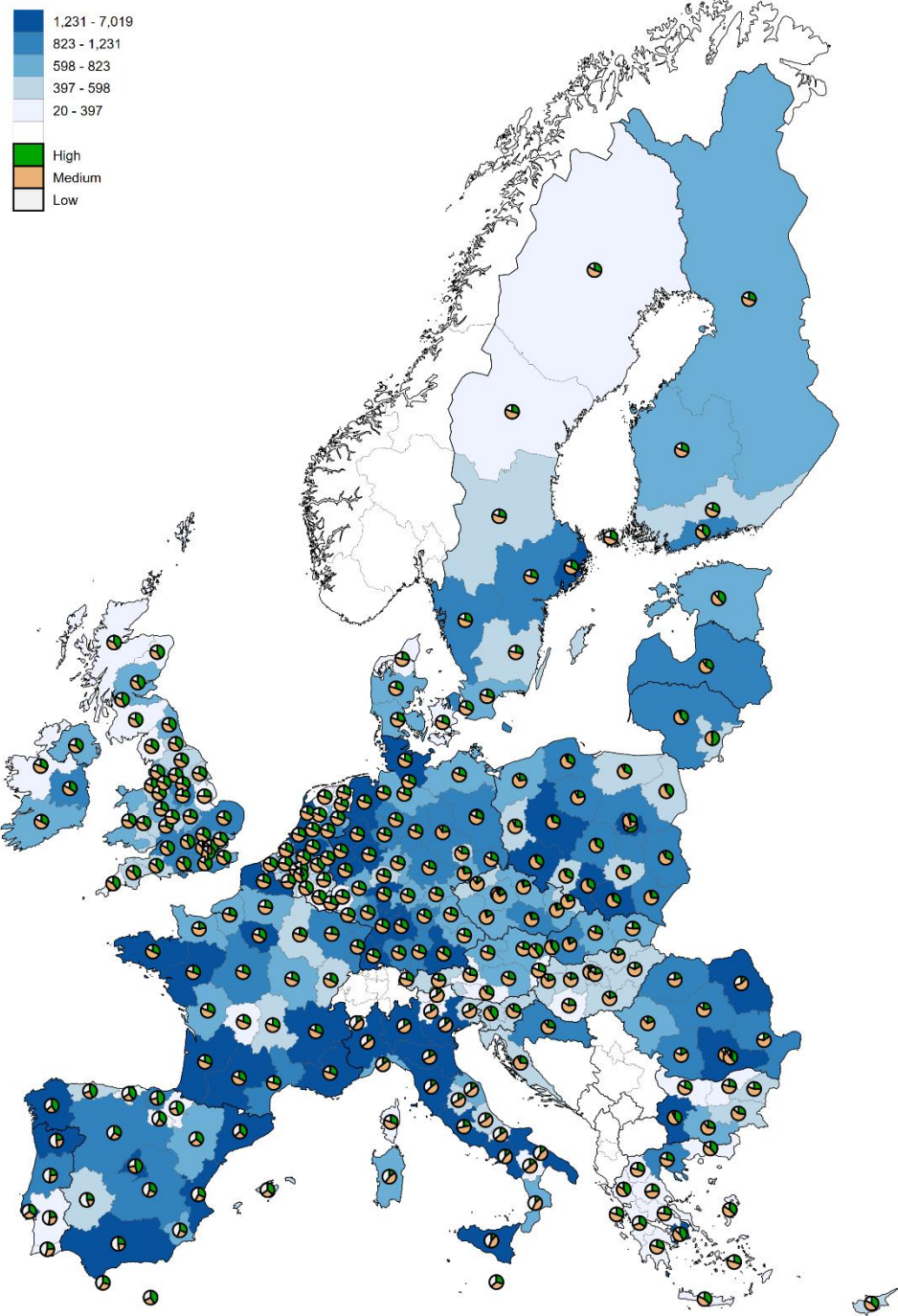
Source: García Rodríguez et al. (2023).

The combination of the share of funds per education group and the density of the population of a particular group in a region will govern the intensity of the results for that specific region.

3. Simulation strategy

As shown in Table 3, the ESF and REACT-EU funds are categorised into four Thematic Objectives (TOs), TO 8 (Promoting sustainable and quality employment and supporting labour mobility), TO 9 (Promoting social inclusion, combating poverty and any discrimination), TO 10 (Investing in education, training and vocational training for skills and lifelong learning) and TO 11 (Enhancing institutional capacity of public authorities and stakeholders and efficient public administration), with each TO consisting of a different set of interventions (on the other hand, the YEI facility consists only of intervention no. 103 of TO 8). In total, 39% of the funds are allocated to TO 8, 28% to TO 9, 30% to TO 10, and 3% to TO 11. Furthermore, the YEI funds amount to 8,047 million euro, while the REACT-EU funds amount to 2,894 million euro. The ESF, YEI, and REACT-EU funds are then classified into four types of RHOMOLO input shocks as per Table 3, which can affect regions depending on the regional allocation of each intervention. Each shock is made of a demand-side and a supply-side component.[8]

Based on the modelling setup of RHOMOLO, the expenditure categories related to training, re/up-skilling and other active labour market policies (no. 106, 108, 115, 116, 117, 118, and 120) are assumed to be human capital enhancing and therefore increase labour productivity. Specifically, resources are converted into additional years of schooling equivalents on the basis of a cost per person (based on country-specific tertiary education costs per student – source: OECD (2024), "Education at a glance: Indicators of education finance"). Each additional year of schooling/training increases labour productivity according to Mincer-type estimates (Card, 2001), and the elasticity is based on country-specific estimates by Psacharaopoulos and Patrinos (2018a and 2018b). On the demand side, these expenditures are assumed to increase government current expenditure.

The spending categories that promote labour market participation, socio-economic integration of marginalised communities, or the modernisation of labour market institutions (no. 102, 103, 105, 107, 109, 110, 111, 112, 113, and 114), are assumed increase the labour supply. This happens through an allocated cost per trainee calibrated on the basis of country-specific secondary education per cost per pupil (source: OECD (2024), "Education at a glance: Educational finance indicators"). On the demand side, these expenditures are assumed to increase government current expenditure.

Intervention for no. 104 is modelled as a reduction in the user cost of capital, which stimulates private investment. The demand-side increase in private investment leads to a temporary increase in the capital stock of firms, which gradually returns to its initial steady state (with an annual depreciation rate of 15%) when the monetary injection ends. Lastly, intervention 119 is modelled via public investment on the demand side, which on the supply side causes a temporary increase in the stock of public capital. The latter is treated in the model as an additional and unpaid factor of production available to all firms, and it depreciates at an annual rate of 5%. Private and public capital are both assumed to depreciate annually at a constant rate to reflect the aging stock of capital procured in previous periods. The

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[8] It can be argued that most interventions may activate more than one channel at a time. The modelling strategy explained here (decided together by the authors and DG EMPL colleagues) assumes that each intervention works according to its main effect only. Also, certain choices affect the results, as some shocks are characterised by higher returns than others (for instance, a public investment shock typically has a higher GDP impact than a labour supply shock). We acknowledge the influence of these assumptions as a limitation of this analysis.

depreciation rates of 15% for firm capital stocks and 5% for public capital stocks are set consistently with Kamps (2006) and Gupta (2014).

A final demand-side shock has to do with the model incorporating the fact that cohesion policy is financed by the Member States' pro rata contribution to the EU budget. This is assumed to be proportional to the weight of their GDP in EU GDP and the implication is that a larger share of the Member States' contributions to cohesion policy comes from more developed parts of the EU, while most interventions take place in less developed territories. In the model, the contribution of the Member States' funding of cohesion policy is assumed to be financed by a lump-sum tax, consequently decreasing household disposable income and partly offsetting the positive impact of the programmes. We further assume that the labour supply increases decay over time at a 5% yearly rate, since policies that alleviate labour market frictions may become antiquated over time due to changing and emerging economic and demographic challenges.[9] On the other hand, we assume that the labour productivity increase does not decay, consistently with the assumption of the ex-ante impact assessment carried out by Sakkas (2018). The simulation is run for 20 time periods, each corresponding to a year and is considered a deviation from the baseline year, in which the economy is assumed to be in equilibrium.

For example, following the introduction of an investment that increases labour productivity, in each period each educational group in each region decides whether or not to enter the labour market (the extensive margin) and the amount of labour that will be allocated to work (the intensive margin). The condition for entering the labour market depends on the relationship between the wage and the amount of benefits each group receives when unemployed, modelled as transfers from the government. The re-skilling of individuals and the entry of additional people into the labour force lead firms to re-optimise their production inputs and their mix of labour inputs (firms adopt a constant elasticity of substitution production function in which they first decide whether to use intermediate inputs or a composite of capital and labour; then, in a separate nest, they decide whether to employ low, medium or high educated workers). Higher labour productivity leads to higher wages, which further increase consumption. On the other hand, the additional inflow of workers into the labour force may also dampen the reduction in unemployment rates and the increase in wages. These effects interact with the increased demand associated with higher government current expenditure and the reduction in household income associated with the financing of the policy. Note that the regions of the EU are divided into two groups: net beneficiaries (receiving more money than they pay to finance the policy) and net contributors (regions where the contribution is greater than the cash injection of the policy).

A labour supply investment has the direct effect of increasing labour market participation in the model. The additional people in the labour market causes changes in firm optimisation due to increased amounts of labour input available, affecting the levels of unemployment and may lead to either positive or negative reactions to the compensation of employees in each group and by extension at the aggregate compensation level. Since investments that promote labour supply do not directly change the productivity of new labour entering the market, there is no direct effect on their wages due to their intrinsic productivity. The effect on the compensation of employees depends on how willing are firms to substitute

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[9] A decay rate of 5% is consistent with other RHOMOLO analyses (see, for example, Crucitti et al., 2024). Other values, such as 4% or 6%, would change the results quantitatively but not qualitatively, leading to a slightly higher or lower long-term impact of the policy.

labour of a particular education group with another given the change in the labour supply across groups that this investment entails.

As with any analysis based on economic modelling, the results presented here are sensitive to the assumptions made in constructing the model and setting the scenarios used to analyse the impact of the policy. In addition, this analysis can only be considered as an ex-post assessment as far as the data are concerned, since they refer to actual rather than planned expenditure. The results remain a scenario analysis and do not reflect the monitoring of actual outcomes observed in the macroeconomic data during the analysed period.

Table 3. Correspondence between Thematic Objectives (TOs) and RHOMOLO input shocks

TO – Investment priorities	ESF No.	Description of the intervention	Model Shock	Amount (€ Millions)	Activated channels
8.1	102	Access to employment for job-seekers and inactive people, including the long-term unemployed and people far from the labour market, also through local employment initiatives and support for labour mobility	Labour Supply	14,462 (of which 260 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
8.2	103	Sustainable integration into the labour market of young people, in particular those not in employment, education or training, including young people at risk of social exclusion and young people from marginalised communities, including through the implementation of the Youth Guarantee	Labour Supply	13,958 (of which 38 from REACT-EU and 8,047 from YEI)	Increase in government consumption (demand) and increase in labour supply (supply)
8.3	104	Self-employment, entrepreneurship and business creation including innovative micro, small and medium sized enterprises	User cost of capital	2,922 (of which 64 from REACT-EU)	Lower user cost of capital stimulating private investments (demand) and temporary increase in capital stock (supply)
8.4	105	Equality between men and women in all areas, including in access to employment, career progression, reconciliation of work and private life and promotion of equal pay for equal work	Labour Supply	1,711 (of which 1 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
8.5	106	Adaptation of workers, enterprises and entrepreneurs to change	Labour Productivity	8,221 (of which 710 from REACT-EU)	Increase in government consumption (demand) and increase in labour productivity (supply)
8.6	107	Active and healthy ageing	Labour Supply	422	Increase in government consumption (demand) and increase in labour supply (supply)

8.7	108	Modernisation of labour market institutions, such as public and private employment services, and improving the matching of labour market needs, including through actions that enhance transnational labour mobility as well as through mobility schemes and better cooperation between institutions and relevant stakeholders	Labour Productivity	1,198 (of which 88 from REACT-EU)	Increase in government consumption (demand) and increase in labour productivity (supply)
9.1	109	Active inclusion, including with a view to promoting equal opportunities and active participation, and improving employability	Labour Supply	19,074 (of which 11 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
9.2	110	Socio-economic integration of marginalised communities such as the Roma	Labour Supply	1,325 (of which 12 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
9.3	111	Combating all forms of discrimination and promoting equal opportunities	Labour Supply	398 (of which 2 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
9.4	112	Enhancing access to affordable, sustainable and high-quality services, including health care and social services of general interest	Labour Supply	8,182 (of which 262 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
9.5	113	Promoting social entrepreneurship and vocational integration in social enterprises and the social and solidarity economy in order to facilitate access to employment	Labour Supply	904 (of which 6 from REACT-EU)	Increase in government consumption (demand) and increase in labour supply (supply)
9.6	114	Community-led local development strategies	Labour Supply	386	Increase in government consumption (demand) and increase in labour supply (supply)
10.1	115	Reducing and preventing early school-leaving and promoting equal access to good quality early-	Labour Productivity	11,063 (of which 679 from REACT-EU)	Increase in government consumption (demand) and

		childhood, primary and secondary education including formal, non-formal and informal learning pathways for reintegrating into education and training			increase in labour productivity (supply)
10.2	116	Improving the quality and efficiency of, and access to, tertiary and equivalent education with a view to increasing participation and attainment levels, especially for disadvantaged groups	Labour Productivity	4,418 (of which 167 from REACT-EU)	Increase in government consumption (demand) and increase in labour productivity (supply)
10.3	117	Enhancing equal access to lifelong learning for all age groups in formal, non-formal and informal settings, upgrading the knowledge, skills and competences of the workforce, and promoting flexible learning pathways including through career guidance and validation of acquired competences	Labour Productivity	8,775 (of which 39 from REACT-EU)	Increase in government consumption (demand) and increase in labour productivity (supply)
10.4	118	Improving the labour market relevance of education and training systems, facilitating the transition from education to work, and strengthening vocational education and training systems and their quality, including through mechanisms for skills anticipation, adaptation of curricula and the establishment and development of work-based learning systems, including dual learning systems and apprenticeship schemes	Labour Productivity	8,923 (of which 196 from REACT-EU)	Increase in government consumption (demand) and increase in labour productivity (supply)
11.1	119	Investment in institutional capacity and in the efficiency of public administrations and public services at the national, regional and local levels with a view to reforms, better regulation and good governance	Public Investment	3,393 (of which 259 from REACT-EU)	Increase in public investment (demand) and temporary increase in public capital stock (supply)

		Capacity building for all stakeholders delivering education, lifelong learning, training and employment and social policies, including through sectoral and territorial pacts to mobilise for reform at the national, regional and local levels			
11.2	120	Capacity building for all stakeholders delivering education, lifelong learning, training and employment and social policies, including through sectoral and territorial pacts to mobilise for reform at the national, regional and local levels	Labour Productivity	98	Increase in government consumption (demand) and increase in labour productivity (supply)
			Total	109,831	

Note: the total amounts (ESF+REACT-EU+YEI) are reported in the "Amounts" column, with an indication of the specific amounts pertaining to REACT-EU and YEI (the latter is only relevant for intervention no. 103). The first columns reports the code of the TO-specific Investment Priorities (IPs) for each field of intervention.

4. Results

4.1 Overall GDP Returns

The overall results presented below have been obtained with a single simulation including all the policy interventions described above (combining ESF, YEI and REACT-EU). When referring to the results by individual funds or TOs, it should be borne in mind that these specific results refer to simulations carried out separately. Thus, the overall results for the whole policy package may differ slightly from the sum of the results of the individual simulations. This is due to interactions and general equilibrium effects in the model.

Figure 3 shows that in 2022, 9 years after the start of the programme, the EU wide GDP impact of the ESF investments (including YEI and REACT-EU) stands at +0.086%, i.e. EU GDP is estimated to be 0.086% (12,224 million euros) higher than the baseline EU GDP (i.e. the baseline scenario in which there no policy is implemented). In 2030, 16 years after the start of the programme, the GDP is still 0.086% (12,241 million euros) higher than the baseline EU GDP. The impact is heterogeneous across regions and most of it is concentrated in Eastern and Southern European Member States since it is correlated with the amounts of regional investments, besides depending on the regional initial economic conditions. Figure 4 shows the regional GDP impact in 2022 (Figure A1 in the Appendix shows the GDP impact in 2030).

Figure 3. EU-wide annual GDP Impact (% deviations from baseline – red line) and size of interventions (% of GDP – blue bars), ESF, YEI and REACT-EU interventions
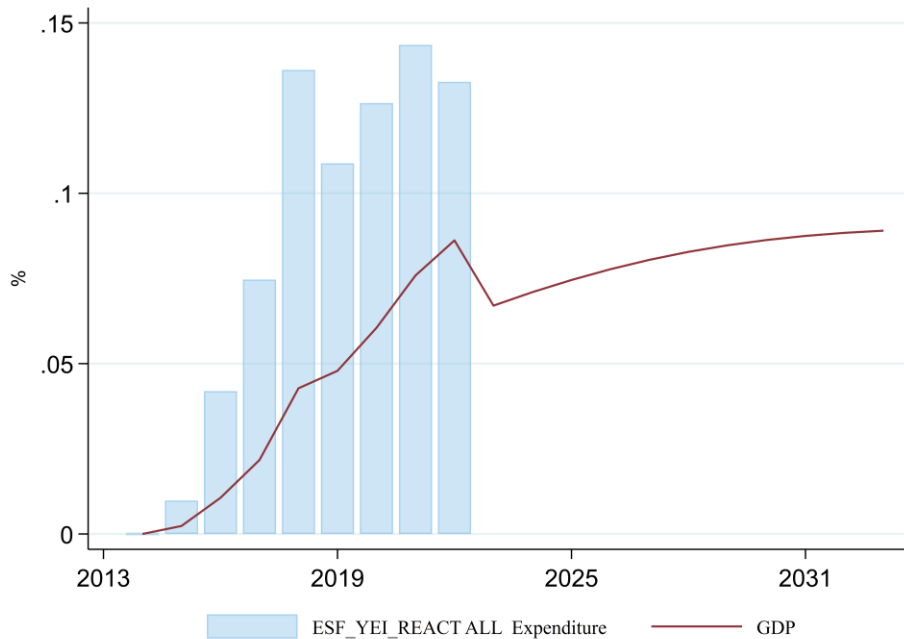
Source: RHOMOLO simulations.

Figure 4. Change in GDP relative to the baseline in 2022 (% deviations), ESF, YEI and REACT-EU
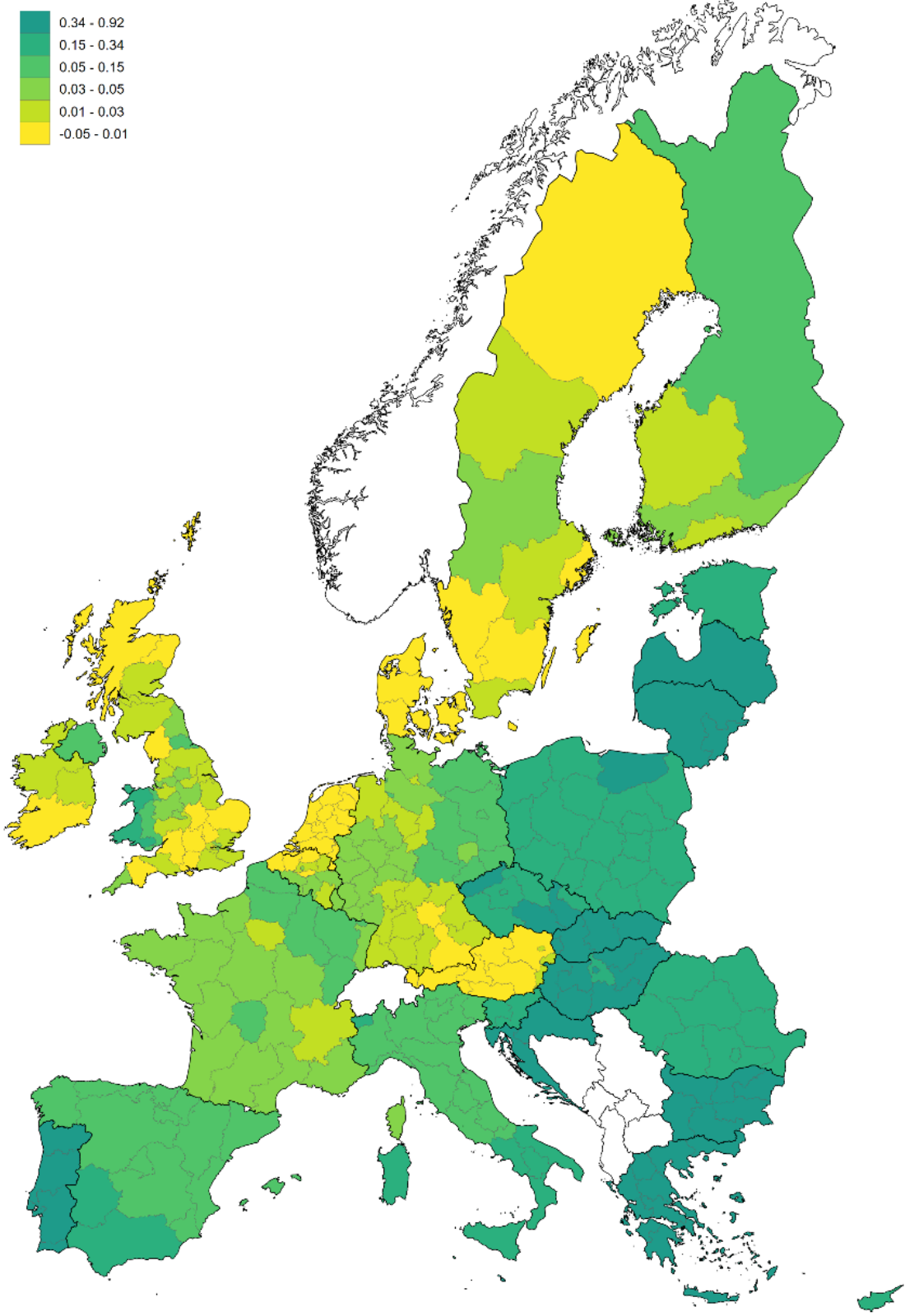
Source: RHOMOLO simulations.

