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Making the EU cohesion policy work to support exports at time of Covid-19: Evidence on the Italian regions[☆]

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ABSTRACT

This study investigates regional trade resilience and the role of the EU cohesion policy to support exports during the first wave of the Covid-19 crisis. We compare regional export resilience during the pandemic shock and the Great Recession in order to find possible similar patterns. We also use panel estimates obtained for the years of the Great Recession to construct regional trade adjustment scenarios at time of Covid-19. Our results suggest that the main adverse consequences of the first wave of the pandemic crisis on regional exports are localised in the regions that show high integration in international global value chains, and high exposure to tourism activities. We also find that the drop in regional exports observed during the first wave of the Covid-19 shock can be limited if more EU funds are timely transferred to beneficiaries. We develop different trade adjustment scenarios to account for heterogeneity among the Italian regions and specific characteristics of the Covid-19 crisis. The main policy implications of our study are finally discussed.

1. Introduction

About ten years after the trade collapse observed during the Great Recession, the Covid-19 pandemic started at the beginning of 2020 has produced greater adverse consequences on international trade and export performance worldwide. In the second quarter of 2020, the volume of global trade in goods and services fell by about 12% and 21% in comparison to the last quarter of 2019 (IMF 2022), with heterogeneous resilience capacity on international trade at the regional level (Mena et al., 2022).¹ Such negative effects have been more pronounced in countries like Italy, where the first wave of the health shock was particularly severe and trade is an important engine of economic growth (Alesina and Giavazzi 2020). In 2020Q2, Italian exports registered a drop of about –28% compared to the same quarter of 2019, with implications on investments, firm sales, and expectations (Schivardi and Guido 2020). Although the Covid-19 crisis and the Great Recession are expected to produce different impact on world trade, mostly because of the

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¹ We primarily focus on the first wave of the pandemic when the effects on trade were relevant (Berthou and Stumpner 2022), and lockdown rules were homogeneous across Italy. In the recent years, there have been other structural challenges to global trade (Comunale and Felice 2022), such as Brexit, the tariffs imposed by the Trump administration, and the current Russia-Ukraine war (Ruta 2022), which are outside the boundaries of the present paper.

combination of both demand and supply shocks in the former crisis only, some learnings from the trade collapse registered in 2008 can be useful to support policymaking at time of pandemic (De Grauwe et al., 2021).²

Since the first wave of the Covid-19 emergency, the EU Commission (EC) has helped member states to cope with the shock, by favouring the reallocation of the EU cohesion funds, increasing the co-financing rates, and simplifying procedures. The short-term re-arrangement of the cohesion policy operated during the pandemic has been inspired by the policy changes adopted by the EC during the Great Recession (EU Commission 2020). The 2021–2027 cohesion policy programme and the Next Generation EU initiative are expected to provide more than 1800 billion euros for sustaining economic growth in the EU over the next years. Moreover, a growing number of EU countries has introduced direct measures to support exports and the sectors more exposed to trade, by means of public guarantees, tax credits, and loans primarily targeted to small and medium enterprises (ITA 2020).³ The Italian government initially supported exports through the improvement of public guarantees for exporting firms with the aim of mobilising up to 200 billion euro. Therefore, it is timely to assess how policy responses are effective at smoothing the negative effects of the Covid-19 shock on trade (De Grauwe and Ji 2020).

The objective of this paper is twofold. First, we provide new evidence on the performance of regional exports in Italy during the Covid-19 shock, by applying resilience indexes and mapping techniques.⁴ This is useful to show where and to which extent the pandemic crisis has produced the most relevant adverse effects on regional trade, and from a policy perspective, to identify the places that request more assistance to recover, given that implementing the right set of policies to promote export competitiveness is fundamental for regional growth (Di Caro and Fratesi 2022a). We also compare regional export resilience at time of pandemic with that observed during the Great Recession in order to document the presence of regional heterogeneity in the two shocks (Cerqua and Letta 2022). Understanding the spatial distribution of the economic effects of the Covid-19 shock is crucial to construct early-warning maps that help the adoption of tailored and effective recovery policies (Coulson et al., 2021).

Second, we investigate the role of the cohesion policy for sustaining the resilience of exporting activities in the Italian regions during the pandemic shock. We first estimate export elasticity scores capturing the effects of the EU cohesion policy during the Great Recession, by using information on the absorption of the EU funds over the programming period 2007–2013 and panel models. Then, we construct different scenarios of regional export adjustments at time of Covid-19, which are useful to quantify the potential benefits of correctly planning expansive fiscal policies in terms of regional exports during the pandemic shock. This approach builds upon the idea that the two shocks share some similarities (Feroni et al., 2020), particularly regarding policy responses (Strauss-Kahn 2020): in Italy, for instance, the sharp reduction of exports observed during the Great Recession is in line with that registered in the first wave of the pandemic. We also discuss alternative adjustment scenarios in order to consider the potential different impact of the two crises on exports (Baldwin 2020).