The total impact on GDP is composed of the impact of the measures relating to the individual TOs addressed by the ESF, YEI and REACT-EU programmes. Table 4 summarises this information, grouping all REACT-EU TOs into a single category due to the relatively small size of the programme compared to ESF (policy expenditure is also reported in Table 4). The impact depends on the level of policy expenditure and the content of the TOs. Even if the highest policy expenditure is allocated to TO 8 (about 5% higher than TO 10), the euro returns are about 3.8% higher for TO 10, which consists of interventions related to labour productivity, while TO 8 consists of a mix of interventions such as labour supply, labour productivity and a small amount allocated to reducing the user cost of capital. The expenditure of TO 9 is about 7% lower than that of TO 10, but the return in euro is only 65% of that of TO 10, because, based on the modelling assumptions, TO 9 focuses exclusively on increasing labour supply, while most of TO 10 increases productivity. Finally, TO 11 tends to have a higher impact relative to its size, as most of the shock is allocated to public infrastructure investment, which affects the public capital stock and subsequently raises the productivity of all firms, stimulating labour demand and leading to large economic returns (an alternative assumption here could be that TO11 funds are used to increase human capital rather than the more general public capital, with consequences for the quantitative result presented here). Thus, the investment in TO 11 is about 10 times smaller than that in TO 10 and the impact on GDP is about a quarter of that in TO 10. With regard to the individual REACT-EU and YEI programmes (which are significantly smaller than those of TO 8, TO 9 or TO 10), their impacts correspond to the nature and size of the interventions. The YEI has a GDP impact that is twice that of the REACT-EU programme, but the size of the policy is about 2.7 times larger.

Table 4. Change in GDP relative to the baseline in 2022 and 2030 (% differences), by ESF Thematic Objective (TO), REACT-EU and YEI programmes

	GDP impact				Policy expenditure (million euros)
	2022		2030		
ESF Thematic Objectives	% deviations from baseline	Million euros	% deviations from baseline	Million euros	
TO 8	+0.027	+3,898	+0.024	+3,401	33,683
TO 9	+0.019	+2,655	+0.013	+1,791	29,875
TO 10	+0.029	+4,048	+0.038	+5,356	32,099
TO 11	+0.009	+1,235	+0.008	+1,202	3,232
YEI	+0.006	+852	+0.003	+463	8,047
REACT-EU	+0.003	+428	+0.003	+454	2,894
ESF, YEI, and REACT-EU	+0.086	+12,224	+0.086	+12,241	109,831

Source: RHOMOLO simulations (GDP impact), and DG EMPL and Ismeri (policy expenditure).

The geographical distribution of the GDP impacts (not reported, but available upon request) is analogous to the size and nature of the regional interventions. In 2022, for TO 8, the biggest GDP impacts of the interventions are recorded in Malta, Hungary, Slovakia and Czechia. Regarding TO 9 almost all Hungarian regions show the greatest impact from policies that increase the labour force, followed by Lithuania and Estonia, although the impact is comparatively lower in size to TO 8 which contains a mix of policies that also increase labour productivity among others (see Table 3). TO 10 concentrates most of its impact in Portugal, Greece, Lithuania and Latvia and TO 11 in Hungary, Bulgaria, Slovakia and Romania. The YEI facility affects mostly Slovakia, Croatia, the polish region Podkarpackie (PL82), and Hungarian region

Észak-Alföld (HU32). Lastly, the REACT-EU facility shows the largest GDP impact in Malta, Slovakia and Hungary with lower impacts recorded in Spain and Portugal.

4.2 GDP multipliers

Table 5, constructed analogously to Table 4, shows that the cumulative change in GDP by 2022 is +0.348% over the baseline GDP (+49,358 million euros). Taking all 16 years together up to 2030, the EU accumulated wide GDP impact of the policy intervention will be 137,968 million euros. This figure is 25.618% higher than the total investments (109,831 million euros).[10] Therefore, the return on investment in terms of GDP, or in other words the GDP multiplier, of 1 euro spent on the ESF in 2030 is 1.256 euro.

Table 5. GDP multipliers in 2022 and 2030, by ESF Thematic Objective (TO), REACT-EU, and YEI programmes

ESF Thematic Objectives	Cumulative change in GDP relative to baseline GDP and multipliers						Policy expenditure (million euros)
	2022			2030			
	%	Million euros	Multiplier	%	Million euros	Multiplier	
TO 8	0.109	15,533	0.461	0.298	42,311	1.256	33,683
TO 9	0.085	12,000	0.402	0.184	26,089	0.873	29,875
TO 10	0.107	15,174	0.473	0.363	51,462	1.603	32,099
TO 11	0.031	4,465	1.381	0.100	14,227	4.401	3,232
YEI	0.027	3,768	0.468	0.054	7,598	0.944	8,047
REACT-EU	0.011	1,569	0.542	0.034	4,823	1.667	2,894
ESF, YEI, and REACT-EU	0.348	49,358	0.449	0.973	137,968	1.256	109,831

Source: RHOMOLO simulations (GDP impact and multipliers), and DG EMPL and Ismeri (policy expenditure).

The TO- and fund-specific results stem from the characteristics of the model, the input data on the policy interventions and the assumptions on the economic channels activated by the policy. Therefore, they should not be interpreted as indicating a higher efficiency of certain interventions compared to others in terms of actual returns materialised in the real economy, but as an indication of the potential impact of the interventions depending on the assumed channels activated in this scenario analysis.

This EU aggregate result masks considerable heterogeneity both at Member State and regional level. Figure 5 shows the regional distribution of the cumulative GDP multipliers for 2022 (Figure A2 refers to 2030), which range from -4.3 to 2.1 and from -5.9 to 4.5 respectively. The status of a region as a net contributor or net beneficiary plays a key role in the calculation of the multipliers: a high-income region that does not receive substantial funding but contributes significantly to the financing of the policy may experience a negative impact. On the other hand, the multipliers will be high in regions that receive

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[10] In each year, the programmes affect the regional GDP, and its resulting level can be compared against the baseline value of the regional GDP. The yearly percentage change (deviation from baseline) is referred to as the GDP impact. By collecting the cumulated amount of GDP changes across years and dividing it by the amount of funds invested, we are able to obtain the GDP return on investment, or in other words the cumulated GDP multiplier. In this case, the cumulated GDP changes in 2030 are 137,968 euros which are compared against the total amount invested standing at 109,831 million euros, implying a GDP return of 1.256 euros per euro invested.

financial injections and do not have to finance proportionally large contributions. Table 6 shows the country-specific cumulative GDP multipliers in 2022 and 2030 if all programmes are implemented.

In 2030, the multiplier is above 1 in 20 of the 28 Member States, indicating that even net contributor countries will receive substantial economic returns in a relatively short period of time. The higher figures are for countries that receive large policy injections without having to bear the corresponding costs of financing the EU budget (Czechia, Hungary, Lithuania and Latvia are the four countries with the highest 2030 multiplier). Also, the composition of the policy interventions matters for the economic returns on the policy, as explained above (see Tables 4 and 5).

Figure 5. Regional GDP multipliers in 2022, ESF, YEI and REACT-EU

Legend:
- 0.55 - 2.06
- 0.41 - 0.55
- 0.34 - 0.41
- 0.28 - 0.34
- 0.18 - 0.28
- -4.27 - 0.18
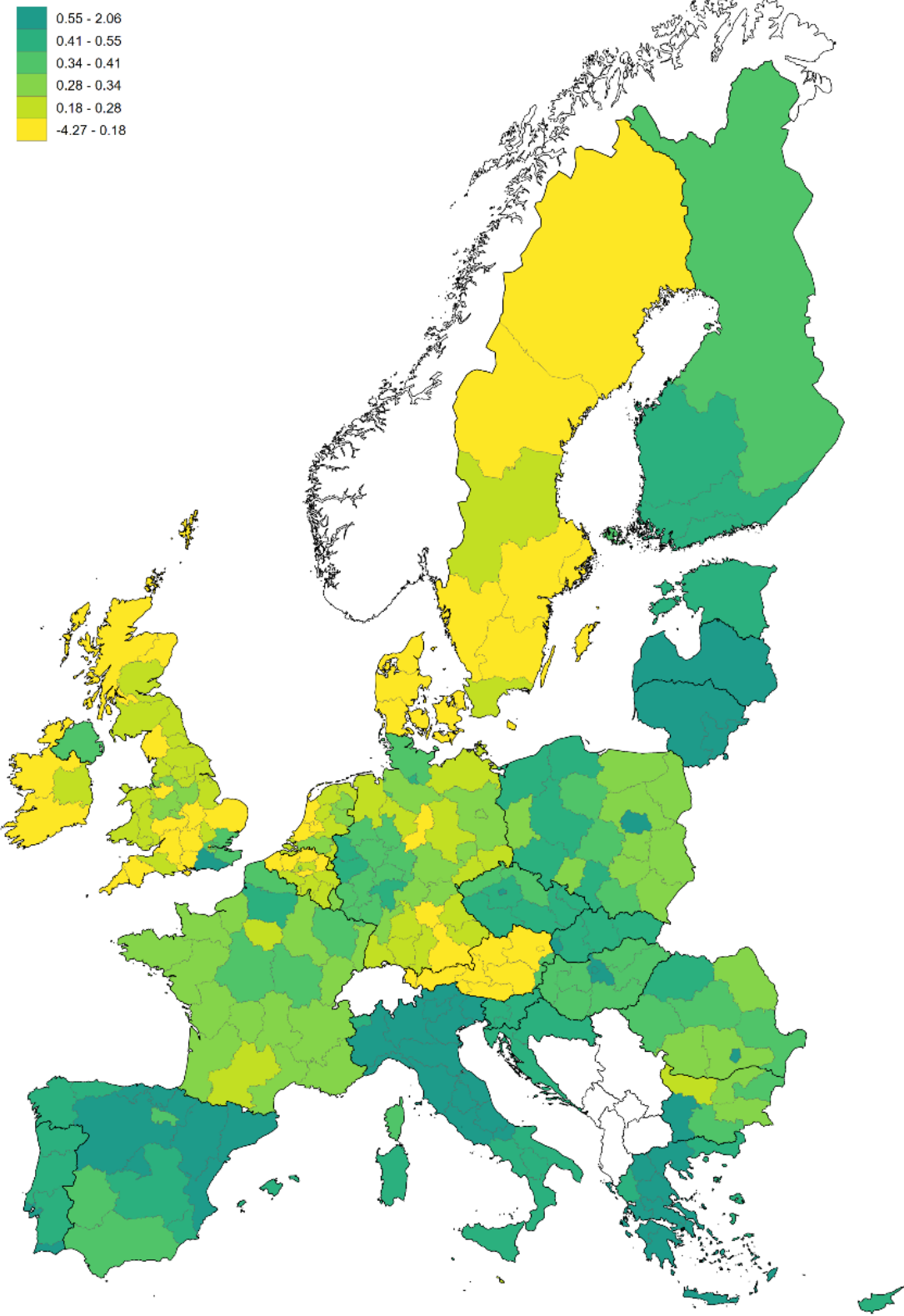
Source: RHOMOLO simulations.

Table 6. National cumulative GDP multipliers in 2022 and 2030, ESF, YEI and REACT-EU

Member State	2022	2030
AT	0.008	0.821
BE	0.221	0.746
BG	0.426	0.928
CY	0.431	0.834
CZ	0.467	1.604
DE	0.330	1.358
DK	-0.336	0.335
EE	0.439	1.136
EL	0.743	1.443
ES	0.537	1.211
FI	0.422	1.425
FR	0.328	1.177
HR	0.451	1.101
HU	0.571	1.537
IE	0.113	0.900
IT	0.589	1.452
LT	0.604	1.681
LU	0.304	1.237
LV	0.562	1.539
MT	0.248	1.214
NL	0.201	0.826
PL	0.400	1.021
PT	0.570	1.358
RO	0.413	1.058
SE	0.077	0.659
SI	0.474	1.384
SK	0.562	1.406
UK	0.253	1.035

Source: RHOMOLO simulations.

4.3 Employment

The impact on employment is heterogeneous across regions, with the highest impact in the regions receiving the highest amounts of investment. The impact also varies by education group and peaks in the last year of the funding period in 2022 (after which the financial injections end and only supply-side effects remain). Table 7 shows the EU-wide change in the number of persons employed in 2022 and 2030 compared to the baseline in total and by education group (Figure 6 shows the behaviour over time of these variables). At the EU level, the change in the number of persons employed by educational level corresponds to about 354,886 additional persons employed in 2022 compared to the baseline (no policy scenario) and about 152,587 additional persons employed in 2030 compared to the baseline (no policy scenario). Most of the additional employees are medium-educated, which is also the largest group in the baseline population of employees in the EU. These numbers do not refer to the direct impact on employment of the policy interventions, but rather to the net change in employment generated by the policy in a general equilibrium setting which takes into account direct, indirect and induced effects. Figure 7 shows the regional distribution of employment changes in 2022, separately by education and for the education levels together (Figure A3 shows the same for 2030). The results depend both on the initial

population of employees by education and on the amount of money allocated to each education group (for example, the increase in employment of low-educated workers in Poland reflects the low number of low-educated workers there).

Table 7. Change in employment relative to the baseline in 2022 and 2030 (number of persons), ESF, YEI and REACT-EU

	Low	**Medium**	**High**	**Total**
Baseline	45,395,077	112,926,789	73,504,441	231,826,307
2022	+71,193 (0.16%)	+181,495 (0.16%)	+102,198 (0.14%)	+354,886 (0.15%)
2030	+29,292 (0.06%)	+88,082 (0.08%)	+35,213 (0.05%)	+152,587 (0.07%)

Source: García Rodríguez et al. (2023 – Baseline employment), and RHOMOLO simulations (changes in 2022 and 2030).

Figure 6. Annual change employment relative to the baseline (number of persons), ESF, YEI and REACT-EU
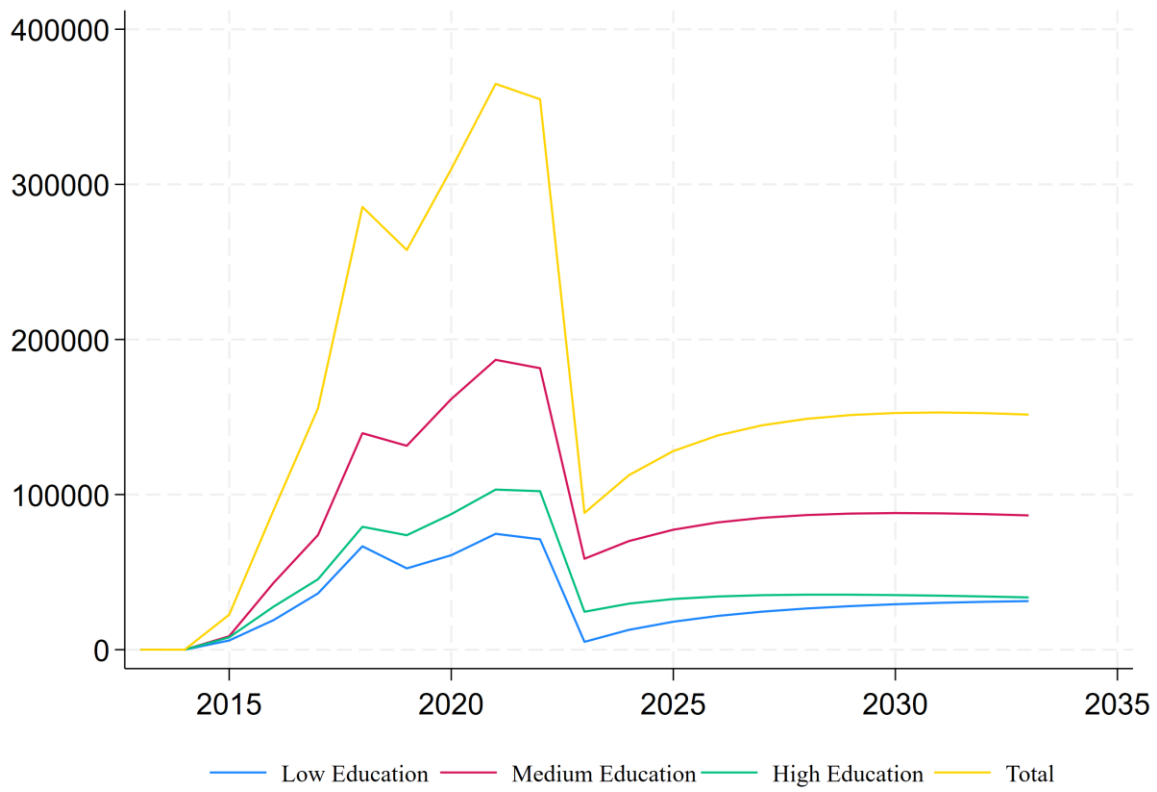
Source: RHOMOLO simulations.

Figure 7. Change in employment relative to the baseline in 2022 (number of persons) by education group and total, ESF, YEI and REACT-EU

Low

Legend:
- 1,582.671 - 3,787.461
- 576.860 - 1,582.671
- 251.251 - 576.860
- 143.772 - 251.251
- 73.256 - 143.772
- -32.400 - 73.256

Medium

High

28

Legend:
- 2,525.220 - 10545.949
- 1,251.774 - 2,525.220
- 503.474 - 1,251.774
- 274.137 - 503.474
- 147.419 - 274.137
- -65.994 - 147.419
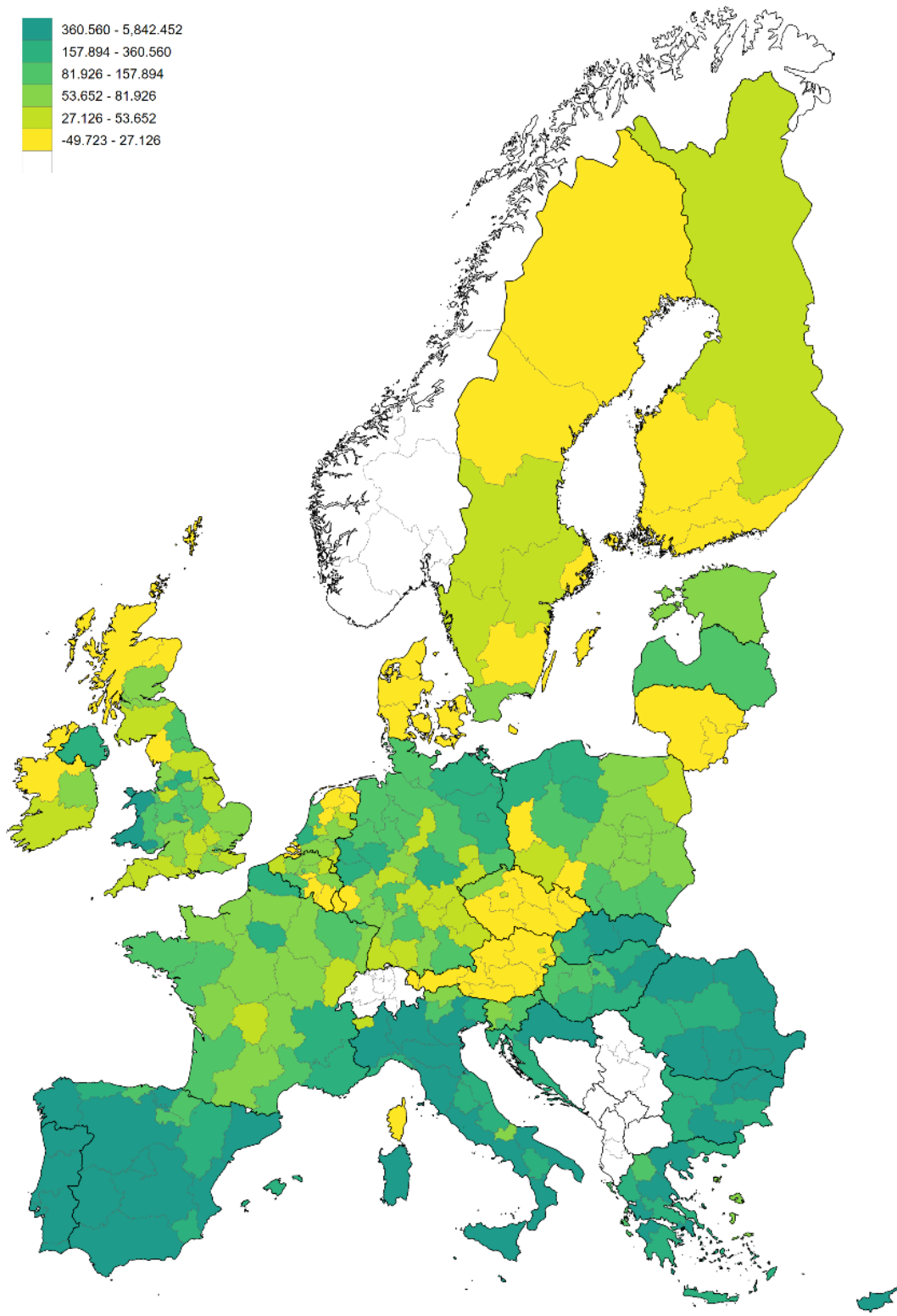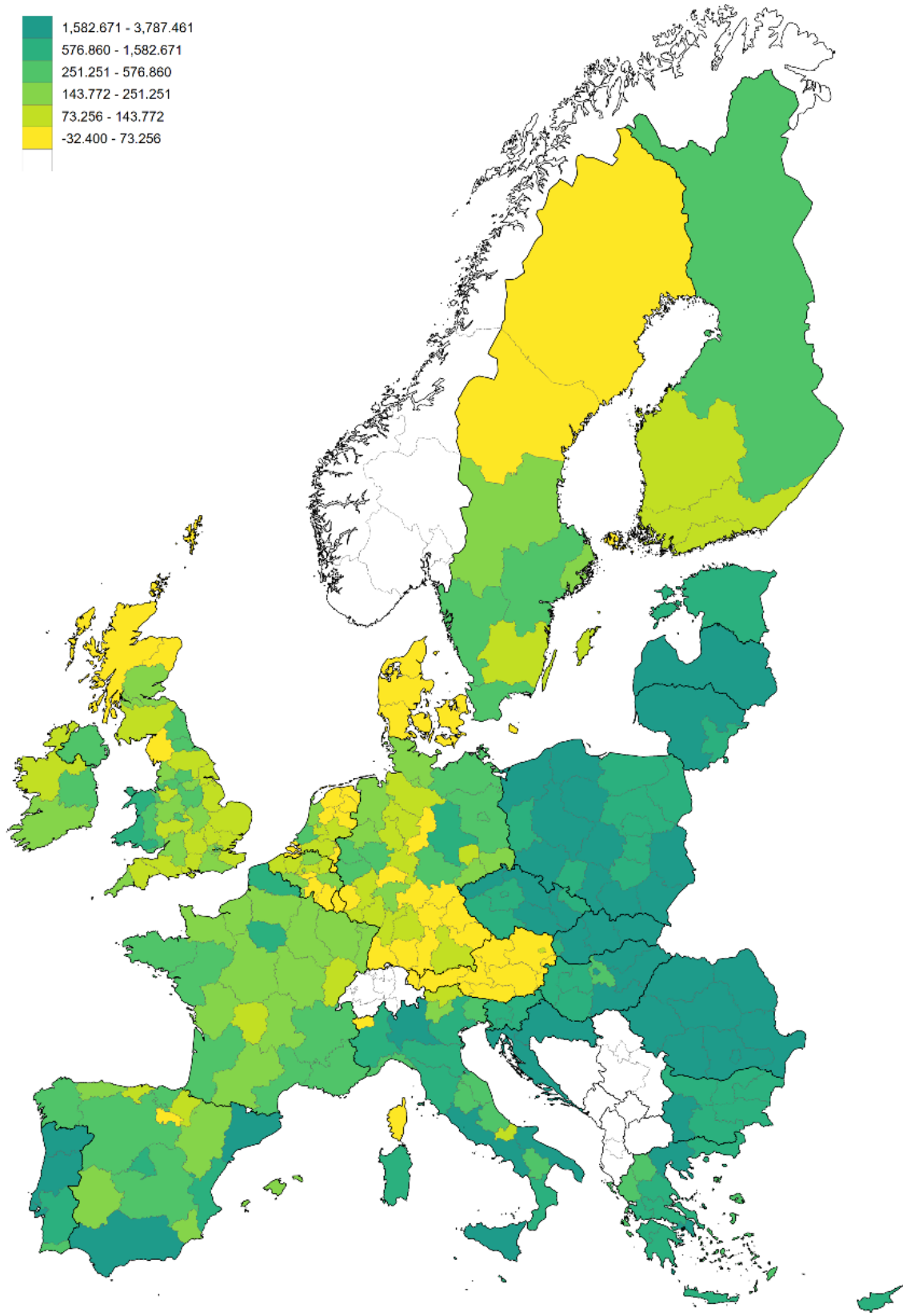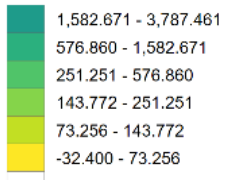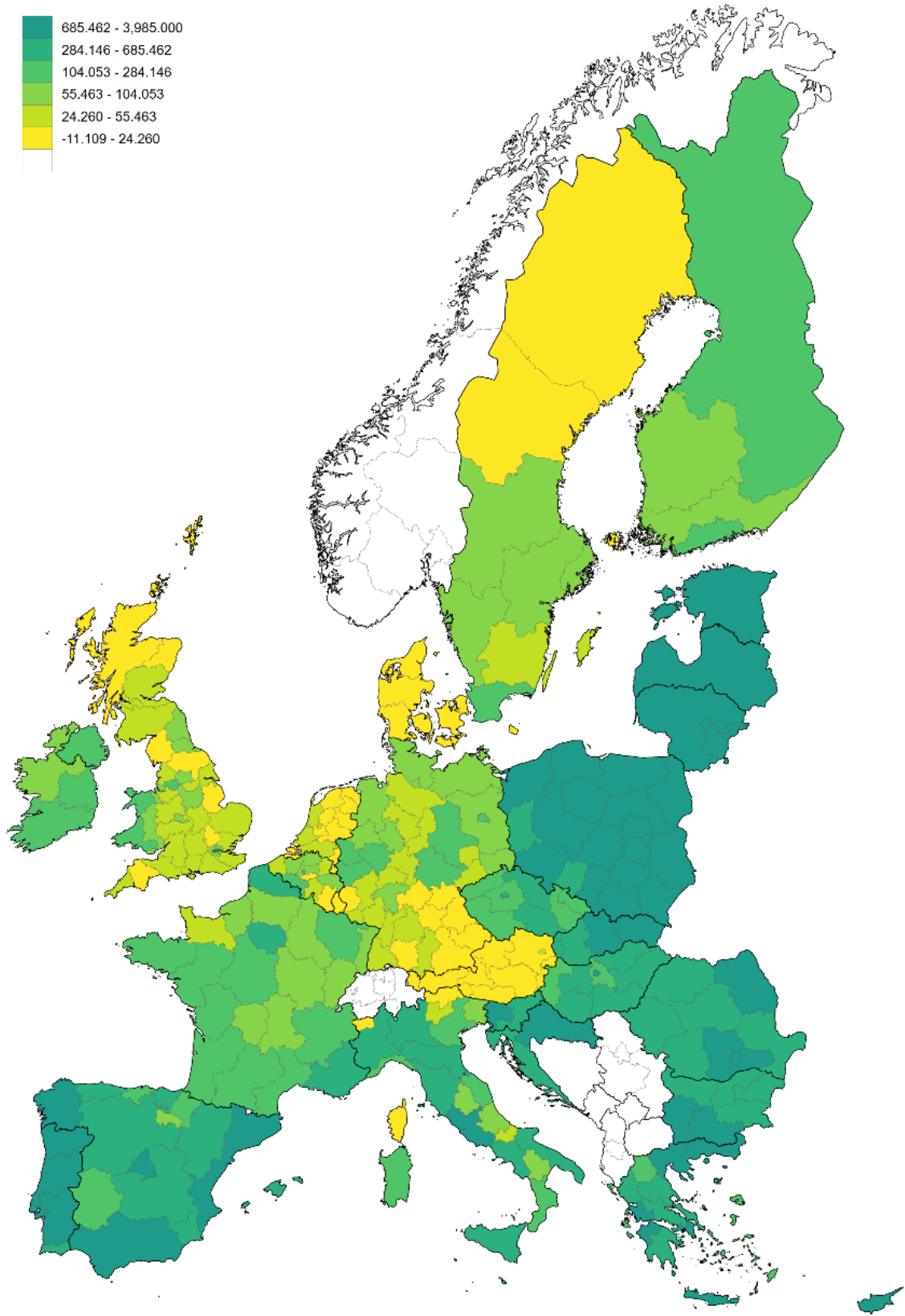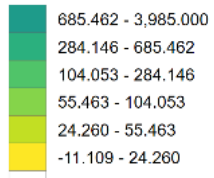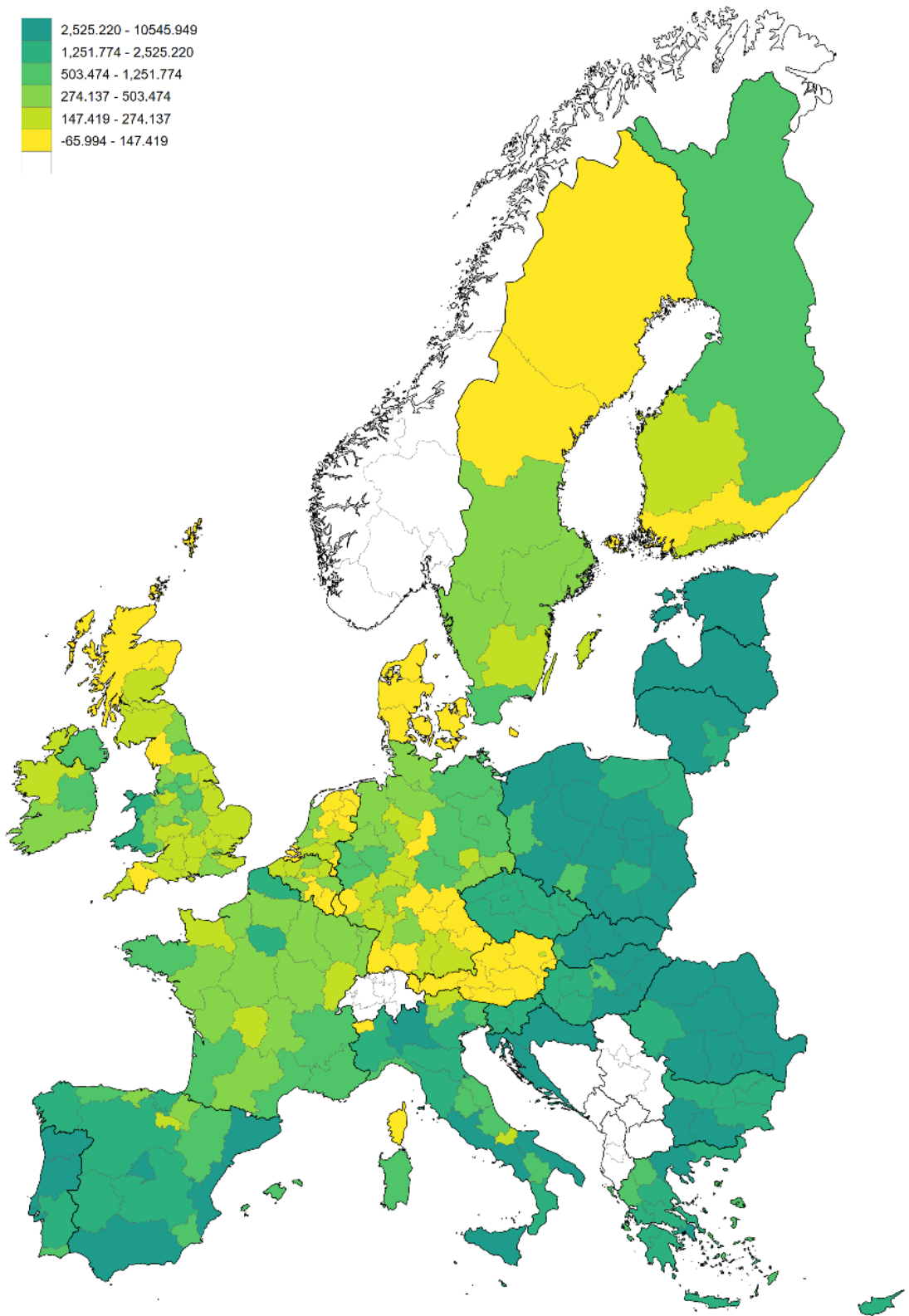
Total

Source: RHOMOLO simulations.

Table 8 shows the employment effects of the individual programmes and shows that the largest contributions come from TOs 8, 9 and 10, which contain most of the interventions related to labour supply and labour productivity and are the largest in terms of expenditure, as described in Table 3. These TOs increase the employment of the low- and medium-educated slightly more than those of the high-educated. Between the YEI and the REACT-EU facilities, although the REACT-EU facility is about 36% the size of the YEI and has a higher impact on GDP than the YEI, the latter tends to have a greater impact on employment. This is due to the programme's exclusive focus on increasing labour supply and hence employment through the demand side effects of the policy (see Table 3).

Table 8. Change in employment relative to the baseline in 2022 and 2030 (number of persons), by ESF Thematic Objective (TO) and YEI and REACT-EU programmes

ESF Thematic Objectives		Low	Medium	High	Total
	Baseline	**45,395,077**	**112,926,789**	**73,504,441**	**231,826,307**
TO 8	2022	+24,081 (0.05%)	+73,347 (0.06%)	+37,647 (0.05%)	+135,076 (0.06%)
	2030	+9,878 (0.02%)	+36,221 (0.03%)	+15,674 (0.02%)	+61,773 (0.03%)
TO 9	2022	+22,904 (0.05%)	+68,632 (0.06%)	+38,060 (0.05%)	+129,595 (0.06%)
	2030	+8,701 (0.02%)	+32,504 (0.03%)	+15,707 (0.02%)	+56,911 (0.02%)
TO 10	2022	13,649 (0.03%)	19,754 (0.02%)	14,324 (0.02%)	47,728 (0.02%)
	2030	4,938 (0.01%)	5,745 (0.01%)	–901 (–0.00%)	9,782 (0.00%)
TO 11	2022	+4,524 (0.01%)	+10,368 (0.01%)	+3,752 (0.01%)	+18,645 (0.01%)
	2030	+4,226 (0.01%)	+9,002 (0.01%)	+2,606 (0.00%)	+15,834 (0.01%)
YEI	2022	+7,419 (0.02%)	+18,087 (0.02%)	+9,485 (0.01%)	+34,992 (0.02%)
	2030	+2,124 (0.00%)	+8,715 (0.01%)	+3,104 (0.00%)	+13,942 (0.01%)
REACT-EU	2022	+2,712 (0.01%)	+3,362 (0.00%)	+2,219 (0.00%)	+8,292 (0.00%)
	2030	+1,128 (0.00%)	+1,564 (0.00%)	+433 (0.00%)	+3,125 (0.00%)
ESF, YEI, and REACT-EU	2022	+71,193 (0.16%)	+181,495 (0.16%)	+102,198 (0.14%)	+354,886 (0.15%)
	2030	+29,292 (0.06%)	+88,082 (0.08%)	+35,213 (0.05%)	+152,587 (0.07%)

Source: García Rodríguez et al. (2023 – Baseline employment), and RHOMOLO simulations (changes in 2022 and 2030).

4.4 Compensation of employees

Table 9 shows that the cumulated impact on total compensation of employees at EU level is 25,274 million euro in 2022 and 70,596 million euro in 2030 (the latter implies a change of +0.97%, which suggests that compensation per employee has increased – given that the employment change in +0.07% in 2030). Compensation of employees accounts for about 51.19% of GDP in 2022 and 2030, with small deviations from the baseline share of EU GDP (the remaining part represents the change in the profit of capital). In 2022, compensation of employees is about 0.348% higher than in the baseline. In 2030 this change is around 0.972%. The net changes in compensation of employees at the EU level are shown in

Figure 8 and the regional distribution of the regional percentage changes in compensation of employees in 2022 compared to the baseline are shown in Figure 9 (Figure A4 refers to 2030).

Table 9. Cumulative change in the compensation of employees relative to the baseline in 2022 and 2030 (million euros), ESF, YEI and REACT-EU

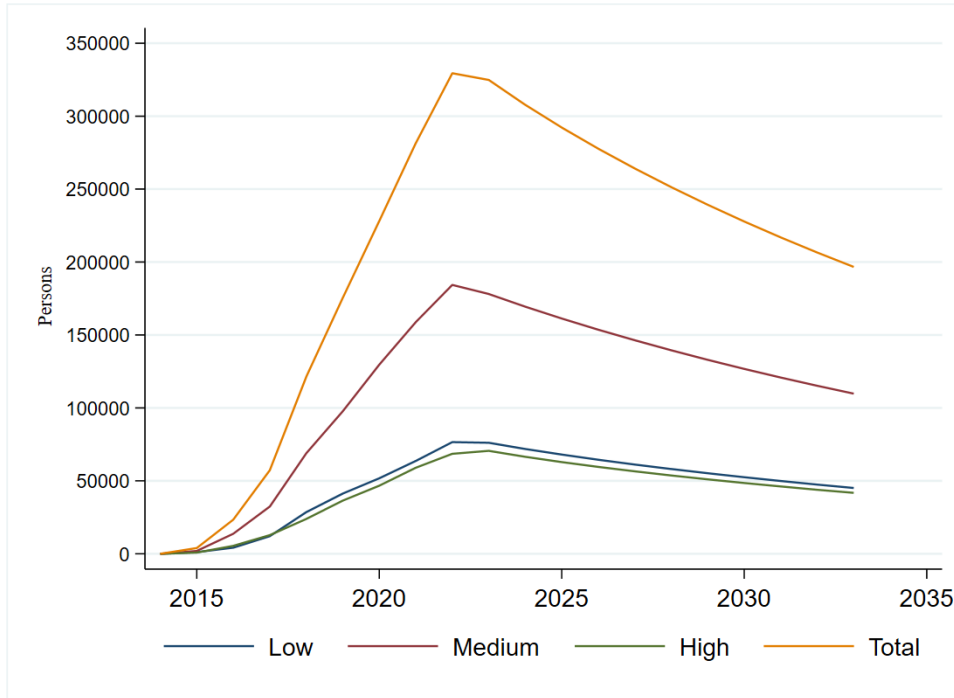|	Low	Medium	High	Total
Baseline	1,067,616	3,015,769	3,179,340	7,262,725
2022	+3,715.28	+10,492.47	+11,065.79	+25,273.54
2030	+10,378.83	+29,316.78	+30,900.32	+70,595.94
Source: García Rodríguez et al. (2023 – Baseline compensation of employees), and RHOMOLO simulations (changes in 2022 and 2030).				

Figure 8. Annual change in the compensation of employees relative to the baseline (million euros) by education group and total, ESF, YEI and REACT-EU
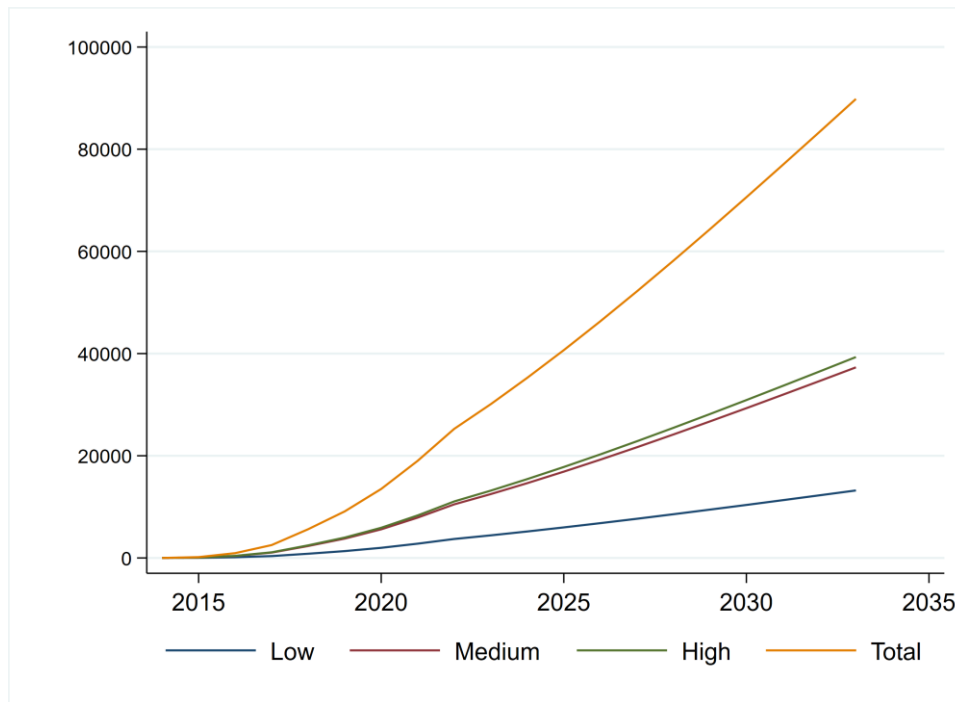
Source: RHOMOLO simulations.

Figure 9. Change in compensation of employees relative to the baseline in 2022 (% deviations) by education group and total, ESF, YEI and REACT-EU