Our results suggest that the main adverse consequences of the first wave of the Covid-19 crisis on regional exports have been concentrated in the North-West and the Islands (Sicily and Sardinia), where exports and tourism activities are relevant for regional economies. In regions like Lombardy and Emilia-Romagna, moreover, the relevant export losses can be explained by the highest integration of these areas in international global value chains (Giunta et al., 2022). Our empirics also confirm the presence of differences in the territorial distribution of export losses during the Great Recession and the pandemic shock (Cerqua and Letta 2022). We find that the drop in regional exports observed during the first wave of the Covid-19 crisis, about –44 billion euro between 2020 and 2019, can be potentially limited if more EU funds are timely transferred to beneficiaries. In particular, a rise of 10% of the absorption of the EU funds, a value in line with the actual progress of the cohesion policy observed in Italy between 2020 and 2019, can contribute to smooth export losses on annual basis by about 8.5 billion euro. The reduction of export losses can reach up to 9.9 billion euro when considering heterogeneity in the absorption of the EU funds among the Italian regions.

The study is organised as follows. In Section 2, we discuss the background literature. In Section 3, we describe the data and provide evidence on the resilience of regional exports during the Great Recession and the Covid-19 shock. The empirical analysis is developed in Section 4. Robustness checks are discussed in Section 5. Concluding remarks and policy implications are in the final section. Additional data and results are in the Appendix.

2. Background and related literature

2.1. Regional growth and cohesion policy

Our work builds on and contributes to the fast-growing literature focusing on the role of the EU cohesion policy during shocks (Di Caro and Fratesi 2022a). Despite the EU cohesion funds are long-term oriented, they can be useful to support countercyclical actions directly and indirectly by means of Keynesian multipliers (Neumark and Simpson 2014). Indeed, the cohesion policy can activate demand-side effects through government consumption and public investment, and the support of private consumption and investment (Monfort et al., 2021). The cohesion policy, moreover, can contribute to promote regional export performance, by funding indirect (i.e.

² The pandemic also produced supply-side effects following the diffusion of the virus at production sites and the preventative measures adopted by governments like lockdowns and border controls (Miroudot 2020).

³ In detail, the public support for trade ranged from 2 billion euro in Austria, France and Spain to 4 billion euro in the UK. In Poland, export activities were supported through the exchange rate. For details, see ITA (2020).

⁴ We refer to trade/export resilience as the ability of a given area to resist shocks to international trade and recover after crises occur (Bas et al., 2022).

physical and social infrastructures) and direct (i.e. research and innovation-R&I, firm competitiveness) projects that help firms to bolster productivity, access to and compete in international markets (Costantini and Mazzanti, 2012). Thus, we expect a positive effect of the cohesion policy on regional economic performance and regional trade resilience during shocks (Berkowitz et al., 2019).

The few existing works covering the EU regions find a positive, conditional effect of the cohesion policy to promote regional resilience during downturns (Di Pietro et al., 2021), though with heterogeneous patterns (Crescenzi and Giua 2020). Positive short-term consequences are also documented when looking at single member states (Arbolino et al., 2020; Psycharis et al., 2020).⁵ Differently from previous works, where resilience has been measured with GDP and labour market variables, we explicitly focus on the effects of the cohesion policy on regional export resilience during shocks (Mena et al., 2022). We also integrate the few studies that use empirics from the EU funds over the years of the Great Recession to construct counterfactual scenarios for the Covid-19 shock (Arbolino and Di Caro 2021), by investigating regional trade dynamics.

This paper is also related to the works that investigate the role of the cohesion policy for promoting international trade and foreign investments (Basile et al., 2008). By providing funds primarily to lagging regions the cohesion policy contributes to improve productivity of local firms (Marrocu et al., 2013) and sustain the attractiveness of territories (Breuss et al., 2010). Therefore, we can expect a positive impact of the EU funds on regional trade also in normal times. We integrate this literature along two dimensions. We explicitly look at regional export performance during shocks, by comparing the two main crises occurred in the last two decades. We assess the consequences of the cohesion funds on export recovery in the short run in order to link EU funds absorption and trade resilience. In doing this, we contribute to the research works that assess the role of the EU for sustaining economic growth at time of Covid-19 (Barbier-Gauchard et al., 2021).

2.2. Trade resilience

Our study is connected to the literature analysing the responses of trade during economic crises and shocks (Eaton et al., 2016): an area of research that regained importance in the past two years to study the effects of the pandemic on the resilience of exporting activities (Bas et al., 2022). Focusing on the effects of downturns on trade is important for different reasons: to identify the degree of sensitivity of trade to shocks; to quantify differences in the export performance across areas during the shock-absorption phase; and, to understand the determinants of international trade recovery (Behrens et al., 2013). Our work differs from previous studies as follows. We explicitly investigate the role of regional policies as drivers of trade resilience, by looking at exports as a new dimension of inquiry in the relation between the EU funds and regional resilience. We also compare trade resilience during two shocks, namely the Great Recession and the Covid-19 crisis, from a regional perspective, by limiting the influence of differences in national institutions and exchange rates that are present in cross-country studies (Nchofoung 2022).

In addition, we integrate the growing number of studies that look at the heterogeneous trade effects of the Covid-19 shock on sectors and firms (Espitia et al., 2022), by focusing on the regional dimension of trade.⁶ The comparison of regional trade performance during different shocks adds to the works that use the trade collapse observed during the Great Recession for understanding the effects of the pandemic, from a country perspective (Baldwin and Tomiura 2020). We also contribute to the analyses on the impact of public policies to support the resilience of exporting activities at time of pandemic for countries (Mena et al., 2022) and firms (Harasztosi et al., 2022), by using information from the cohesion policy implementation at regional level to construct different scenarios. As for Italy, we contribute to the recent discussion on the regional effects of the Covid-19 shock (Ferraresi et al., 2021; Brancati and Brancati, 2020), by explicitly looking at the relationship between export resilience and cohesion policy.