Low

Medium

Legend:
- 0.712 - 4.396
- 0.276 - 0.712
- 0.044 - 0.276
- 0.021 - 0.044
- 0.003 - 0.021
- -0.066 - 0.003
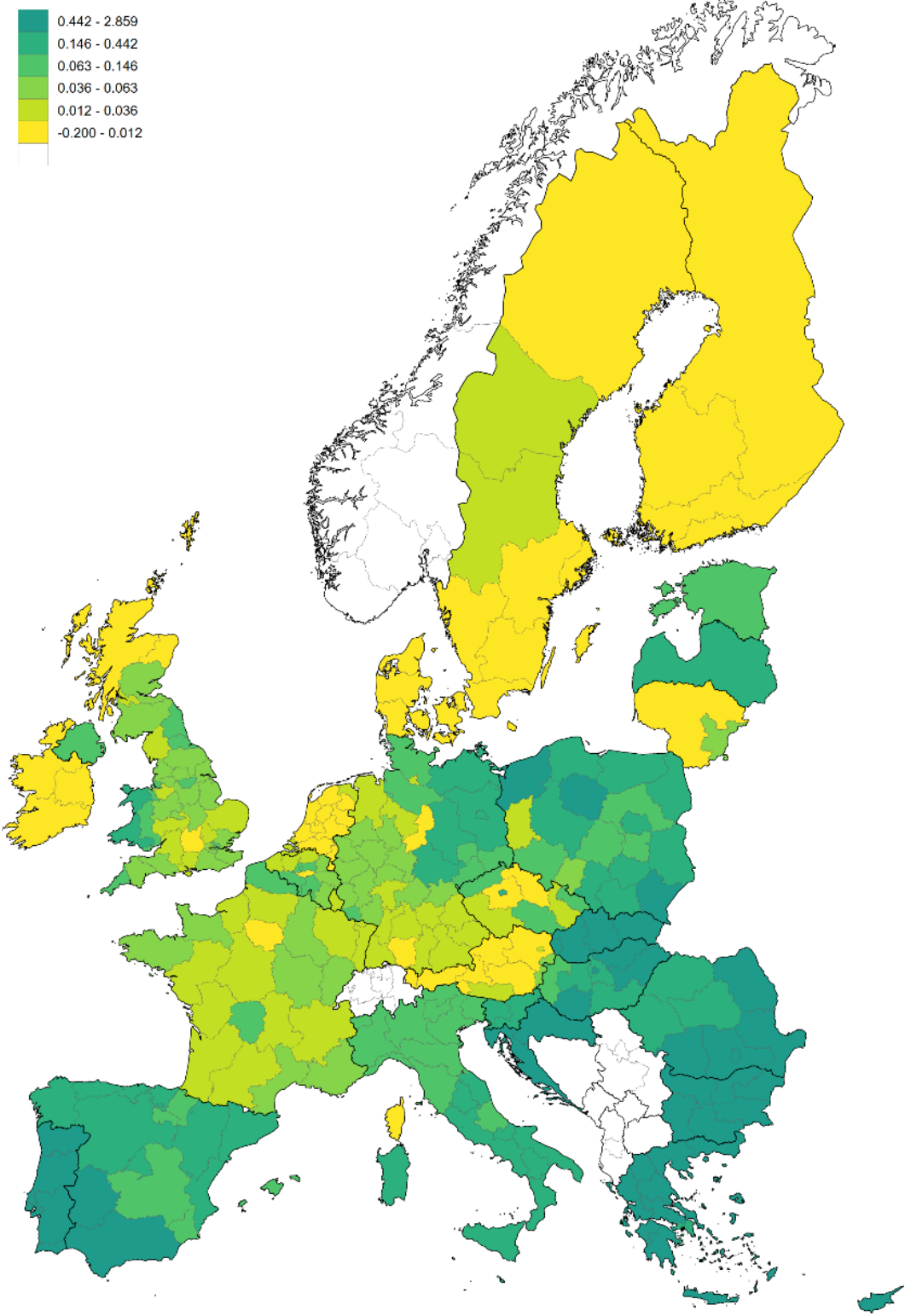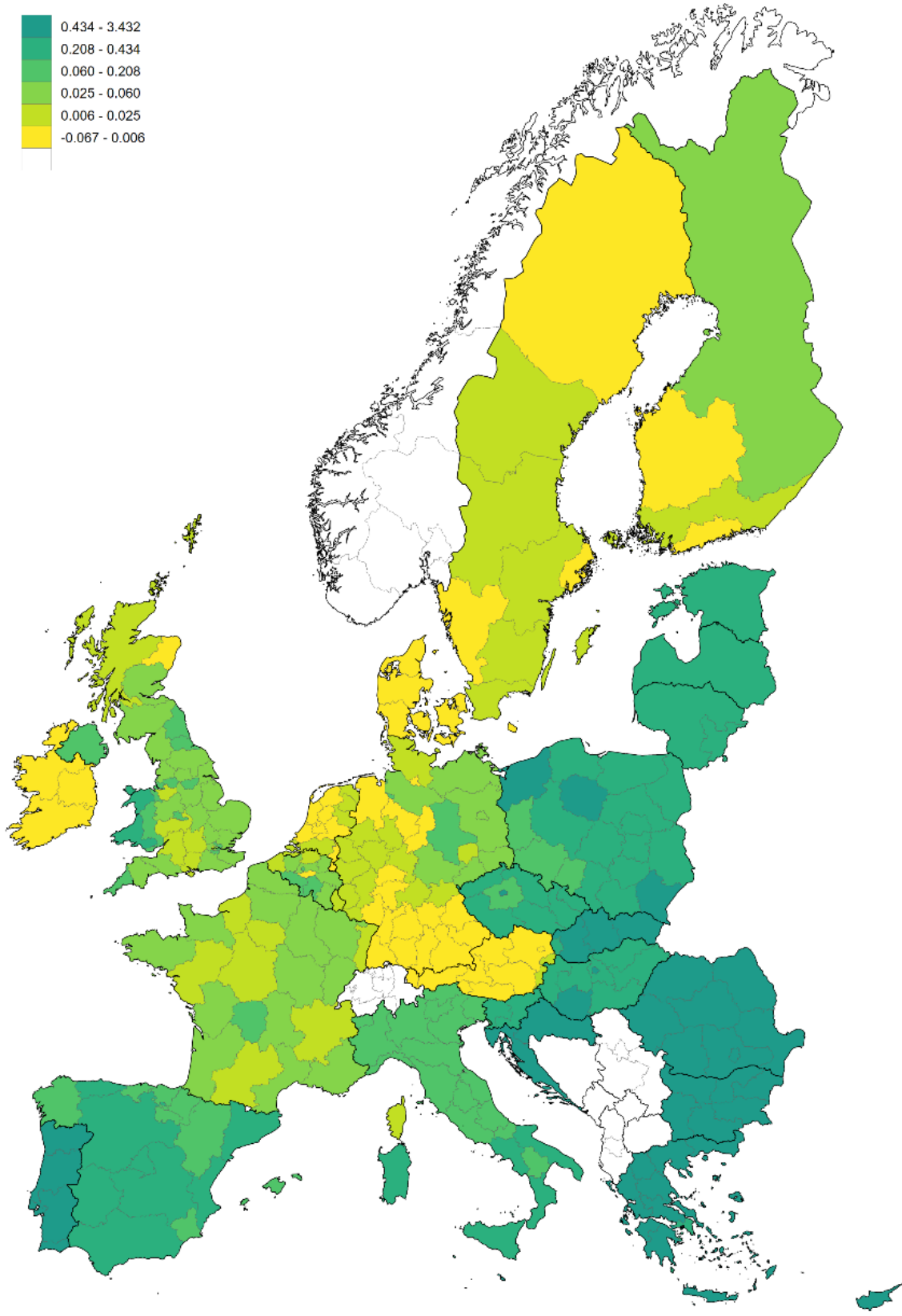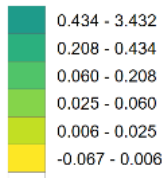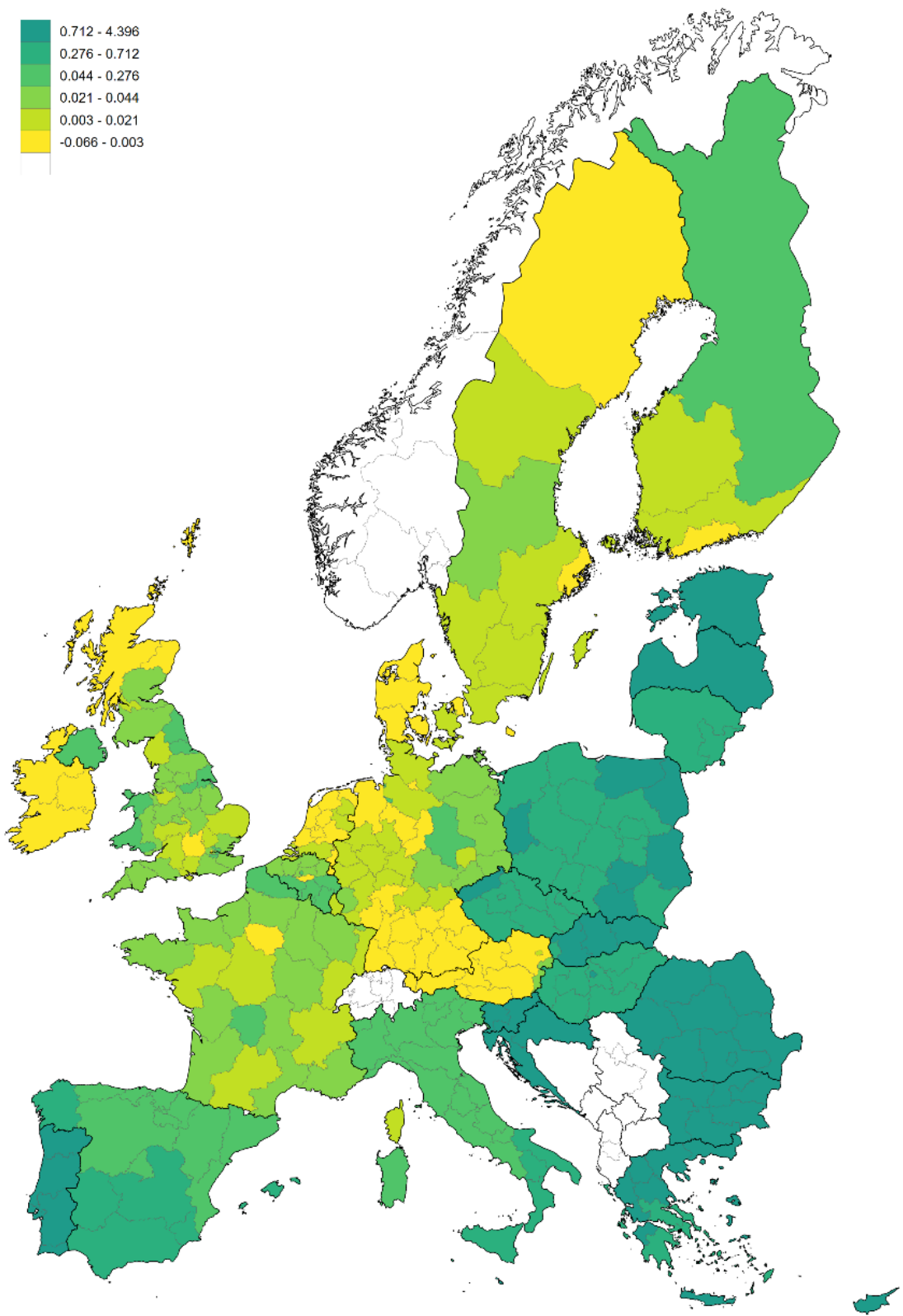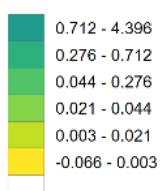
High
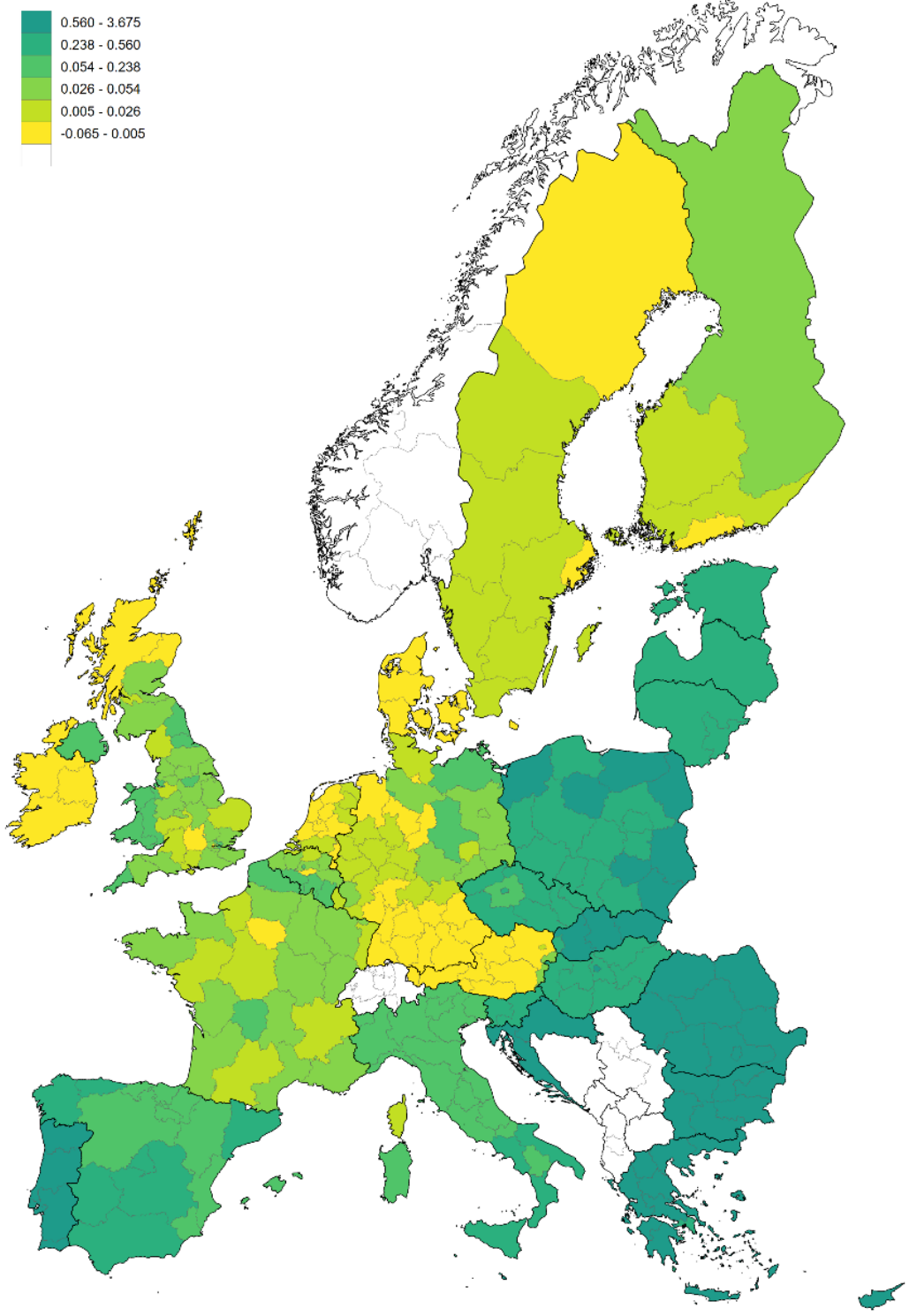
Total

Source: RHOMOLO simulations.

Table 10 shows the change in compensation of employees after the implementation of each of the ESF TOs and the REACT–EU and YEI interventions. The impact is mainly determined by the type of intervention, e.g. TOs 8 and 10, which include measures to increase labour productivity, lead to the largest increase in employee compensation. The same is true for the REACT–EU programme in relation to its size, while measures affecting labour supply, as expected, show only a modest response in relation to their size, as in the case of TO 11 and YEI. Thus, the contribution to the overall impact comes mainly from TO 8 and TO 10 and then, due to their size, from TO 9 and TO 11.

Table 10. Cumulative change in compensation of employees relative to the baseline in 2022 and 2030 (million euros), by ESF Thematic Objective (TO) and YEI and REACT–EU programmes

ESF Thematic Objectives		Low	Medium	High	Total
	Baseline	1,067,616	3,015,769	3,179,340	7,262,725
TO 8	2022	+ 1,169.00 (0.11%)	+ 3,302.11 (0.11%)	+ 3,481.53 (0.11%)	+ 7,952.64 (0.11%)
	2030	+ 3,183.83 (0.30%)	+ 8,993.60 (0.30%)	+ 9,480.90 (0.30%)	+ 21,658.33 (0.30%)
TO 9	2022	+ 903.11 (0.08%)	+ 2,551.07 (0.08%)	+ 2,689.71 (0.08%)	+ 6,143.89 (0.08%)
	2030	+ 1,963.23 (0.18%)	+ 5,545.72 (0.18%)	+ 5,846.37 (0.18%)	+ 13,355.32 (0.18%)
TO 10	2022	+ 1,141.96 (0.11%)	+ 3,225.38 (0.11%)	+ 3,400.78 (0.11%)	+ 7,768.12 (0.11%)
	2030	+ 3,872.04 (0.36%)	+ 10,937.14 (0.36%)	+ 11,529.33 (0.36%)	+ 26,338.51 (0.36%)
TO 11	2022	+ 335.98 (0.03%)	+ 949.08 (0.03%)	+ 1,000.55 (0.03%)	+ 2,285.60 (0.03%)
	2030	+ 1,070.67 (0.10%)	+ 3,024.43 (0.10%)	+ 3,188.40 (0.10%)	+ 7,283.50 (0.10%)
YEI	2022	+ 283.60 (0.03%)	+ 801.08 (0.03%)	+ 844.56 (0.03%)	+ 1,929.25 (0.03%)
	2030	+ 571.74 (0.05%)	+ 1,615.05 (0.05%)	+ 1,702.64 (0.05%)	+ 3,889.43 (0.05%)
REACT–EU	2022	+ 118.07 (0.01%)	+ 333.50 (0.01%)	+ 351.60 (0.01%)	+ 803.17 (0.01%)
	2030	+ 362.99 (0.03%)	+ 1,025.34 (0.03%)	+ 1,080.94 (0.03%)	+ 2,469.27 (0.03%)
ESF, YEI, and REACT–EU	2022	+ 3,715.28 (0.35%)	+ 10,492.47 (0.35%)	+ 11,065.79 (0.35%)	+ 25,273.54 (0.35%)
	2030	+ 10,378.83 (0.97%)	+ 29,316.78 (0.97%)	+ 30,900.32 (0.97%)	+ 70,595.94 (0.97%)

Source: García Rodríguez et al. (2023 – Baseline compensation of employees), and RHOMOLO simulations (changes in 2022 and 2030).

4.5 Labour supply

Thanks to the ESF, YEI and REACT–EU interventions, people which were not participating in the labour market decide to enter it. Table 11 shows that the EU wide impact on the labour force is a net increase of 329,465 (+0.13%) individuals in 2022 and of 227,798 (+0.09%) in 2030. The changes in the labour force over time is shown in Figure 10, and Figure 11 shows their regional distribution in 2022, separately for each education group and also for the three groups aggregated (Figure A5 refers to 2030).

Table 11. Change in the labour force relative to the baseline in 2022 and 2030 (number of persons), ESF, YEI and REACT–EU

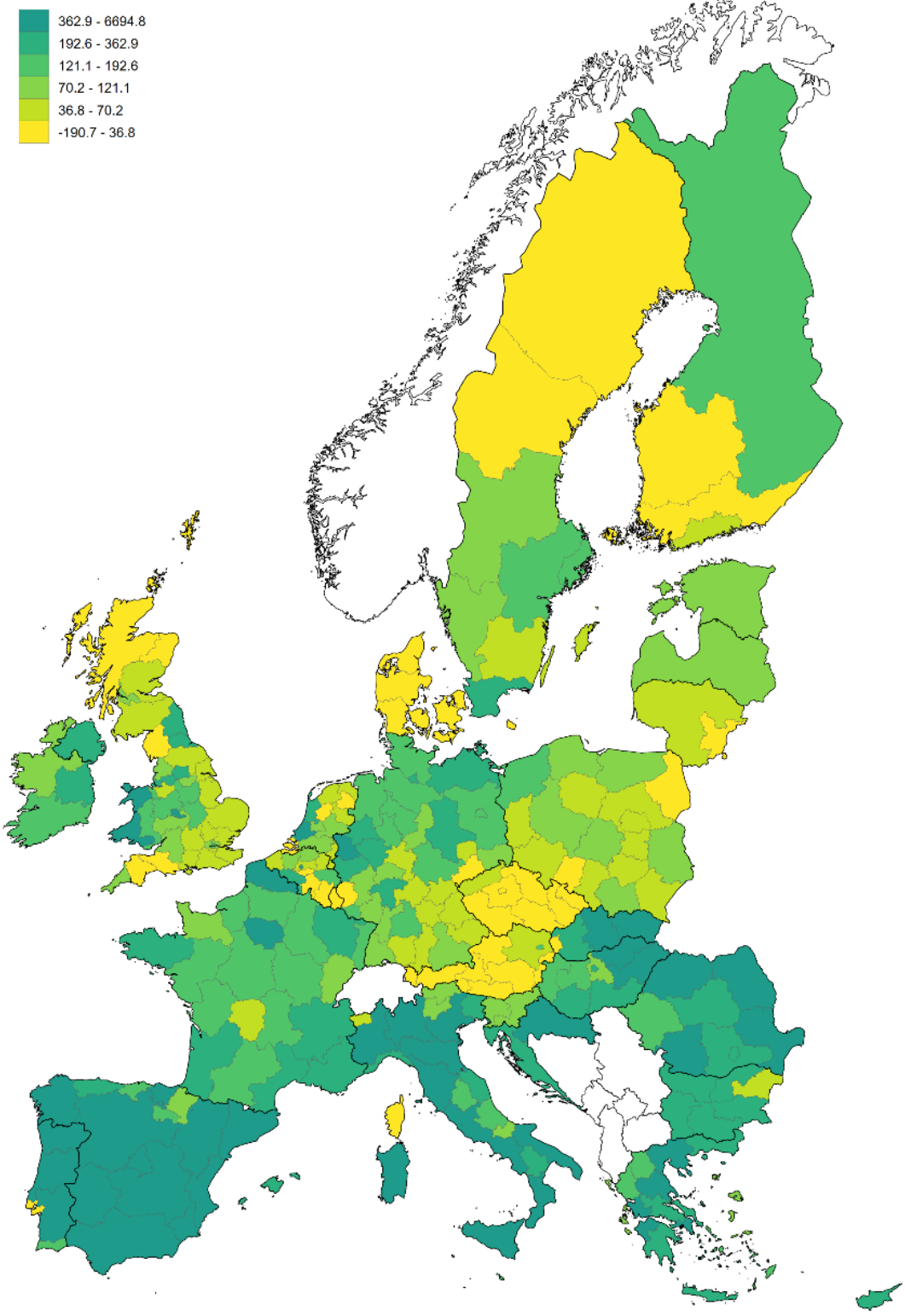|	Low	Medium	High	Total
Baseline	53,337,777	121,685,281	77,012,184	252,035,242
2022	+76,589 (0.14%)	+184,319 (0.15%)	+68,558 (0.09%)	+329,465 (0.13%)
2030	+52,502 (0.10%)	+126,760 (0.10%)	+48,537 (0.06%)	+227,798 (0.09%)