3. Data and preliminary evidence

3.1. Regional trade resilience in Italy: Great Recession and Covid-19

The start phase of the Covid-19 crisis produced severe adverse consequences on the Italian economy, particularly during the general lockdown decided by the government between March and May 2020 (Juergensen et al., 2020). In this period, all economic variables registered significant negative variations: in 2020Q2, for instance, exports and imports decreased by about -28% and -20% in comparison to the previous quarter. The negative impact of the first wave of the pandemic on exports, calculated as the difference in regional exports between the first semester of 2020 and the corresponding period of 2019, shows asymmetries across Italy: -16% (North-West); -14% (North-East); -15% (Centre); -13% (South); and, -20% (Islands). Regional differences, which are significant at 1% level after performing the ANOVA Tests on the equality of the mean level, mostly depend on the uneven concentration of the first wave of the health emergency in Italy, with the regions located in the North that experienced the most severe health shock (Ascani et al., 2021). Differences in regional economic structures and trade openness diversity are additional factors that can explain the asymmetric territorial distribution of the effects of the Covid-19 shock on regional trade (Prometeia 2020).

In Table 1, we report export sensitivity indexes for the twenty Italian regions, calculated as the regional percentage decline in exports compared to the national decline in the same variable; data from the Italian Institute of Statistics (ISTAT). Regional sensitivity

⁵ As for Italy, Albanese et al. (2020) analyse the effects of the allocation of the EU funds on different outcomes in the local labour systems in Southern Regions over the years 2007–13; Cerqua and Pellegrini (2018) find a positive impact of the cohesion policy on the growth of employment in Italian municipalities during the Great Recession. For a review, see Arbolino and Di Caro (2021).

⁶ For a review of the literature on the effects of Covid-19 on trade resilience, see Bas et al. (2022).

refers to the first year of the Great Recession, when the trade collapse was particular relevant (Francois and Woerz 2009), and the first wave of the pandemic crisis.⁷ This index provides information on the degree of synchronization of a given region with respect to the national benchmark in terms of positive/negative growth of exports during a shock, with the national economy being the reference against which to measure the relative resistance of regions (Fingleton et al., 2012). Since the growth of Italian exports during the observation periods is negative, a value of the sensitivity index higher (lower) than one denotes the situation of a region showing lower (higher) export resilience to a given crisis. Our preference for regional exports as a measure of trade resilience is motivated by noting that exports directly follow business cycle variations and changes in firm attitudes during shocks (Iacovone et al., 2019), particularly when comparing different locations within the same country (Martin and Gardiner 2019). We use regional exports in nominal values since differences in prices among regions within the same country are difficult to be measured with accuracy (Cecchetti et al., 2002). For completeness, we have checked the robustness of our results (Section 5) to alternative measures of trade resilience, including trade openness indicators and variables in real values (Alcalá and Ciccone, 2004).

From Table 1, some comments are worth noting. Regional export sensitivity has been more unequal during the first year of the Covid-19 shock compared to the Great Recession: the standard deviation observed during the pandemic is more than twice that registered during the years 2009–08. In the first wave of the pandemic, moreover, different regions registered very high export sensitivity values, with export losses that were about two and four times higher than the Italian average in regions like Sicily and Sardinia. One of the reasons for the low resilience registered in these regions can be the high concentration of the tourism and petroleum sectors, which were severely affected by demand slowdown and reductions in petroleum price. Interestingly, the initial effects of the Covid-19 on exports were not as strong as those of the Great Recession in the case of Puglia, Emilia-Romagna, and Abruzzo, probably due to the importance of the agricultural and food sectors in these regions, which were classified as necessary activities (Ferraresi et al., 2021). Although the impact of the two shocks on regional exports shows some differences, we find a positive, significant correlation of about 0.75 when comparing the sensitivity indexes of columns 1 and 3, by suggesting the presence of some common patterns during the Great Recession and the Covid-19 crisis across the Italian regions (Arbolino and Di Caro 2021).

3.2. The cohesion policy in the Italian regions

We construct the following index to measure the absorption of the cohesion policy in a given region for each programming period year:

$$0 \leq EU \text{ Absorption Index}_{i,t} = \left(\frac{Payments_{i,t}}{Funds \text{ Allocated}_{i,t}} \right) \leq 1. \quad (1)$$

For each region, this index is calculated as the ratio of finalised payments at the end of a given year with respect to the amount of funds allocated for the same year (Arbolino et al., 2020). Values of this measure close to one (zero) denote high (low) financial absorption of the EU funds on a regional level, that is, high values of the index implies high absorption of the EU cohesion policy. We use information on the location and progress of the EU funds obtained from the database *Opencoesione* for the programming period 2007–2013, by covering almost 800,000 projects.⁸

Given our interest for the relationship between cohesion policy and regional exports, we focus on the EU funds allocated to the following six project areas: Research and Innovation; Education; Firm Competitiveness; Digitalisation; Transport and Infrastructure Network; and Employment and workers mobility. Based on the literature studying the link between public policies and export performance, the selected project areas cover EU projects that can have a direct or indirect effect on export performance (Nicolini 2003; Ferrara et al., 2017). In addition, the EU funds supporting programs in these policy areas have been recalibrated during the Great Recession and the Covid-19 shock to sustain firms and territories (Ciffolilli et al., 2019). In Emilia Romagna and Tuscany, for instance, the EC has redirected 30 million euro during the first wave of the pandemic crisis to help such regions to cope with the Covid-19 shock.