Figure 10. Annual labour force changes relative to the baseline (number of persons) by education group and total, ESF, YEI and REACT-EU
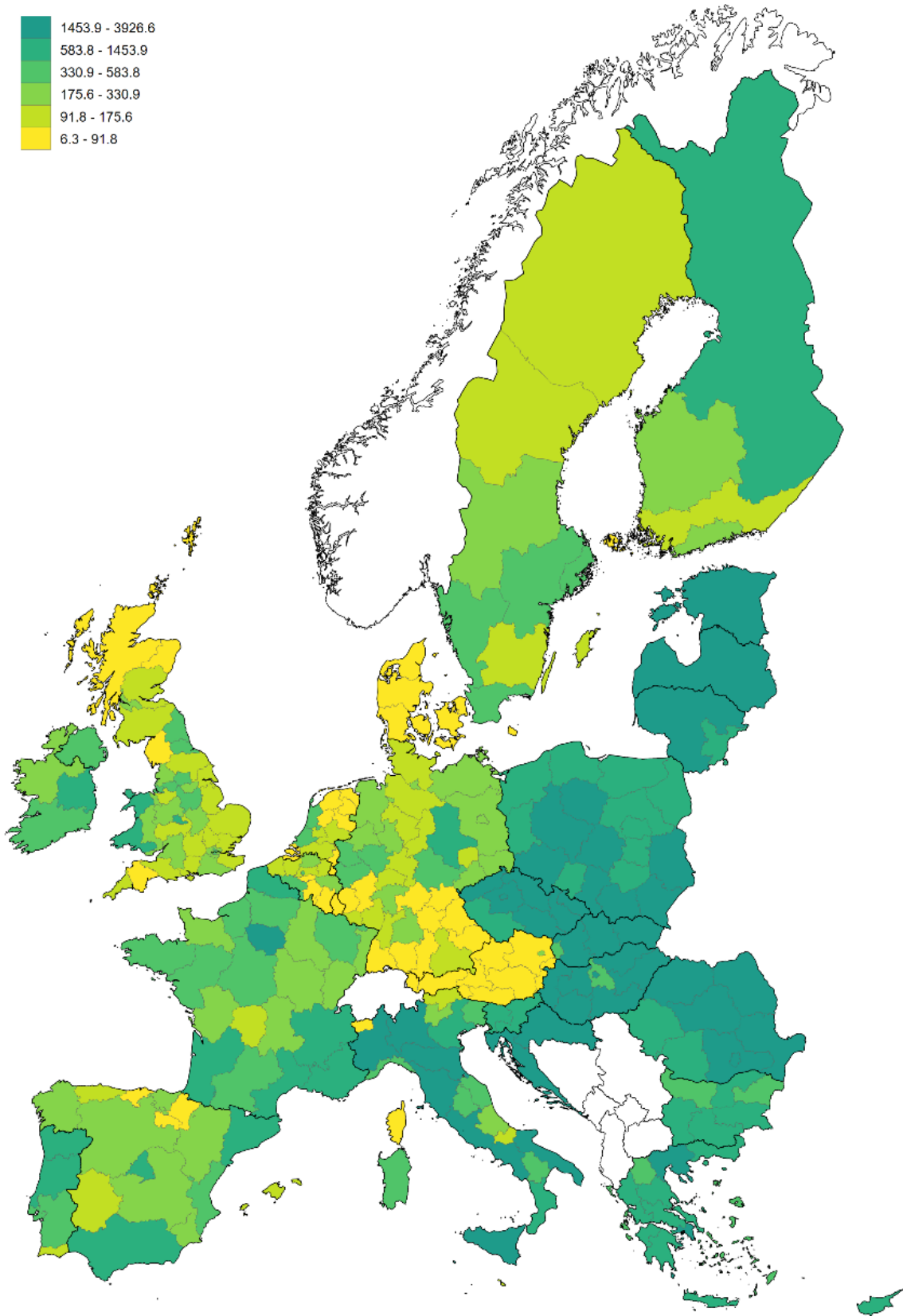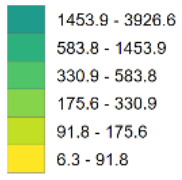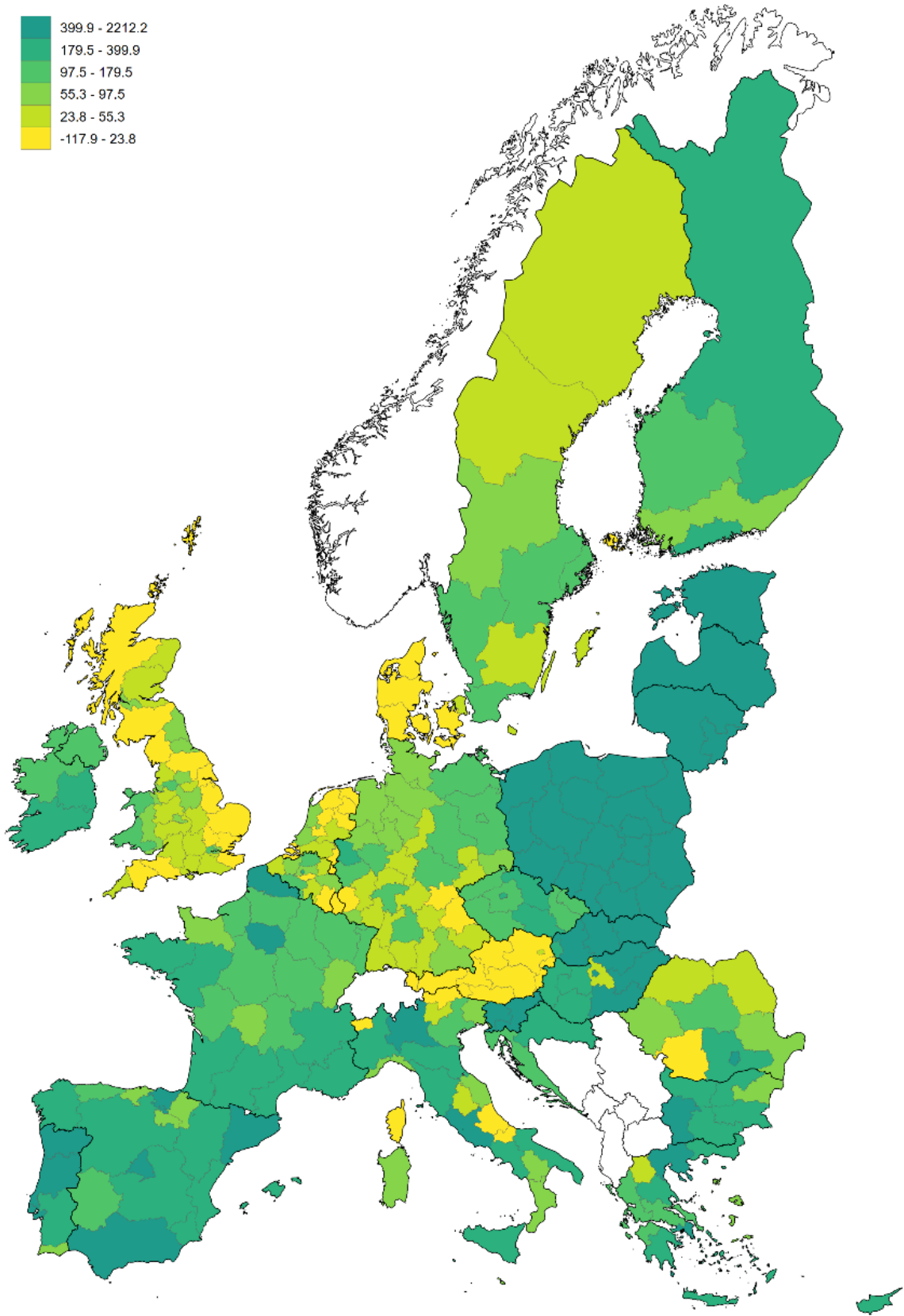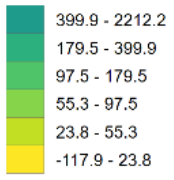

Source: RHOMOLO simulations (2024).

Figure 11. Change in regional labour force relative to the baseline in 2022 (number of persons) by education group and total, ESF, YEI and REACT-EU
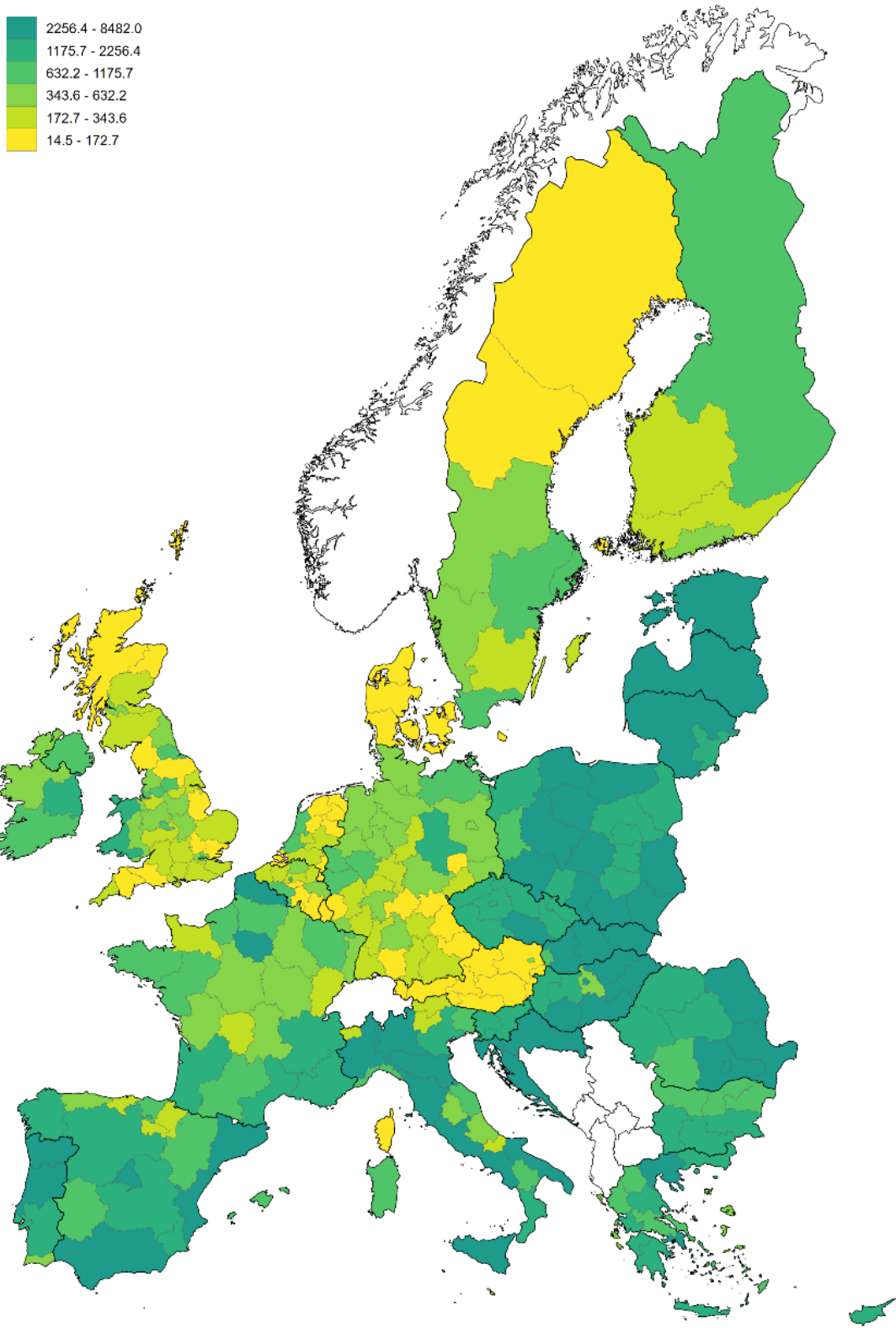

Low

Medium

Legend:
- 399.9 - 2212.2
- 179.5 - 399.9
- 97.5 - 179.5
- 55.3 - 97.5
- 23.8 - 55.3
- -117.9 - 23.8

High

Total

Source: RHOMOLO simulations.

Table 12. Change in the labour force relative to the baseline in 2022 and 2030 (number of persons), by ESF Thematic Objective (TO) and YEI and REACT-EU programmes

ESF Thematic Objectives		Low	Medium	High	Total
	Baseline	53,337,777	121,685,281	77,012,184	252,035,242
TO 8	2022	+ 26,943 (0.05%)	+ 75,355 (0.06%)	+ 27,729 (0.04%)	+ 130,027 (0.05%)
	2030	+ 18,659 (0.03%)	+ 51,716 (0.04%)	+ 19,600 (0.03%)	+ 89,975 (0.04%)
TO 9	2022	+ 35,949 (0.07%)	+ 85,078 (0.07%)	+ 32,265 (0.04%)	+ 153,292 (0.06%)
	2030	+ 24,287 (0.05%)	+ 57,842 (0.05%)	+ 22,713 (0.03%)	+ 104,841 (0.04%)
TO 10	2022	−1,124 (−0.00%)	−551 (−0.00%)	−649 (−0.00%)	−2,325 (−0.00%)
	2030	−894 (−0.00%)	+ 253 (0.00%)	+ 40 (0.00%)	−600 (−0.00%)
TO 11	2022	+ 205 (0.00%)	+ 527 (0.00%)	−378 (−0.00%)	+ 355 (0.00%)
	2030	+ 229 (0.00%)	+ 600 (0.00%)	−163 (−0.00%)	+ 666 (0.00%)
YEI	2022	+ 11,480 (0.02%)	+ 26,611 (0.02%)	+ 7,784 (0.01%)	+ 45,875 (0.02%)
	2030	+ 8,020 (0.02%)	+ 18,250 (0.01%)	+ 5,293 (0.01%)	+ 31,563 (0.01%)
REACT-EU	2022	+ 705 (0.00%)	+ 1,909 (0.00%)	+ 688 (0.00%)	+ 3,302 (0.00%)
	2030	+ 489 (0.00%)	+ 1,330 (0.00%)	+ 462 (0.00%)	+ 2,282 (0.00%)
ESF, YEI, and REACT-EU	2022	+ 76,589 (0.14%)	+ 184,319 (0.15%)	+ 68,558 (0.09%)	+ 329,465 (0.13%)
	2030	+ 52,502 (0.10%)	+ 126,760 (0.10%)	+ 48,537 (0.06%)	+ 227,798 (0.09%)

Source: García Rodríguez et al. (2023 – Baseline labour force), and RHOMOLO simulations (changes in 2022 and 2030).

Table 12 shows that the TOs that promote the expansion of the labour force, such as TO 9 and the YEI facility, have the largest response per invested resources, while the opposite is true for thematic objectives that exclusively target those already in the labour force, such as TOs 10 and 11 and the REACT-EU facility. The individual measures described tend to favour the entry of low- and medium-educated people into the labour force compared to the high-educated, as 23% of the total increase in the labour force in 2022 is due to the entry of low-educated workers, 56% to medium-educated workers and 21% to high-educated workers. In particular, TO 9 is the most important in the overall impact of all programmes, as it allows for the same percentages of total labour force entry for each education group, while the YEI facility is more targeted at the low and medium educated (25% and 58% respectively). TO 8, which contains a mix of measures, including those to expand the labour market, leads to an equal percentage of the increase in the labour force being allocated to the low and high educated, while 58% of the increase is attributed to the entry of the medium educated.

4.6 Macroeconomic education mismatch

Figure 12 shows that the adjustments in employment and employment rates following ESF investment (including YEI and REACT-EU) lead to a reduction in the macroeconomic education mismatch relative to the baseline in 2022 (see Figure A6 for the 2030 results).[11] As with the previous economic indicators

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[11] Following Estevão and Tsounta (2011), Kiss and Vandeplas (2015), Vandeplas and Thum-Thysen (2019), and Christou et al. (2023), we calculate for each NUTS-2 region an index of macroeconomic education mismatch as the relative dispersion of employment rates across three population groups with different educational attainment (by combining labour force survey data (Eurostat) for employment rates and populations of different levels of education):

presented, the change in the macroeconomic education mismatch depends on the funds invested and the employment effects they generate, which affect the employment rates of the three groups of workers.

The largest decreases are observed in Spain, Greece, Bulgaria, Germany and Slovakia in 2022 and in Spain, Greece, Germany and Croatia in 2030. There are some increases in the educational mismatch, such as in Portugal and Poland. This is due to a combination of factors such as the initial distribution of education in the labour force, the distribution of ESF funding by education group and the employment rates of the three groups of workers.

$$MEM_{r,t} = \sum_{i=L,M,H} \left| \frac{E_{r,i}}{E_{r,t}} - \frac{P_{r,i}}{P_{r,t}} \right| = \frac{1}{e_{r,t}} \sum_{i=L,M,H} \left| \frac{P_{r,i}}{P_{r,t}} \left(e_{r,i} - e_{r,t} \right) \right| \qquad (1.1)$$

where for every region r, $E_{r,i}$ denotes total employment of education type i: low, medium and high education, $P_{r,i}$ is working age population of education group i and $e_{r,i}$ is the employment rate. Variables indexed with t denote aggregate total economy variables. The indicator weighs different education types according to their weight in the working age population and using employment rates of each education level, it shows of the level of macroeconomic education mismatch in a specific region. The indicator takes values between 0 and 1, where 0 implies no mismatch. Intuitively this indicator measures how far is the employment rate of a particular education group from the mean employment rate of a region and builds an indicator represented as an aggregate distance. The indicator is calculated in each period and region and is compared to its baseline value.

Figure 12. Change in macroeconomic education mismatch in 2022 (% deviations), ESF, YEI and REACT–EU
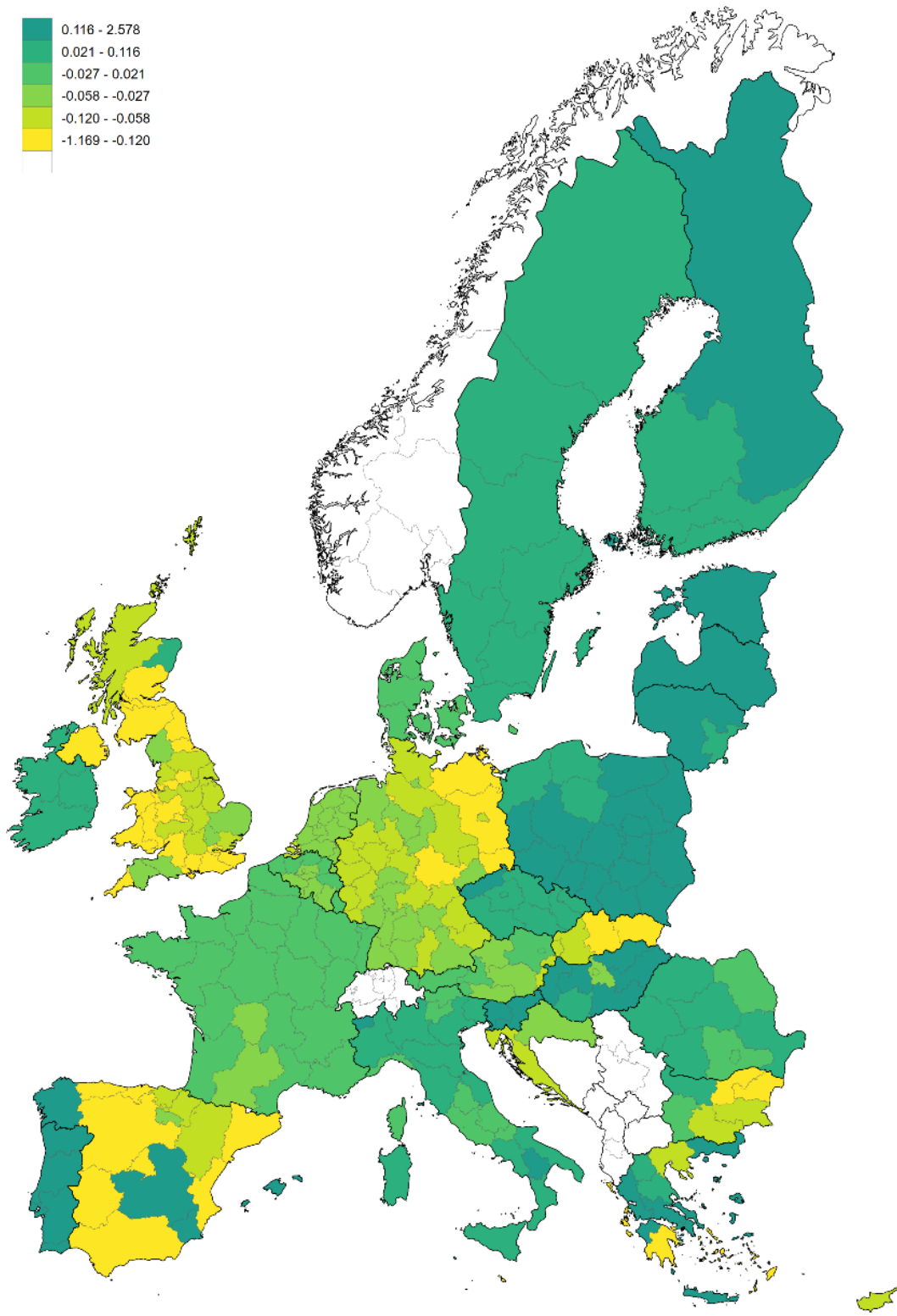
Source: RHOMOLO simulations.

4.7 Consumer welfare

Figure 13 shows the change in welfare (calculated from changes in private consumption per capita) due to ESF investment (including YEI and REACT–EU) in 2022 (see Figure A7 for the 2030 results). Consumer welfare is measured in terms of compensating variation, defined as the total change in consumption per worker due to the policy intervention up to a given year, compared to the change in consumption per worker in the absence of the policy up to the same year. In essence, this measure quantifies the change in an individual's utility relative to their baseline utility due to the policy and is measured in euros.

It is mostly positive across Europe, with the highest values in Southern and Eastern Europe, where most of the interventions take place. The few negative values are small in absolute terms and are due to the net contributor status of the regions in which they are recorded.

Figure 13. Impact on consumer welfare in 2022 (euros per person), ESF, YEI and REACT-EU
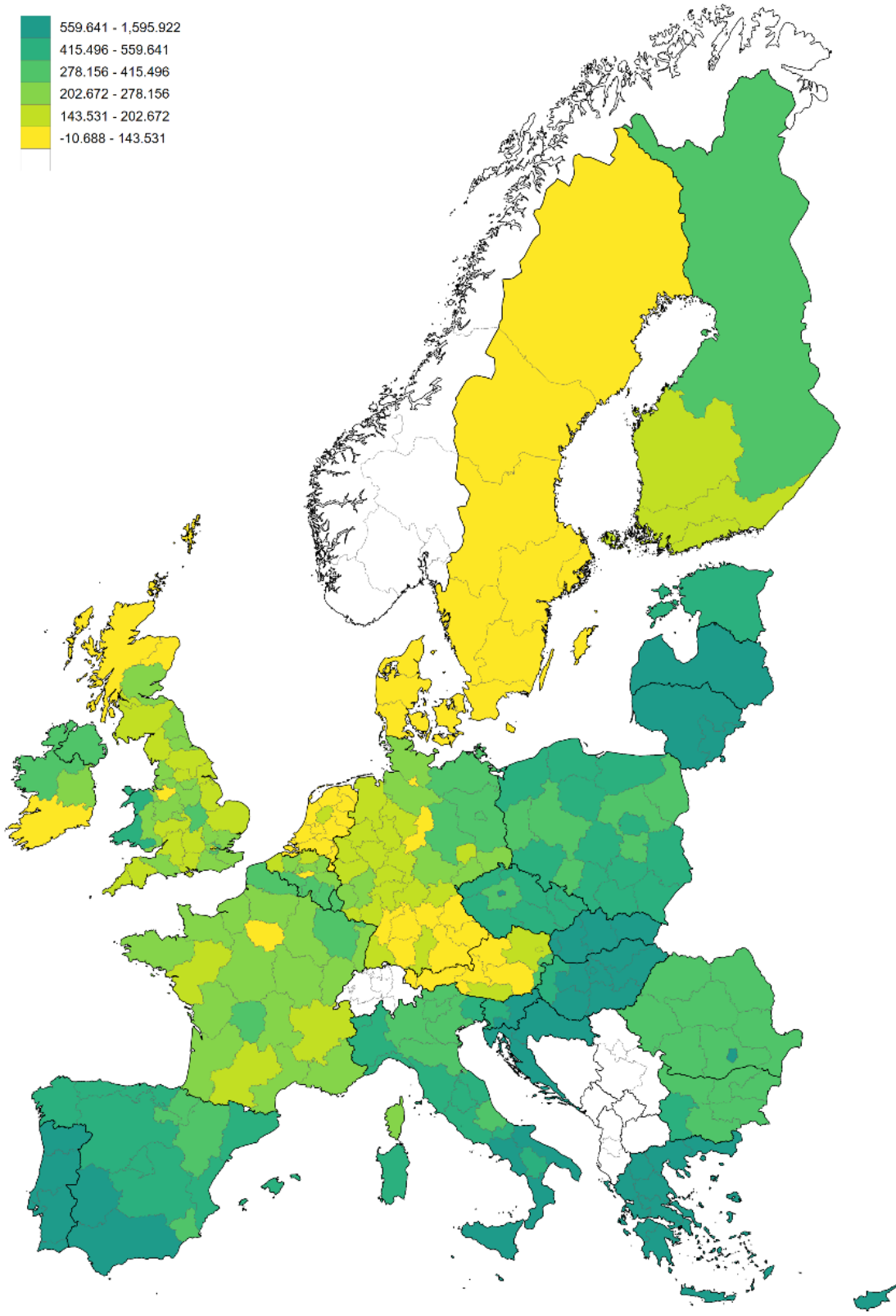
Source: RHOMOLO simulations.

4.8 Regional disparities

Figure 14 shows that the ESF interventions, including YEI and REACT-EU, reduce regional disparities in the EU. The coefficient of variation, which measures the spread of regional GDP per capita relative to the average[12], decreases after the start of the programmes and remains below the initial value 20 years later. After 2022, when the programme ends, it increases slightly due to the discontinuation of demand-side injections, but the supply-side effects of the policy keep it below the initial level. This suggests that the gap between regions in terms of GDP per capita is narrowing, and the interventions lead to a more equal distribution of GDP per capita compared to a scenario without such interventions.