In Fig. 1, we report the regional distribution of the absorption index calculated for all (graph a) and selected (graph b) project areas covering R&I and Education, for which we can expect a direct impact on export performance, for the programming period 2007–2013. Northern and Central regions show high absorption of cohesion policy funds, while Southern regions register low values, though the latter ones receive the highest amount of cohesion funds in Italy (as also in Arbolino et al., 2019). The North-South divide is also present when looking at the progress of the EU funds supporting projects for R&I and Education, though with differences within the two macro-areas. Campania and Sicily show the lowest absorption rates, while Lombardy registers the highest level of absorption. Therefore, we can expect different impacts of the cohesion funds in the Italian regions due to the heterogeneous distribution of the absorption of the EU payments (Arbolino et al., 2020). Interestingly, during the period 2019–21, regional differences in the absorption of the cohesion policy have narrowed, with a decrease of the standard deviation of the absorption index of about -0.01 , by suggesting the alignment of the progress of the EU payments particularly when looking at nationally managed programs (MEF 2022).

The absorption index, however, captures the financial dimension of the cohesion policy only, which needs to be integrated with qualitative aspects on the management of the EU funds to understand differences in regional performance more punctually (Moreno 2020). Thanks to the detailed information in the *Opencoesione* database, for each region, we also build a measure describing the

⁷ We do not calculate the index for the first quarter of 2020 since the start of the Covid-19 shock in Italy was in March 2020. The fourth quarter of 2020 has been excluded given that starting from November 2020 the Italian government introduced a system of region-based restrictive measures that can bias regional comparisons.

⁸ We provide details on the EU cohesion data used in the paper in the Appendix.

Table 1
Regional export sensitivity index, Great Recession and Covid-19 shock.

Region	Great Recession		Covid-19 shock	
	(2009–2008)	(2020Q2/2019Q2)	(2020–2019)	
Piemonte	1.031	1.282	1.353	
Valle d' Aosta	1.735	1.491	2.191	
Liguria	−0.494	1.058	0.036	
Lombardia	0.998	0.957	1.153	
Trentino A.A.	0.801	0.825	0.787	
Veneto	1.026	0.915	0.834	
Friuli V.G.	0.899	0.965	0.841	
Emilia Romagna	1.107	0.879	0.764	
Toscana	0.427	1.058	0.608	
Umbria	1.062	1.052	1.313	
Marche	1.189	0.943	1.226	
Lazio	0.832	1.023	0.848	
Abruzzo	1.502	0.970	0.632	
Molise	1.675	−0.339	−2.873	
Campania	0.766	0.687	0.608	
Puglia	1.082	0.794	0.924	
Basilicata	1.067	1.962	0.445	
Calabria	0.780	0.529	1.561	
Sicilia	1.796	0.885	2.260	
Sardegna	2.093	2.340	4.388	
Italy	1.000	1.000	1.000	
St. dev.	0.552	0.527	1.297	
Min	−0.494	−0.339	−2.873	
Max	2.093	2.340	4.388	

Note: Sensitivity indexes are calculated by comparing variations for the following periods: 2009–08 (Great Recession); 2020Q2–2019Q2 and 2020–2019 (Covid-19 shock); own elaboration on data from ISTAT.

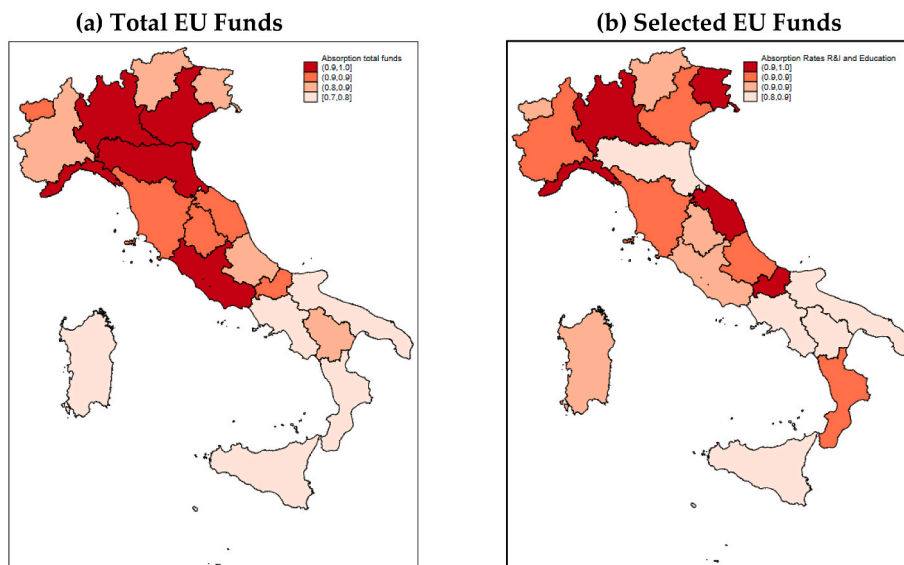


Fig. 1. The absorption of EU cohesion policy, total and selected project areas.