Figure 14. Evolution of regional disparities, by ESF Thematic Objective (TO) and YEI and REACT-EU programmes
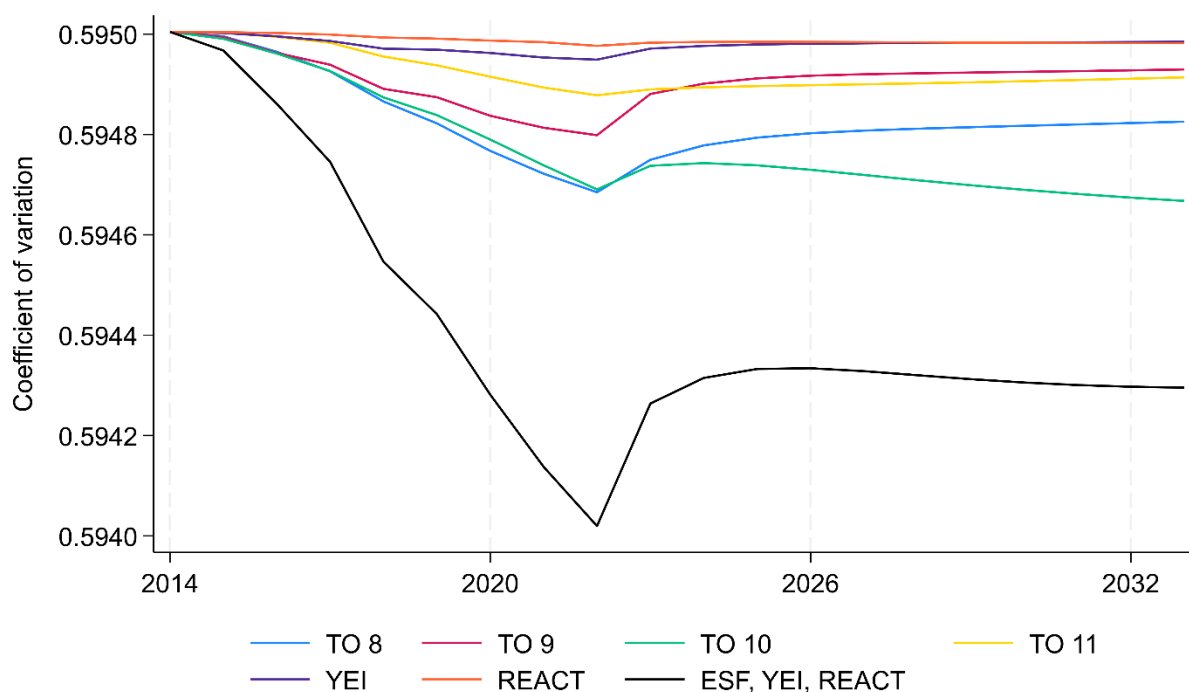
Source: RHOMOLO simulations.

TOs 8 and 10 contribute most to the reduction of regional disparities, due to the multifaceted measures of TO 8 and the labour productivity enhancing measures of TO 10. Given its size, TO 11 reduces disparities relatively more than TO 9 (the amount of investment is about 10% of TO 9). Given the roughly equivalent size of the measures, TO 9 reduces disparities relatively less than TO 8 and TO 10, because the returns to labour are lower than in the other two TOs, as more people enter the labour force and per capita returns are not as high.

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[12] The coefficient of variation is defined as the ratio of the standard deviation of regional GDP relative to the mean regional GDP per capita. A declining ratio implies less variation and a more homogeneous level of GDP per capita that converges toward the mean and vice versa.

5. Conclusion

We have provided a macroeconomic impact assessment of the 2014–2020 European Social Fund, the Youth Employment Initiative and the labour market interventions of the REACT-EU programme, using data updated to the end of 2023. We use the spatial dynamic general equilibrium model RHOMOLO, modified to include endogenous labour force participation, to analyse the impact of nearly €110 billion EU funding in total, showing how GDP, employment, wages and various measures of inequality respond to the policies.

We have found that ESF investment, including the REACT-EU and YEI programmes, has had a positive impact on EU regions. Policies that increase labour productivity, together with policies that increase labour supply, tend to increase regional employment, reduce educational mismatches and regional disparities, and lead to higher compensation of employees and overall welfare. These policies are effective in the long run and the positive effects can be observed up to 10 years after the end of the implementation phase of the programmes. We find that the impact of the policies is heterogeneous across regions. This mainly depends on the size of the investment in the region, the economic conditions of the region and the type of investment. For example, although labour supply policies increase aggregate welfare and have positive employment effects, their impact is smaller than that of policies that increase labour productivity or promote private and public investment. The main beneficiaries of these policies are the eastern Member States, southern Spain, Portugal, Greece, Malta and southern Italy.

As with any analysis based on economic modelling, the results presented here are sensitive to the assumptions made in constructing the model and setting the scenarios used to analyse the impact of the policy. In addition, this analysis can only be considered as an ex-post assessment as far as the data are concerned, since they refer to actual rather than planned expenditure. However, the results remain a scenario analysis and do not reflect the monitoring of actual outcomes observed in the macroeconomic data during the analysis period.

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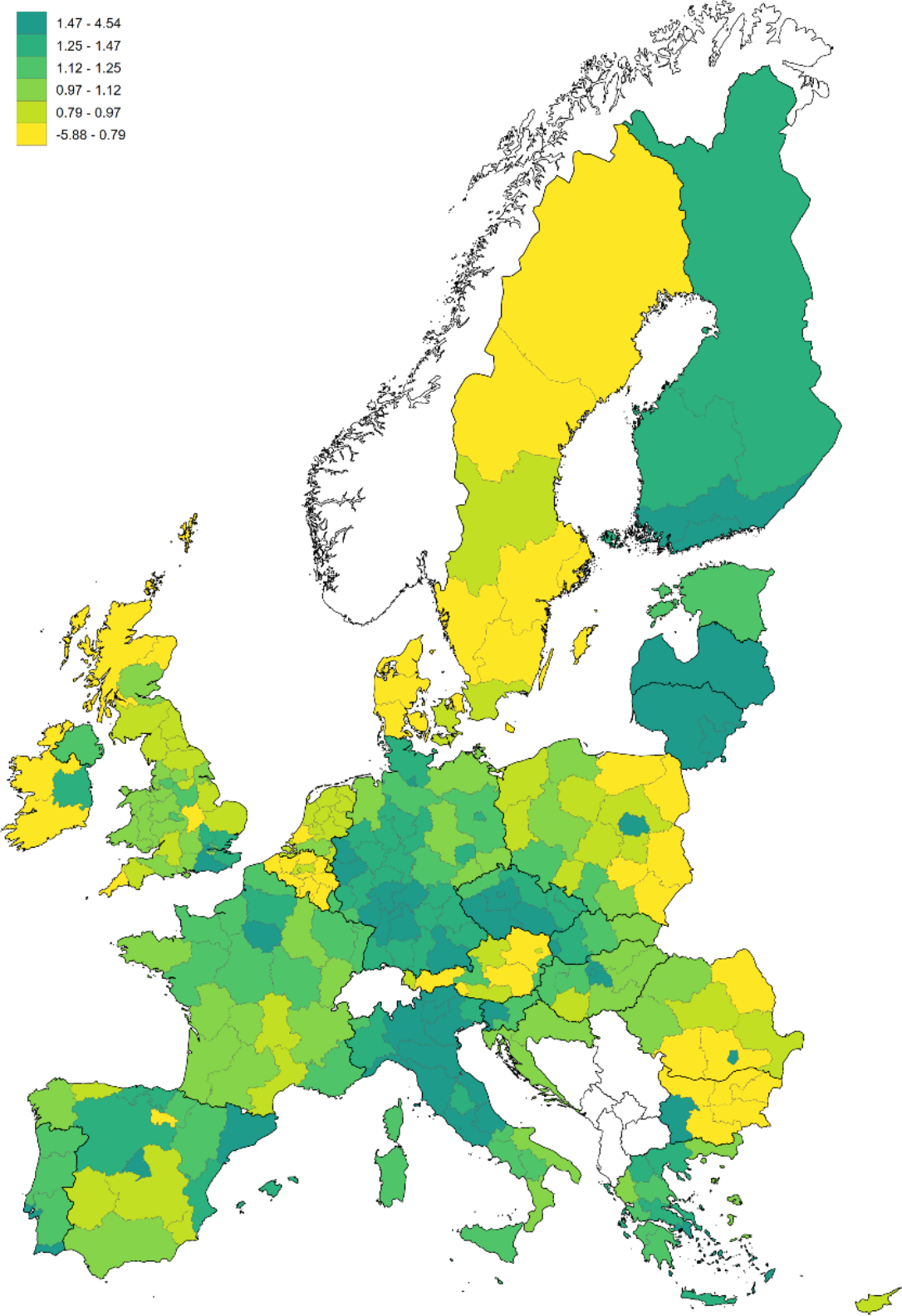
Appendix

Figure A1. Change in GDP relative to the baseline in 2030 (% deviations), ESF, YEI and REACT-EU
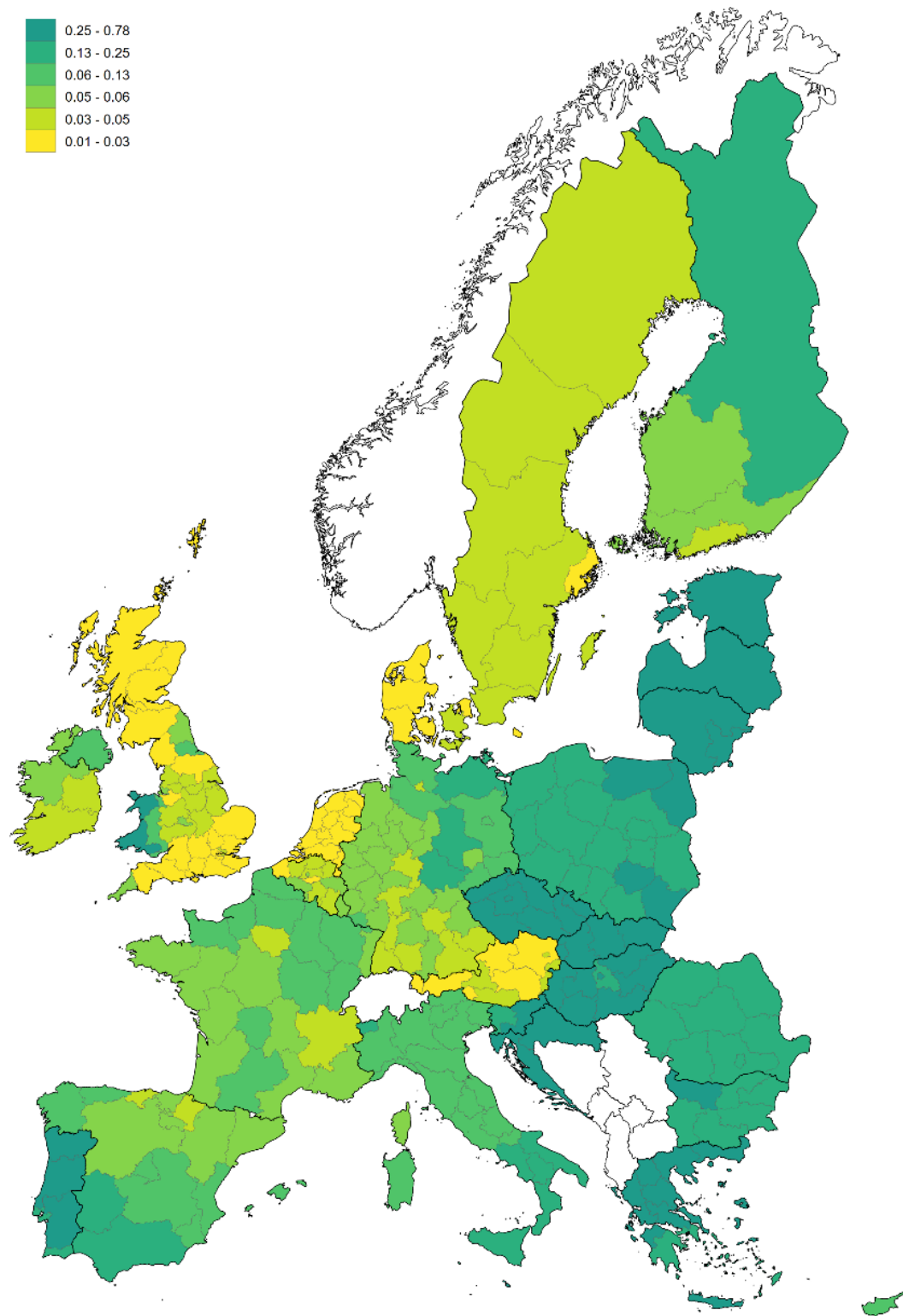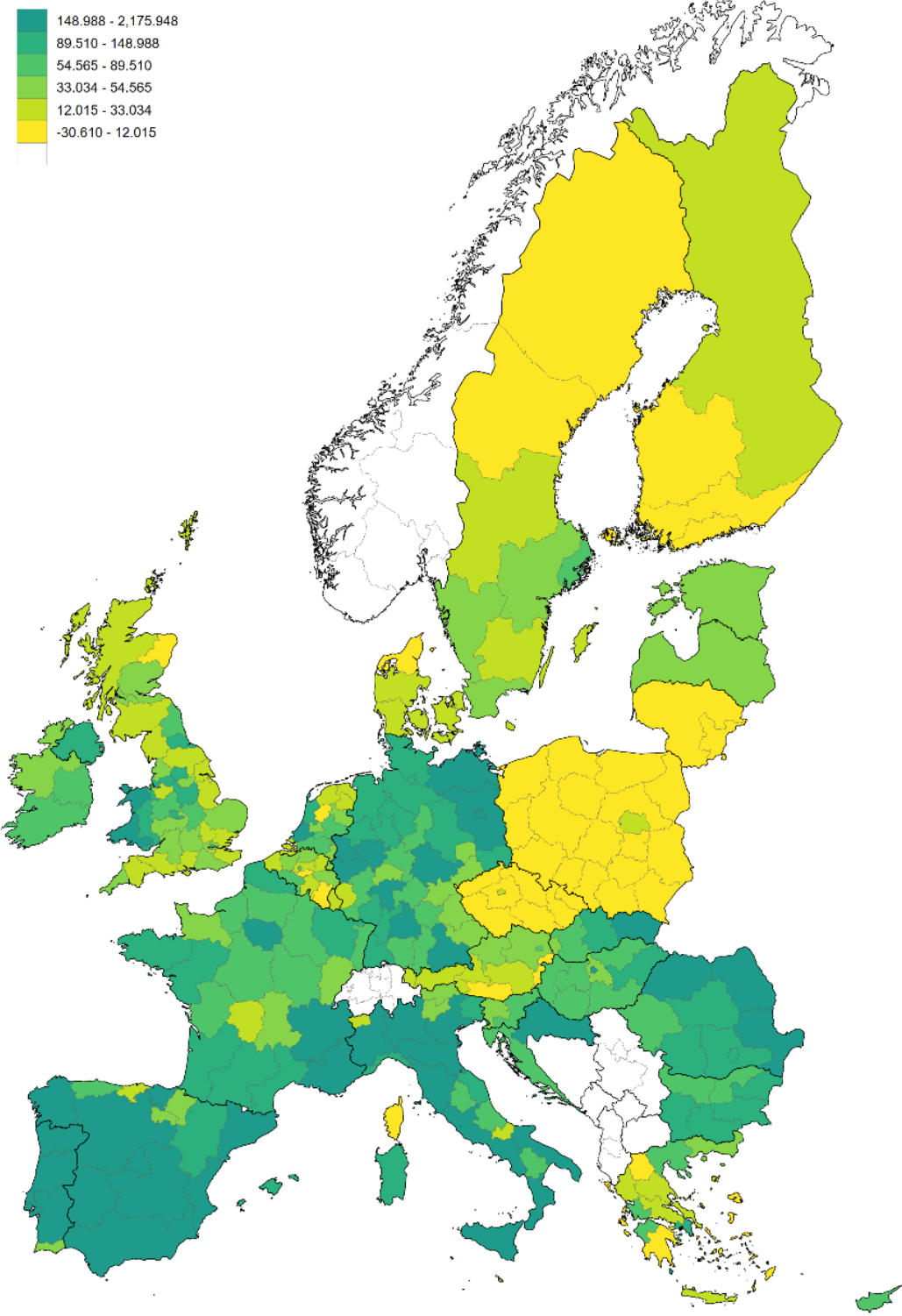

Source: RHOMOLO simulations.

Figure A2. Regional GDP multipliers in 2030, ESF, YEI and REACT-EU

Legend:
- 1.47 - 4.54
- 1.25 - 1.47
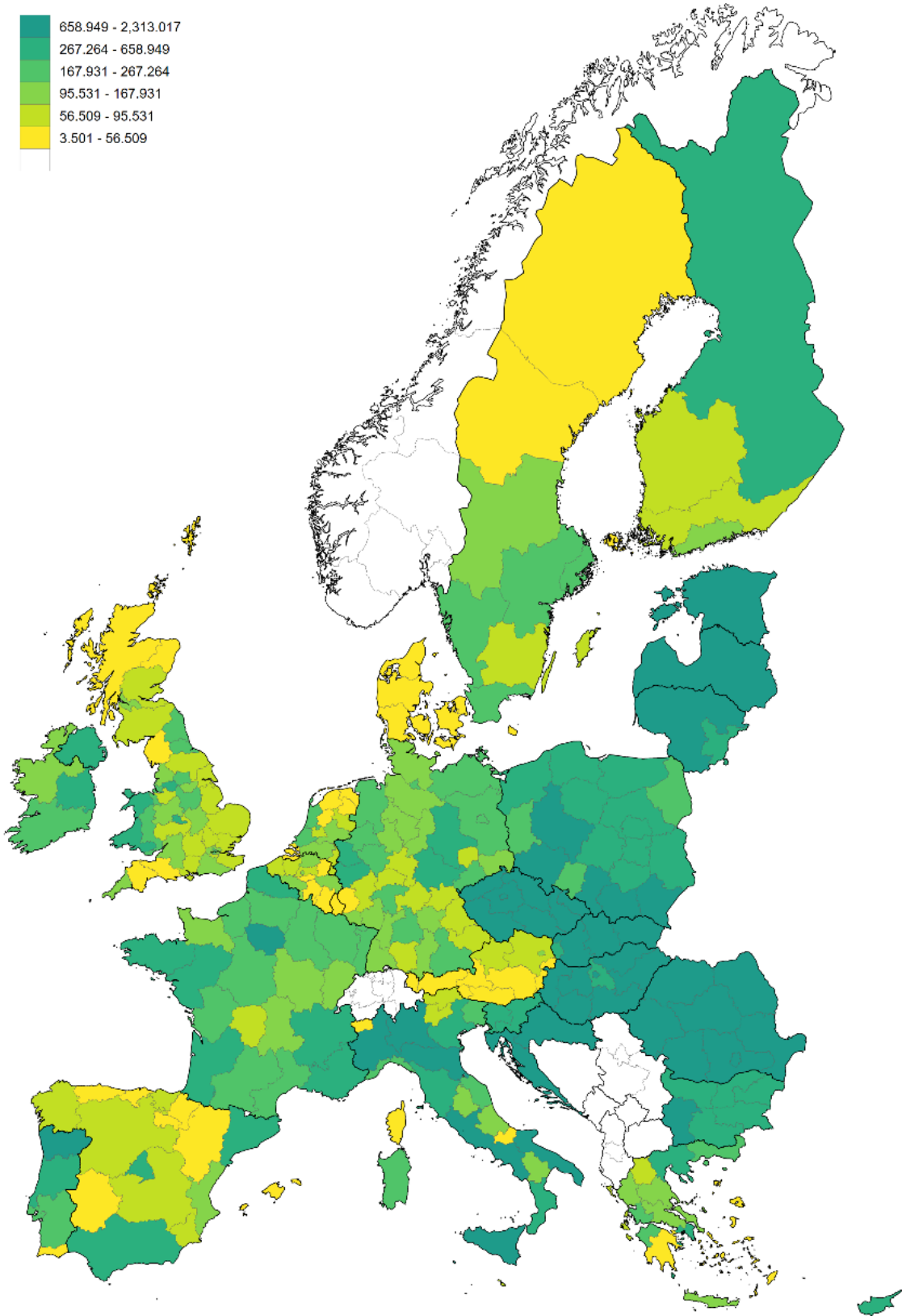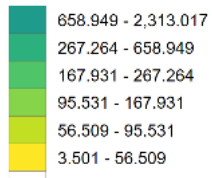- 1.12 - 1.25
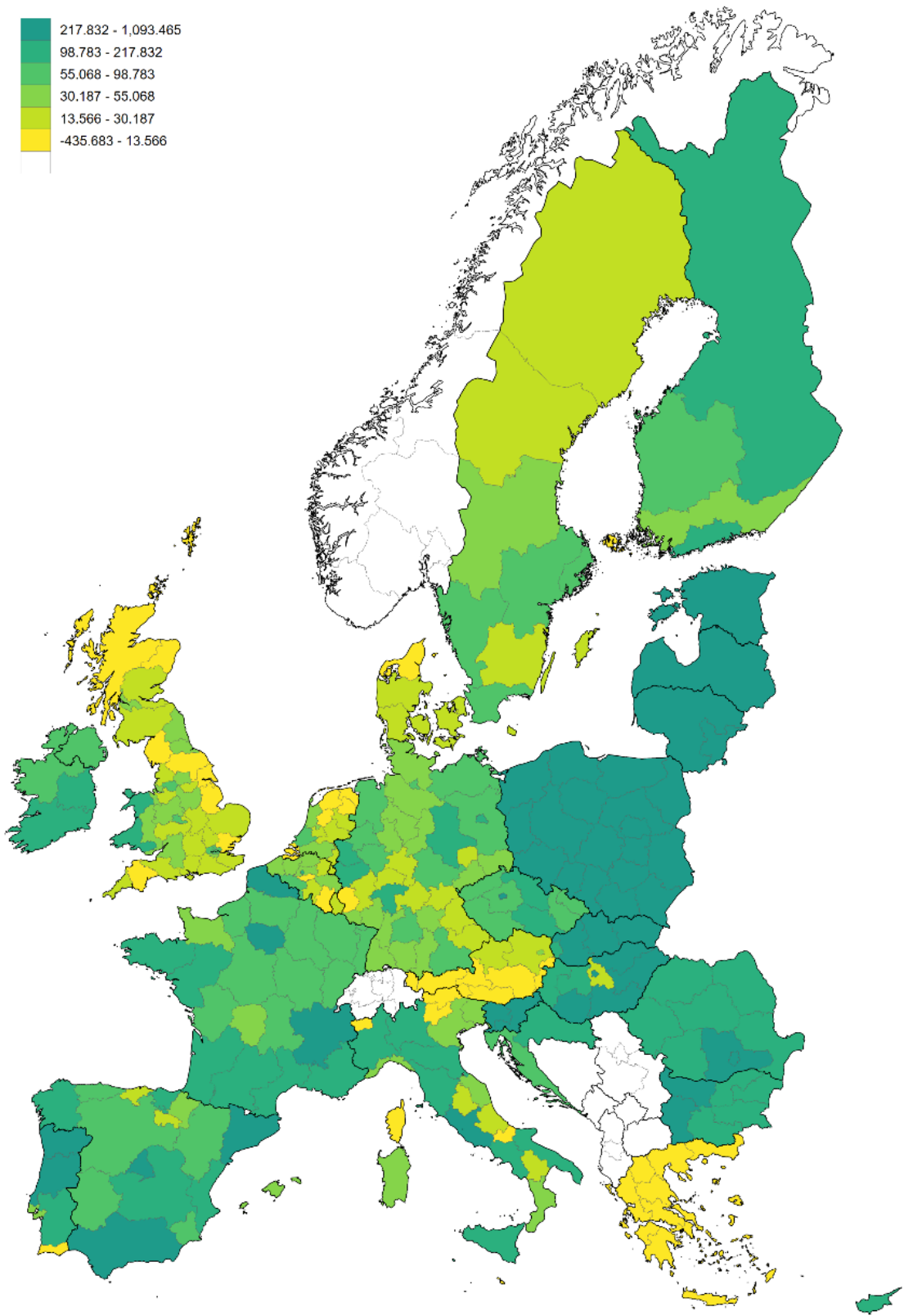- 0.97 - 1.12
- 0.79 - 0.97
- -5.88 - 0.79

Source: RHOMOLO simulations.