Note: The graph a (b) reports the regional distribution of the absorption index for total (two selected) project areas, calculated on average for the programming period 2007–2013; own elaboration on OpenCoesione data.

effective time of implementation of the EU projects during the 2007–2013 programming period, which we obtain from the comparison between the expected and effective dates of project conclusion. In detail, this index is constructed as the weighted average of regional time implementation scores of the EU funds, with projects timely concluded having a score equals to one, and projects whose effective completion date is delayed counting for 0.5. Regions with values of the index above (below) the Italian average are defined as Timely (Late) implementation regions.⁹ By including this information in our empirical analysis, we also describe the non-financial progress of the EU cohesion policy (Ederveen et al., 2006); for more details, see the Appendix.

4. The empirical analysis

Our empirical strategy proceeds as follows. We start calculating the regional export elasticity of the cohesion policy during the Great Recession to identify the effects of the EU funds on regional export performance during shocks. The panel specification includes both the effects of the absorption of the EU funds and a measure describing the total allocation of the cohesion policy on a regional level. Our panel models also allow for the consideration of the effects of the national strategy ‘Piano Azione & Coesione’ (PAC) that was operative in the years 2011–2013 to speed up the implementation of the EU expenditures during the Great Recession. Some of the innovations of the PAC, such as the role of the central government in the management of cohesion funds, have been confirmed during the programming period 2014–2020 (Camera dei Deputati, 2020). The model specification and main results are reported in Section 4.1.

We use the estimates obtained for the years of the Great Recession to build different regional export adjustment scenarios that we apply to the first wave of the Covid-19 shock. In detail, we compare the export losses actually observed in the Italian regions during the first year of the pandemic crisis (baseline) with the net export losses that can derive from the inclusion of the effects of the absorption of the EU funds (alternative scenario). We construct two scenarios depending on the regional export elasticity coefficient that we apply to regional export data. Scenario 1, when we use the average estimated effects of the cohesion policy on a regional level; scenario 2, when we apply different estimated elasticity coefficients of the cohesion policy obtained for the sub-group of regions that show timely/late implementation of the EU funds, as discussed beforehand. In economic terms, the regional export effects of the absorption of the cohesion policy are calculated in the presence of homogeneous (heterogeneous) relations between the EU funds and regional exports for scenario 1 (scenario 2). The description of the results is given in Section 4.2.

The application of empirics from the Great Recession for building economic scenarios during the Covid-19 shock relies on the assumption that the two crises show some similarities (Wilson 2020). In this case, the resulting calculations can be read as good short-term approximations at time of Covid-19 (Foroni et al., 2020), which can be used to support policymaking in real-time (Baldwin 2020). The Great Recession and the first wave of the Covid-19 shock registered similar magnitudes in the international trade collapse (IMF 2022) and, most importantly, economic policy responses at time of Covid-19 have been designed on the basis of some of the actions undertaken during the previous crisis (Strauss-Kahn 2020). In the EU, the impact of the two shocks on stock markets, trade, and manufacturing activities shown several parallels (Breitenfellner et al., 2020). Global value chains suffered during the Great Recession and the pandemic shock, as well (Meier and Pinto 2020). We discuss this issue in Section 5.

4.1. Results for the Great Recession

To describe the effects of cohesion policy on regional export performance during crises we have estimated the following panel model:

$$Export_{i,t} = \beta_0 + \beta_1 Cohesion_{i,t-1} + \beta_2 Cohesion_PAC_{i,t} + \beta_3 TotalFund_{i,t} + \gamma' X_{i,t} + \sum_{2013}^{2007} \delta_t d_t + \varepsilon_{i,t} \quad (2)$$

where $Export_{i,t}$ is the (log of) export value (in euro) in region i ($i = 1, \dots, 20$) at time t ($t = 2007, \dots, 2013$). The variable *Cohesion* is our main explanatory variable that describes the effects of the cohesion policy, as measured by the absorption index in (1). It has been lagged by one period in order to check for the dynamic impact of the EU funds on regional exports, that is, the relation between structural funds and regional export performance can take some time to become effective (Mohl and Hagen 2010). We also define an interaction variable (*Cohesion_PAC*) between the absorption index and a dummy covering the years (2011–2013) to capture the effects of the new strategy PAC.

In our baseline specifications, the vector of controls $X_{i,t}$ includes the following covariates. The log of regional gross domestic product per-capita (*GDP per capita*), used to account for differences in economic conditions across regions and heterogeneous home market and labour effects (Jafari et al., 2011; Bonasia et al., 2020), for which we expect a positive impact. Regional population (in logs) to control for the different size of regional units (Becker et al., 2010). The covariate *TotalFund*, defined as the total amount of funds yearly allocated in every region at the beginning of the programming 2007–2013, to check for differences in committed funds, given

⁹ The Timely implementation group includes: Piemonte, Valle d’Aosta, Lombardia, Veneto, Friuli V.G., Emilia Romagna, Umbria, Lazio, Abruzzo, Molise, Basilicata and Sardegna. The remaining regions are in the Late implementation group. Results, available upon request, are unchanged when applying different scores (in the range 0–0.5) for describing late implementation and classifying regions.

the presence of some Objective 1 regions¹⁰ in our sample. In every specification, moreover, we add regional and time fixed-effects in order to account for time-invariant differences and shocks common to all regions (Bondonio and Engberg 2000). In Section 5, the baseline set of controls has been enriched with other variables commonly used in the literature to check the robustness of our findings.