Figure A3. Change in employment relative to the baseline in 2030 (number of persons) by education group and total, ESF, YEI and REACT-EU
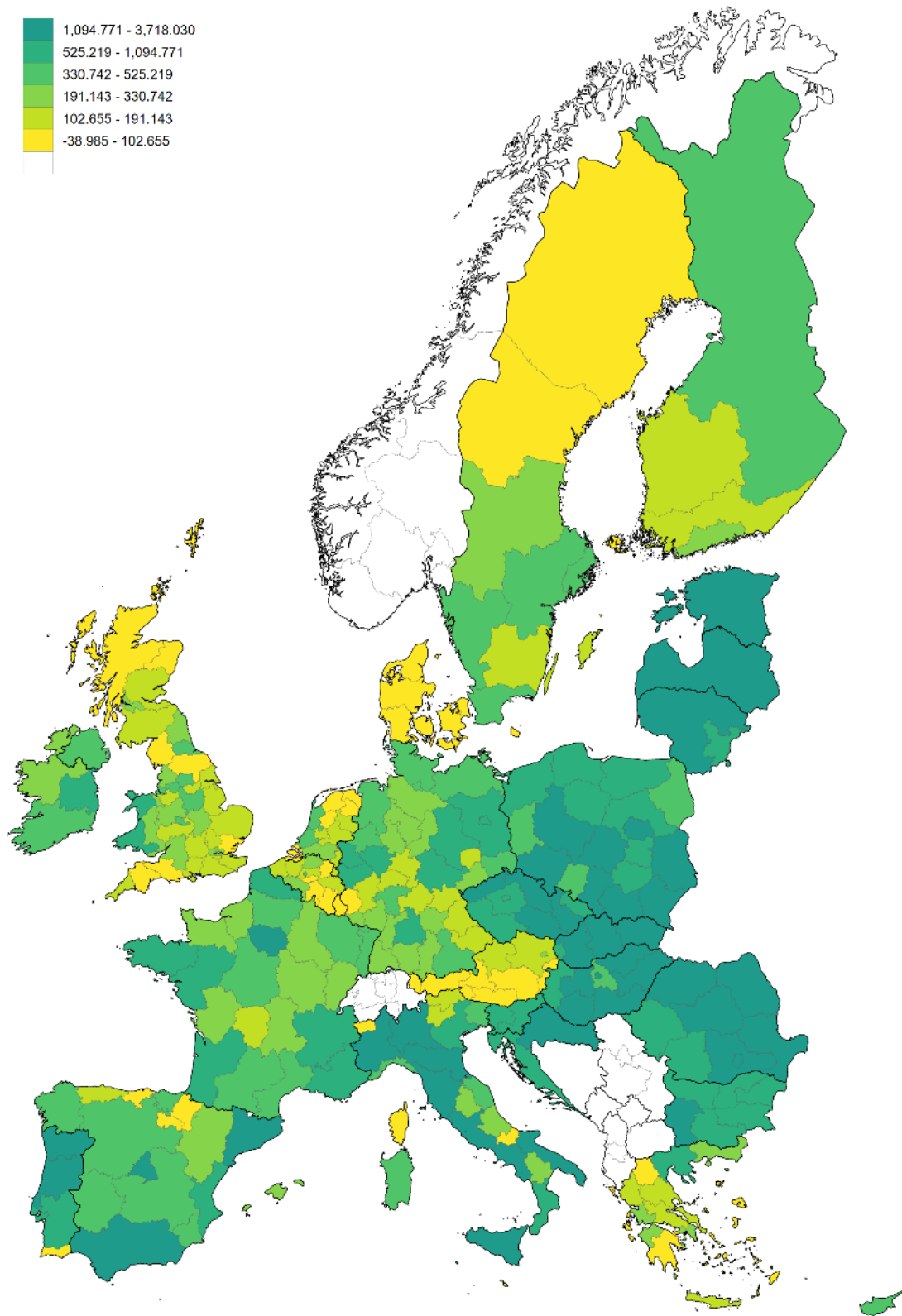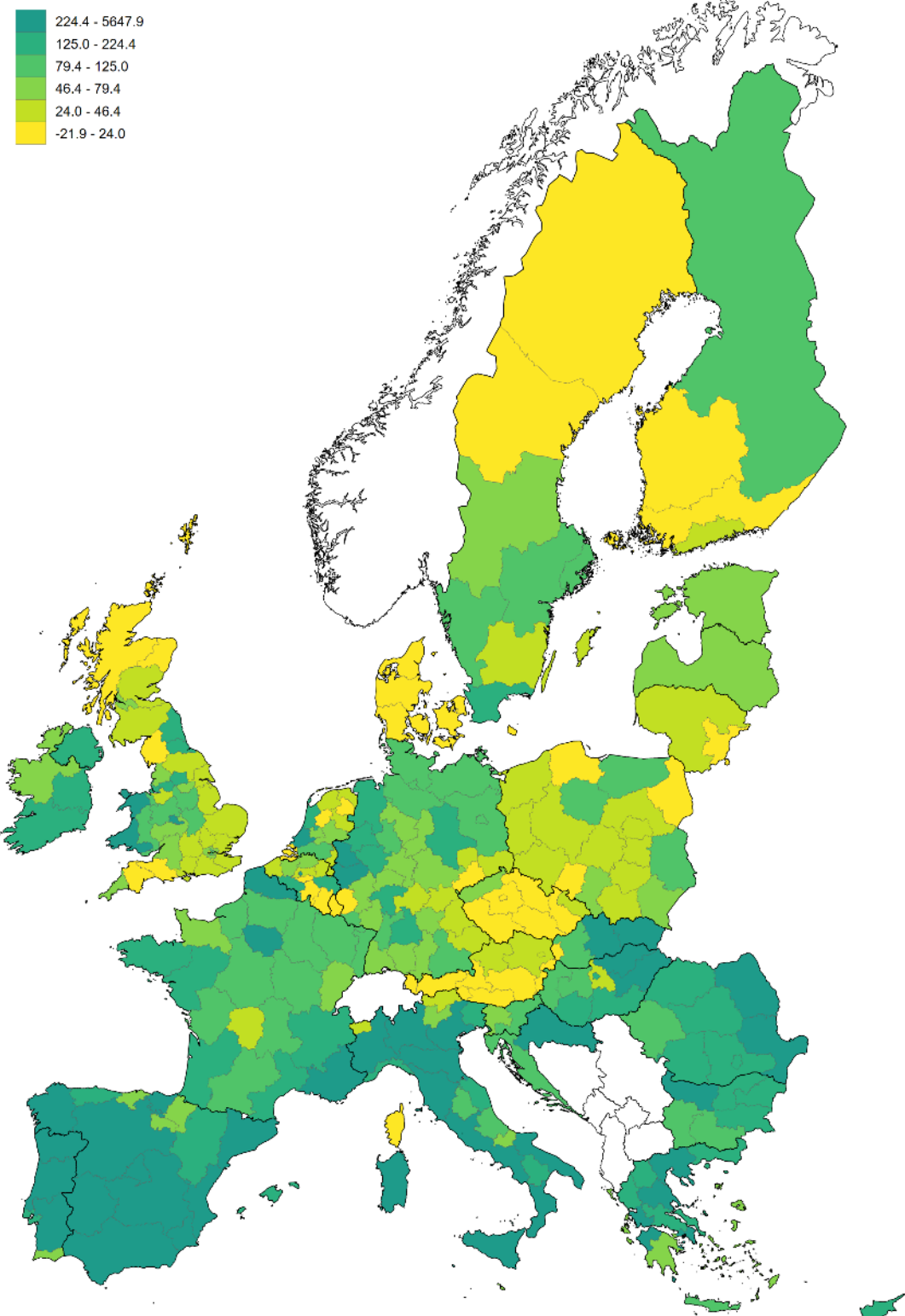

■	148.988 - 2,175.948
■	89.510 - 148.988
■	54.565 - 89.510
■	33.034 - 54.565
■	12.015 - 33.034
■	-30.610 - 12.015

Low

Medium

217.832 - 1,093.465
98.783 - 217.832
55.068 - 98.783
30.187 - 55.068
13.566 - 30.187
-435.683 - 13.566

High

55

Total

Source: RHOMOLO simulations.

Figure A4. Change in compensation of employees relative to the baseline in 2030 (% deviations) by education group and total, ESF, YEI and REACT-EU
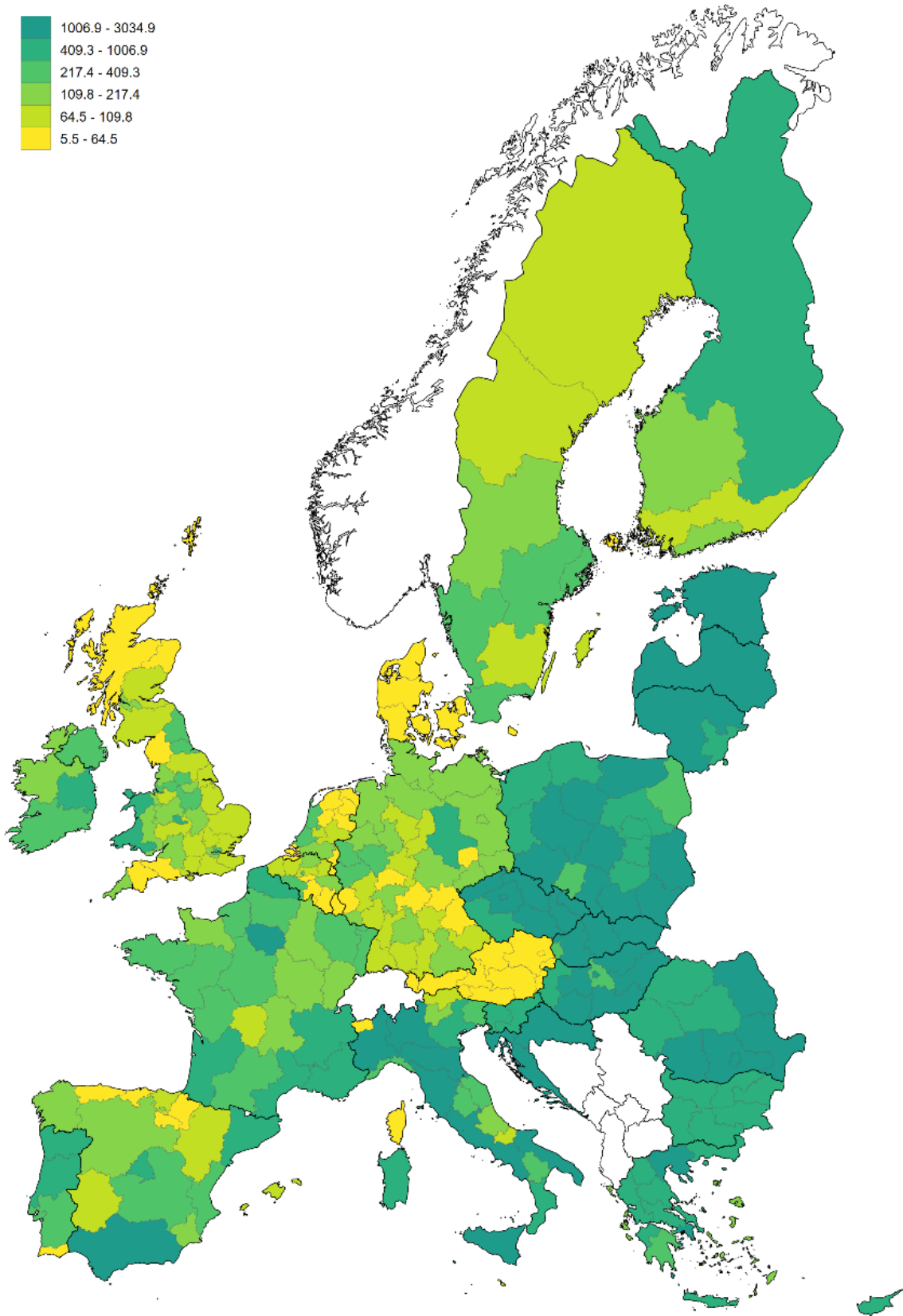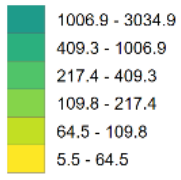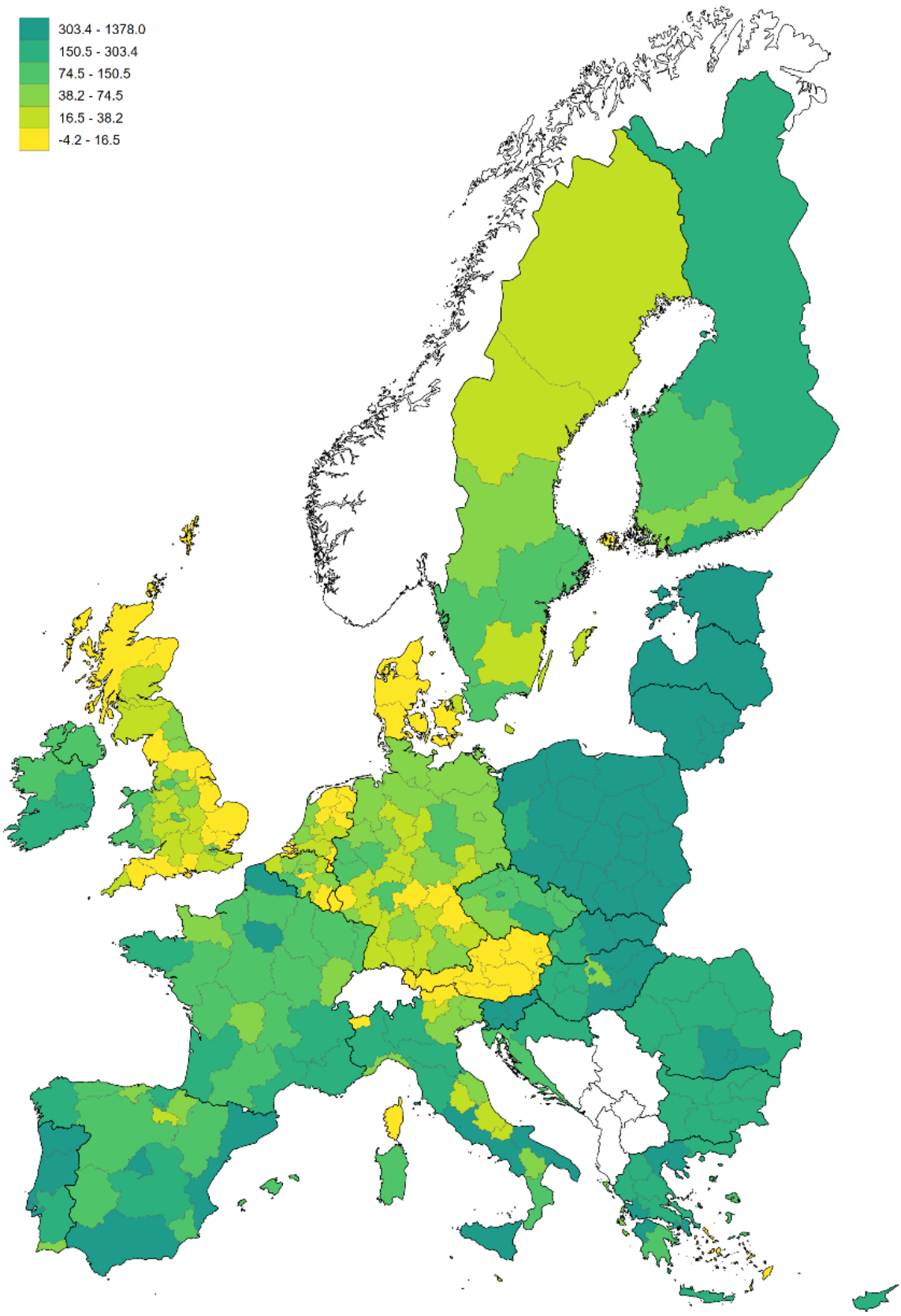