In Table 2, we report the estimates of the relation (2) by using the feasible Generalized Least Squares (GLS) estimator to our panel data, which is appropriate in the presence of regional and time fixed effects, and when heteroskedasticity is a concern (Hsiao, 2014). We have estimated the relation (2) for: the full sample of Italian regions, models A-B; and, the sub-sample of regions that show timely (late) implementation of the EU cohesion projects, models C-D (E-F). In the specifications B–C–F, we also include the interaction variable *Cohesion_PAC* to account for the role of the national strategy PAC. In these models (B–C–F), the variable *Cohesion* indicates the baseline effect of the policy, while the sum of the coefficients associated to the variables *Cohesion* and *Cohesion_PAC* assesses the overall impact of the policy in the concerned period. Therefore, the *Cohesion_PAC* policy evaluates the additive effect of the policy to the degree of effectiveness of Cohesion policy.

Model information and diagnostics are at the bottom of Table 2. Alternative specifications are in Section 5.

Our main results can be summarised as follows. We detect a positive, significant impact of the absorption of the EU funds on regional export performance during the Great Recession, notwithstanding the model specification used. In economic terms, in the regions where cohesion funds are adequately transferred to beneficiaries the trade collapse observed during the Great Recession is less pronounced, since policy actions bolstered the adaptability of regional economies to the changing international environment (Mena et al., 2022). Moreover, the positive consequences of the EU funds on regional exports are amplified when considering the new strategy PAC (as proved by the coefficient associated to the variable *Cohesion_PAC*), by confirming the beneficial role of the recalibration operated in the years 2011–13 for regional resilience (Arbolino et al., 2020). We also find differences in the role of the cohesion funds on promoting exports during shocks for the two sub-groups of regions showing timely/late implementation of cohesion payments. Indeed, in the regions with timely absorption the impact of cohesion policy on regional exports is about one-third higher than that estimated for the regions with late absorption of the EU funds. This is in line with recent evidence highlighting the heterogeneous impact of cohesion funds on regional economic growth (Di Caro and Fratesi 2022b). The standard controls have the expected signs and, in particular, we confirm that the total allocation of the EU funds does not necessarily have a positive impact on regional growth during shocks (Di Caro and Fratesi 2022a).

4.2. Trade adjustment scenarios at time of Covid-19

To construct our trade adjustment scenarios, we start calculating the average annual change of total exports from the observations for the baseline year (2020), data from ISTAT, following a 10% variation of the EU funds absorption on a regional level, by applying the elasticity coefficients reported in Table 2. In economic terms, we use the relation between regional exports and cohesion policy estimated for the Great Recession, a shock for which we have information, to approximate changes in regional exports during the Covid-19 crisis.

We have assumed a 10% variation of the EU funds absorption in the reference period based on the actual change of this indicator observed between 2020 and 2019, as resulting from the official monitoring of the cohesion policy published by the Ministry of Economy and Finance (MEF 2021). In scenario 1, we have used the elasticity of the EU funds absorption (i.e., β_1 coefficient) obtained from model A, which captures the average impact of the cohesion policy on regional exports. In economic terms, it can be read as a simulation scenario that is valid under the assumption of homogeneous impact of the progress of the EU payments on regional exports across Italy during shocks. In scenario 2, for each region, we have applied the elasticity of the EU funds absorption estimated for the reference sub-group (i.e. Timely and Late), as obtained from models C and E. This scenario is consistent with the idea that the relation between the cohesion policy and regional exports shows heterogeneity among regions (Di Caro and Fratesi 2022a).

In Table 3, we report the observed value of regional exports in Italy at the end of 2020, data from ISTAT. We also show the simulations for scenario 1 (scenario 2) in the second (third) column. Our results suggest that, other things being equal, a 10% increase in the absorption of the EU funds under the homogeneous scenario (scenario 1) can produce a positive impact on regional exports for more than 8,5 billion euro on a national level, of which more than 70% concentrated in the Northern regions. The positive impact of the cohesion policy on regional exports during shocks can be amplified, with a raise of total exports up to about 10 billion euro, under the assumption that the effects of the EU funds absorption are estimated to be heterogeneous across region groups (scenario 2). In this scenario, as expected, the regional distribution of the benefits of the cohesion policy on regional export performance is mostly localised in the North, almost 90% of the simulated impact, given that most of the regions with timely implementation are located in this area.

In Fig. 2, we show the export losses observed in the Italian regions during the first year of the pandemic crisis (blue bar), calculated as the annual variation of total exports between 2020 and 2019. In Italy, about 44 billion euro exports were lost over this period primarily due to the Covid-19 shock. We also report the net export losses under scenario 1 (red bar) and scenario 2 (green bar), which are calculated as follows:

$$\begin{aligned}\Delta export_i^{S1} &= \Delta export_i^B + \Delta export_i^{C1} \\ \Delta export_i^{S2} &= \Delta export_i^B + \Delta export_i^{C2}\end{aligned}\tag{3}$$

¹⁰ Regions with a GDP per capita below the 75% of the EU average are named Objective 1 Regions (2000–2006 Programming Period), Convergence Regions (2007–2013 Programming Period) or Less Developed (2014–2020). They receive the largest part of EU funds (Crescenzi and Giua, 2020).

Table 2

The short-term impact of cohesion policy on regional exports.

Main covariates	Dependent Variable: <i>Total exports (log)</i>					
	(A)	(B)	(C)	(D)	(E)	(F)
<i>Cohesion</i>	0.1976***(0.0753)	0.1054*(0.0622)	0.2438**(0.1258)	0.2194*(0.1221)	0.1813*(0.1020)	0.0116(0.1001)
<i>Cohesion_PAC</i>	–	0.1042***(0.0180)	–	0.0369*(0.0226)	–	0.1591*** (0.0320)
<i>Population</i>	5.6976***(1.1137)	5.6976***(1.1001)	7.5501***(1.3308)	6.6729***(1.4025)	3.2342(2.2714)	0.5962(2.3564)
<i>GDP per-capita</i>	2.4247***(0.3639)	3.2243***(0.3738)	2.8707***(0.3839)	2.9634***(0.3851)	1.2407(0.7854)	2.8809*** (0.7525)
<i>Total Fund</i>	–0.0577*** (0.0168)	–0.0472*** (0.0170)	–0.0733*** (0.0171)	–0.0748*** (0.0172)	–0.0404 (0.0407)	0.0392(0.0372)
<i>Constant</i>	YES	YES	YES	YES	YES	YES
<i>Regional effects</i>	YES	YES	YES	YES	YES	YES
<i>Time effects</i>	YES	YES	YES	YES	YES	YES
<i>Sub-group</i>	–	–	Timely	Timely	Late	Late
<i>Observations</i>	120	120	72	72	48	48
<i>Wald statistics ($\chi^2_{(k)}$)</i>	45,991[0.000]	73,575[0.000]	32,084[0.000]	33,661[0.000]	12,901[0.000]	18,276[0.000]

Note: Robust standard errors are in parentheses (). * implies significance at 10%, ** significance at 5%, *** significance at 1%. In models B,D,F the hypothesis of joint not significance (F-Tests) of the covariates *Cohesion* and *Cohesion_PAC* is always rejected at 1% of statistical significance. Figures in brackets are p-values. Models (A) and (B) refers to the whole sample of regions; (C) and (D) to Timely Implementation regions; (E) and (F) to Late Implementation regions.

Table 3

Regional trade adjustments to cohesion policy funds.

Region	Export Baseline	Δ export scenario 1	Δ export scenario 2
Piemonte	41,107,394	812,282	1,002,198
Valle d'Aosta	560,974	11,085	13,677
Liguria	7,079,778	139,896	128,356
Lombardia	114,062,925	2,253,883	2,780,854
Trentino A.A.	8,441,687	166,808	153,048
Veneto	60,180,750	1,189,172	1,467,207
Friuli V.G.	14,305,953	282,686	348,779
Emilia Romagna	61,973,121	1,224,589	1,510,905
Toscana	40,839,947	806,997	740,428
Umbria	3,797,902	75,047	92,593
Marche	10,865,717	214,707	196,995
Lazio	25,556,703	505,000	623,072
Abruzzo	8,209,473	162,219	200,147
Molise	952,629	18,824	23,225
Campania	11,658,812	230,378	211,374
Puglia	8,205,720	162,145	148,770
Basilicata	3,305,245	65,312	80,582
Calabria	411,417	8130	7459
Sicilia	7,538,490	148,961	136,673
Sardegna	3,391,910	67,024	82,695
Italy	432,446,560	8,545,140	9,949,037

Note: Export values refer to observed data in, 2020; scenario 1 (2) calculations are based on the application of the beta coefficients of model A (C and E), as reported in Table 2. The total for Italy can differ due to rounding; own elaboration on data from ISTAT.

For a given scenario, the simulated net regional export variation (Δexport_t^S) is obtained by summing the (negative) changes of regional exports actually observed (Δexport_t^B) during the first year of the pandemic crisis and the expected (positive) variation of regional exports during shocks deriving from the EU funds absorption (Δexport_t^C), as reported in the second and third columns of Table 3.

The trade adjustment scenarios provide a real-time approximation of the potential consequences of the progress of the EU cohesion funds on regional exports at time of Covid-19, *ceteris paribus*. We find that the net export losses due to the pandemic are reduced after taking into account the effects of the EU funds: other things being equal, we detect a reduction of export losses on annual basis by about 19%–22%, that is, from the observed 44 billion euro exports (baseline) to about –34,9 and –33,5 billion euro exports. As for scenario 1, the highest reduction of export losses is registered in the smallest regions (i.e., Valle d'Aosta, Basilicata, and Molise) and in Abruzzo, Campania, and Toscana, where the positive role of cohesion funds can contribute to reduce export losses up to 40%. When considering the heterogeneous case (scenario 2), the major reduction of export losses is also observed in regions like Friuli V.G., Emilia Romagna,

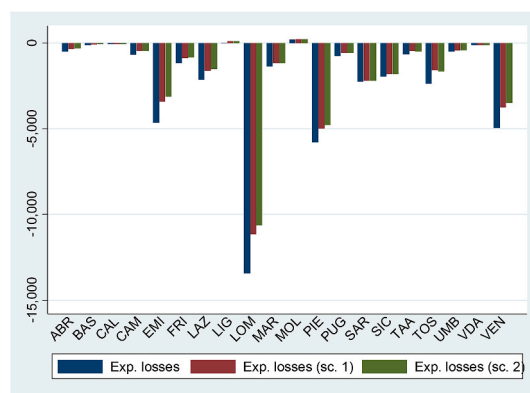


Fig. 2. Regional export changes and the effects of EU funds absorption.