Low

Medium

High

■	0.069 - 0.565
■	0.038 - 0.069
■	0.031 - 0.038
■	0.021 - 0.031
■	0.016 - 0.021
■	-0.113 - 0.016
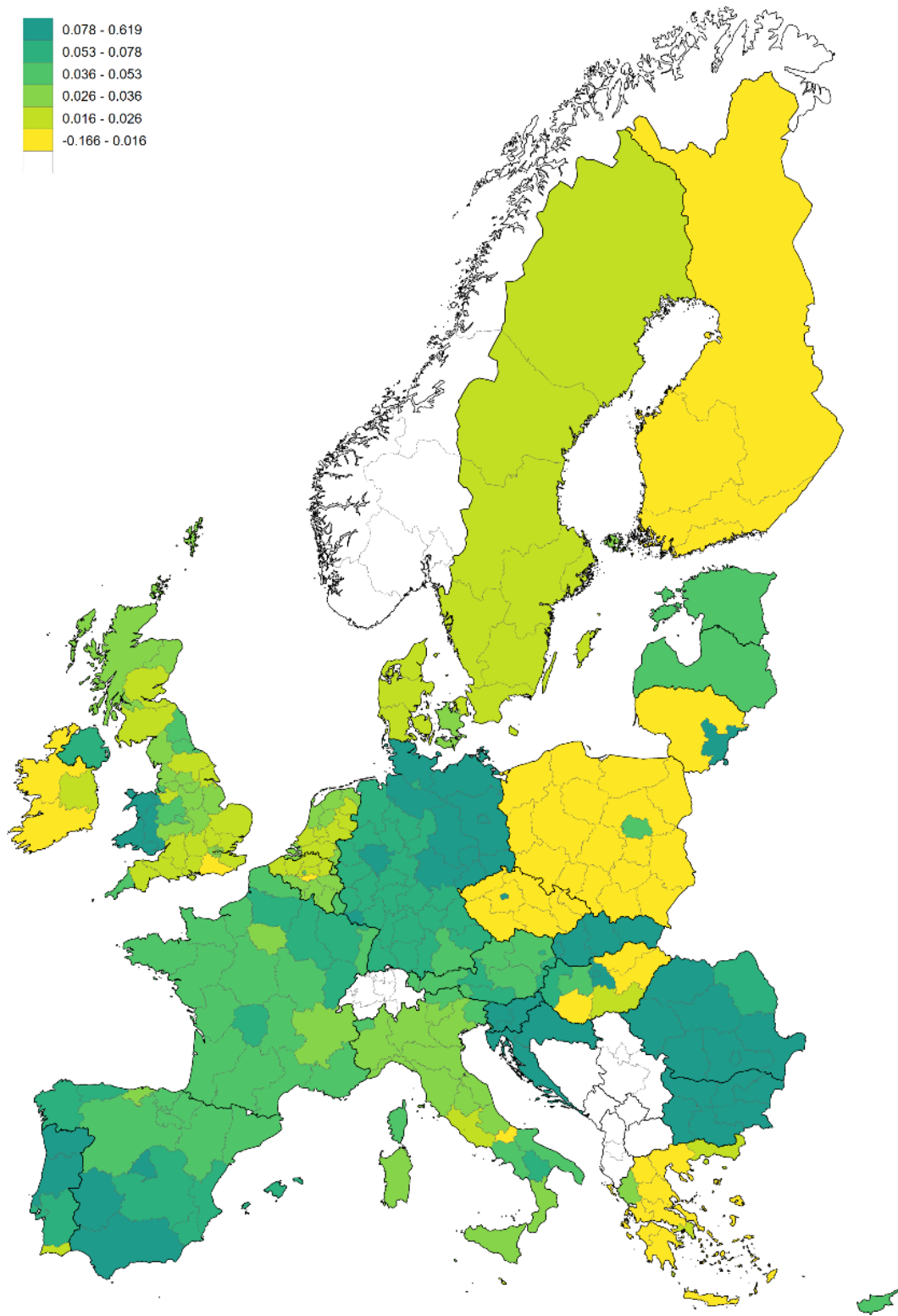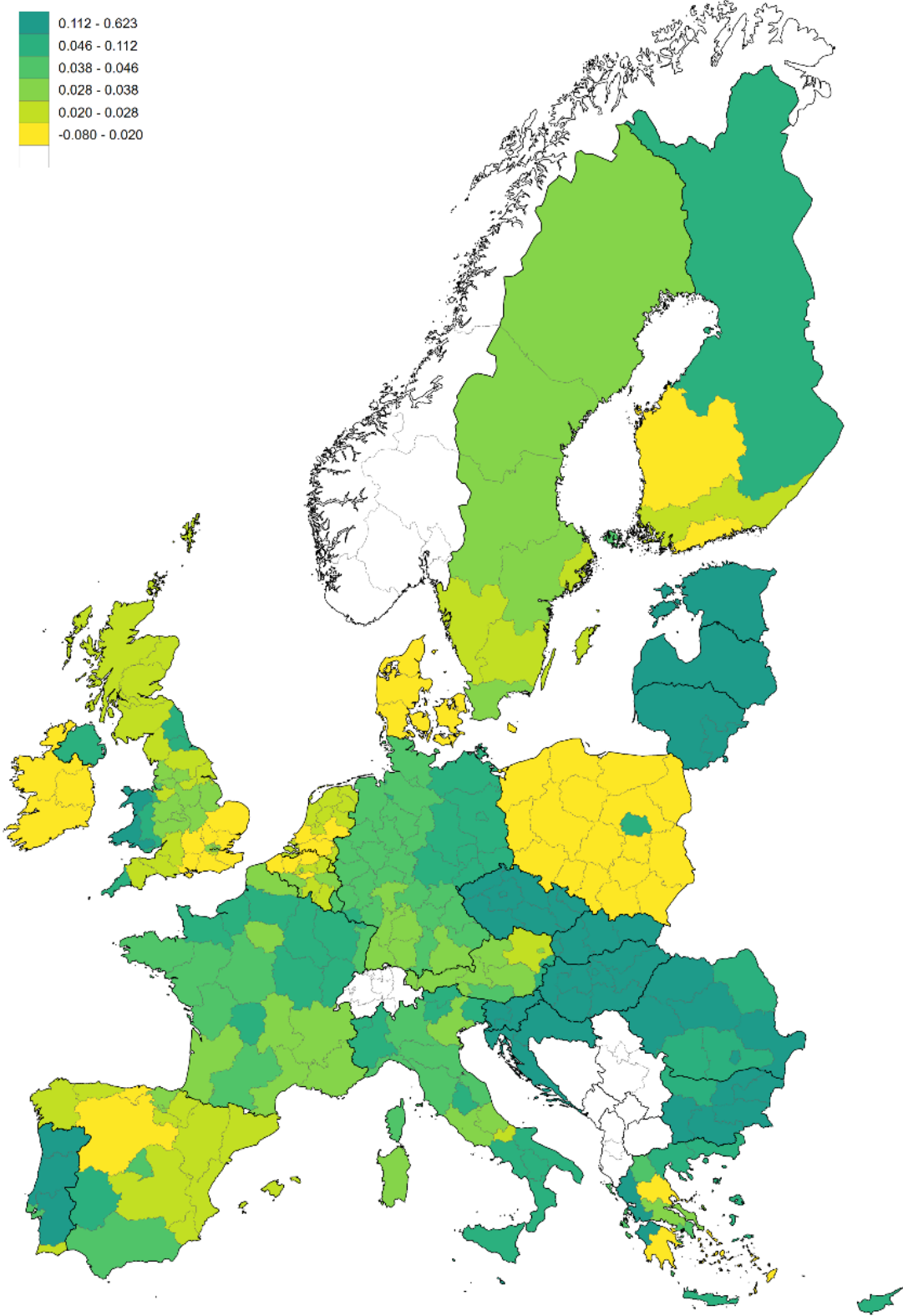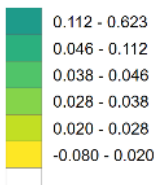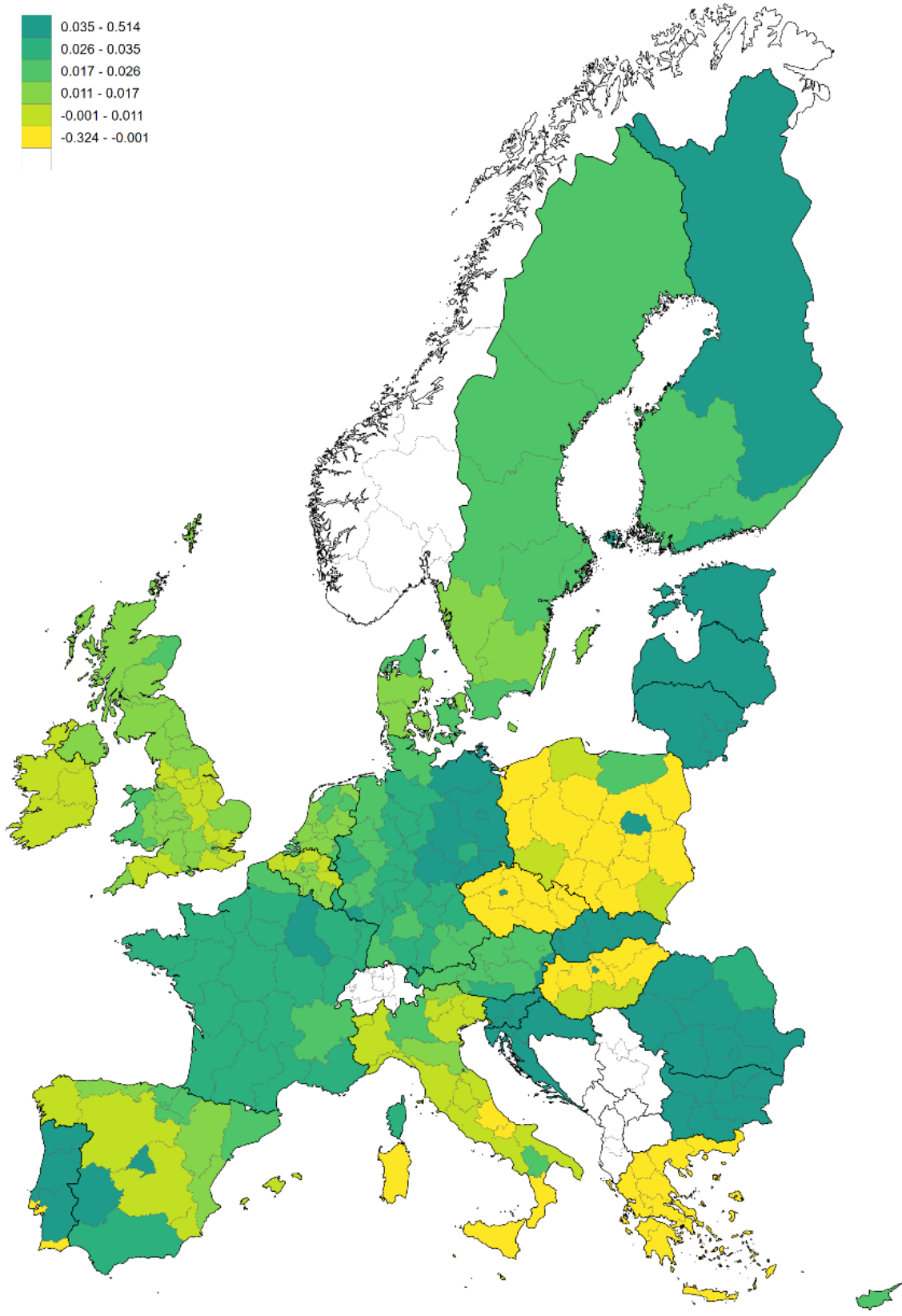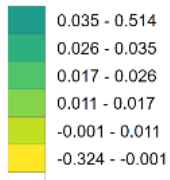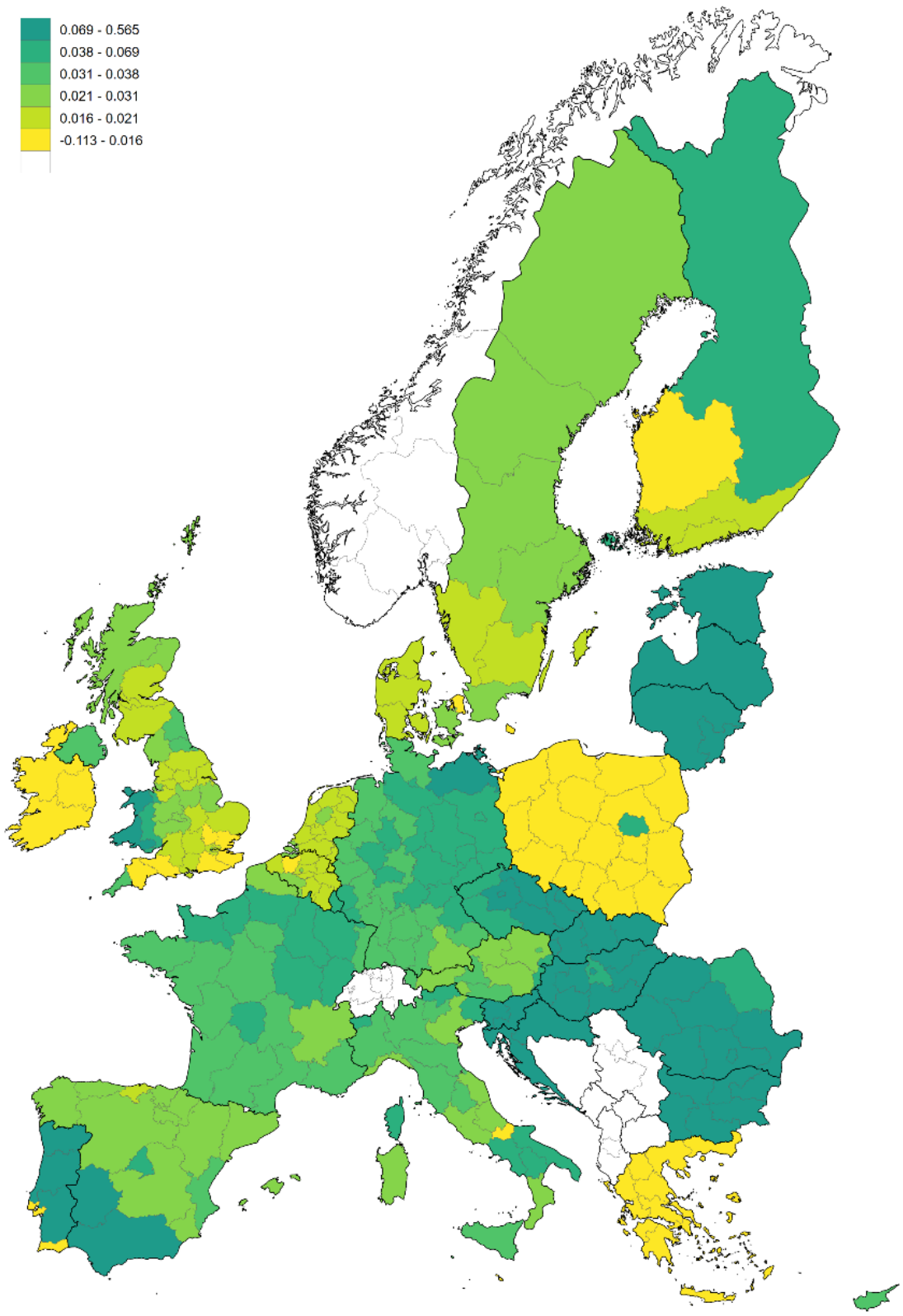
Total

Source: RHOMOLO simulations.

Figure A5. Change in regional labour force relative to the baseline in 2030 (number of persons) by education group and total, ESF, YEI and REACT-EU
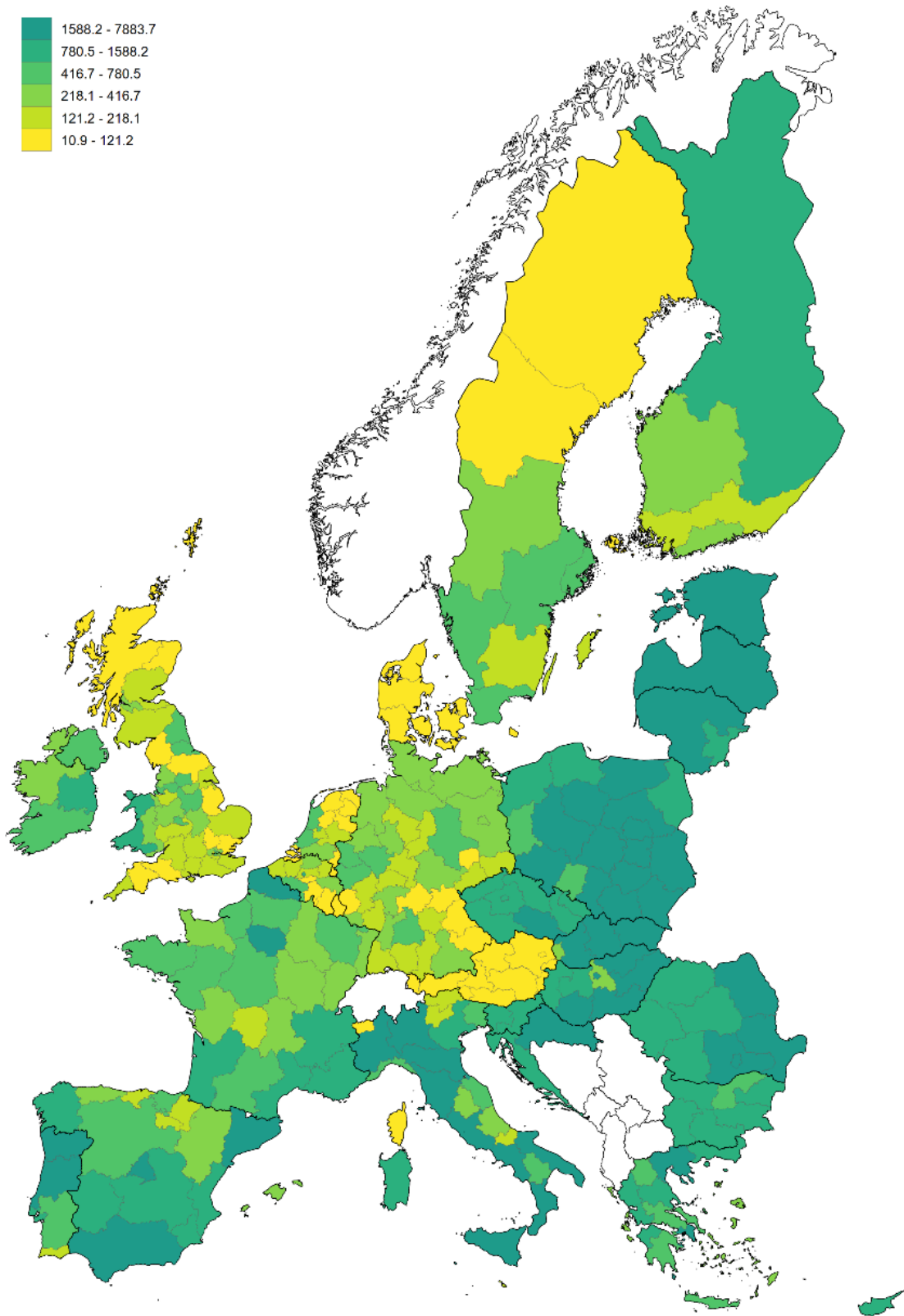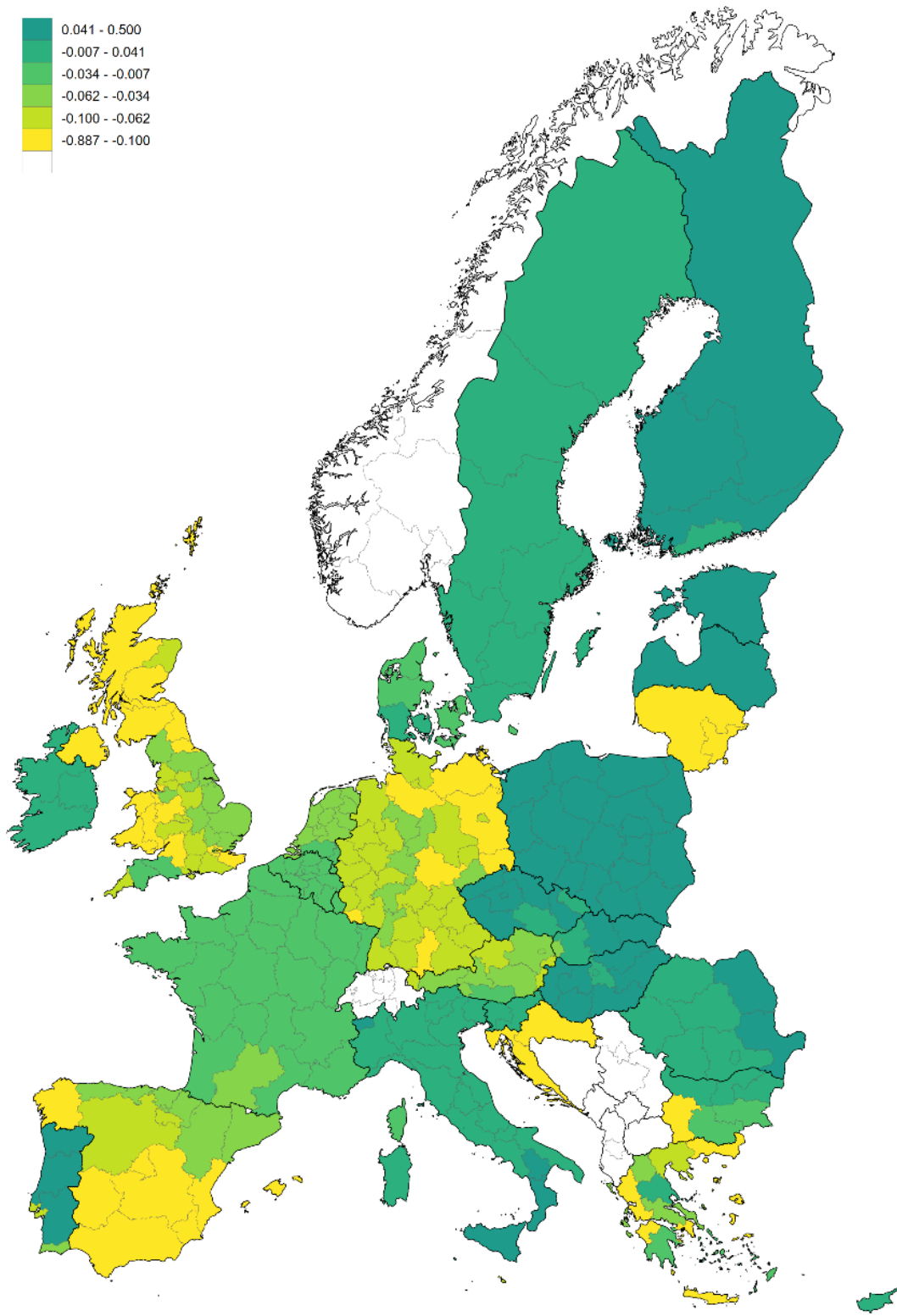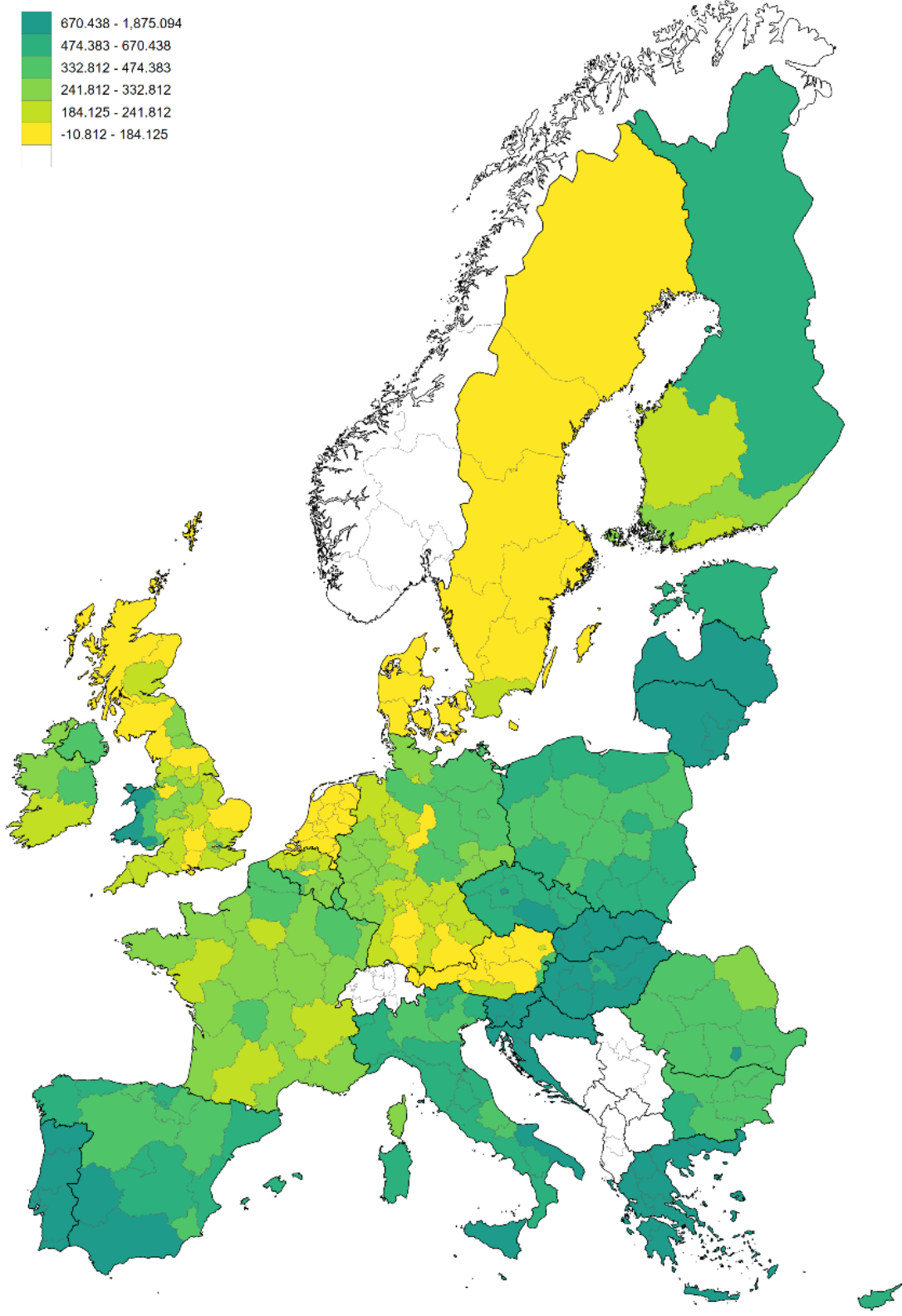

224.4 - 5647.9
125.0 - 224.4
79.4 - 125.0
46.4 - 79.4
24.0 - 46.4
-21.9 - 24.0

Low

Medium

High

	1588.2 - 7883.7
	780.5 - 1588.2
	416.7 - 780.5
	218.1 - 416.7
	121.2 - 218.1
	10.9 - 121.2

Total

Figure A6. Change in macroeconomic education mismatch in 2030 (% deviations), ESF, YEI and REACT-EU

Source: RHOMOLO simulations.

Figure A7. Impact on consumer welfare in 2030 (euros per person), ESF, YEI and REACT-EU

Source: RHOMOLO simulations.