Note: Regions are in alphabetical order; scenario 1 refers to a 10% positive variation of the EU funds absorption (coefficient from model A); scenario 2 refers to a 10% positive variation of the EU funds absorption (coefficients from models C and E).

and Veneto where there is a timely implementation of the EU funds. Other things being equal, therefore, our results suggest that the timely implementation of the cohesion policy can contribute to smooth the adverse effects of the Covid-19 on trade resilience in Italy, by confirming the results obtained for the labour market (Di Pietro et al., 2021).

As a subsequent step completing the scenario analysis, we construct four further scenarios based on the assumption of a potential demand-side shock. Indeed, we consider the growth forecasts released by the IMF in April 2022, based on whom we estimate an increase in GDP of the main trade partners of Italy between 1.1% (lower-bound) and 3.3% (upper bound) might occur up to 2023 (the official closing date for the 2014–2020 Cohesion Programming cycle). This might result in an increase in the demand for Italian export between 6.4% and 8.6%. Additionally, by considering the absorption of EU funds and its effects, export variation might increase up to 8.8–11.1% by the end of the current Programming Cycle (2023). These further analyses are to be considered as alternative short-term forecasts of both regional export performance and the effects of cohesion policy. The methodology adopted for the sensitivity analysis and the results of are discussed in Appendix B.2.

5. Robustness checks

5.1. Alternative specifications for the Great Recession

Panel estimates for the period 2007–13 can be used to construct trade adjustment scenarios at time of Covid-19 provided that they remain unchanged after modifying the baseline relation in (2). In this Section, we start by enriching the set of control variables used in Section 4.1 based on the main literature on regional trade growth. In Table 4, we report the results obtained by adding other controls to the model A (Table 2), where we have estimated the relations between EU funds and regional exports for the total sample of the Italian regions. Additional results for the two sub-groups of regions (models C and E) are reported in the Appendix for saving space.¹¹ In detail, we have added a measure of regional physical infrastructures (model I), data from *Tagliacarne Institute*, to account for regional differences in the endowment of roads, highways, railways, ports, and airports, given the positive influence of infrastructures on transportation costs and exports (Vijil and Wagner 2012). We have also included a proxy for regional human capital (model II), calculated as the share of adult population holding a tertiary degree, given its positive role on regional export competitiveness (Mubarik et al., 2020). In model (III), we have added the regional institutional quality index IQI, which is a composite measure widely adopted for describing institutions in the Italian regions (Nifo and Vecchione 2014), to check for the effects of regional institutions on export growth performance (Levchenko 2007). We have checked for the role of political stability on export flows (model IV), by including a variable describing the average effective duration of regional governments (Alcalá and Ciccone, 2004).

To account for regional differences in innovation capacity, which can influence export performance particularly during shocks (Costantini and Mazzanti, 2012), we have also included: the share of high-tech and high-knowledge activities in each region (model V); and, a measure describing private expenditure in R&I (model VI), calculated as the level of private co-funding to R&I projects during the programming period 2007–13. Finally, in model (VII), we have added selected regional value added sector shares (i.e. agriculture, construction, and manufacturing) to check for differences in regional economic structures across Italy (Rodríguez-Pose and Fratesi 2004). In all the additional specifications, the coefficients of the variable describing the absorption of the cohesion policy are in line with our baseline estimates. The control variables, moreover, have the expected signs (Nicolini 2003). Our main findings remain unchanged, results available upon request, when extending the observation period of the Great Recession until 2015 in order to check for all final payments of the EU cohesion programming period 2007–13 given the N+2 expenditure rule. The introduction of more lags of the absorption index of the cohesion policy, up to two given our short time period, which can capture further dynamics in the

¹¹ Additional results for the models with the interaction term describing the PAC are available upon request.

Table 4
Results with additional control variables, model A.

Main covariates	Dependent Variable: <i>Total exports (log)</i>						
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
<i>Cohesion</i>	0.1787** (0.0723)	0.1711** (0.0725)	0.1585** (0.0647)	0.1940** (0.0824)	0.2108*** (0.0764)	0.1193* (0.0651)	0.1915*** (0.0664)
<i>Population</i>	5.8805*** (1.0916)	3.6191*** (1.3543)	3.9970*** (0.8834)	5.6522*** (1.1822)	5.8204*** (1.1384)	3.3571*** (1.2847)	4.6079*** (1.1464)
<i>GDP per-capita</i>	2.4941*** (0.3605)	2.3609*** (0.3661)	2.0492*** (0.3245)	2.3786*** (0.3734)	2.4139*** (0.3731)	3.0423*** (0.3635)	2.4871*** (0.3692)
<i>Total Fund</i>	−0.0614*** (0.0165)	−0.0476*** (0.0180)	−0.0516*** (0.0156)	−0.0592*** (0.0175)	−0.0660*** (0.0171)	−0.0503*** (0.0169)	−0.0676*** (0.0169)
<i>Infrastructure</i>	0.0055*** (0.0021)						
<i>Human Capital</i>		1.2555*** (0.4541)					
<i>Institutional Quality</i>			1.0774*** (0.1617)				
<i>Pol. Stability</i>				0.3933*** (0.1168)			
<i>High-Tech Spec. R&I investments</i>					0.0046(0.0399)	0.0000** (0.0000)	
<i>Agriculture</i>							−4.3626** (2.1655)
<i>Construction</i>							−6.3545*** (1.3149)
<i>Manufacturing</i>							−2.0339* (1.1155)
<i>Constant</i>	YES	YES	YES	YES	YES	YES	YES
<i>Regional effects</i>	YES	YES	YES	YES	YES	YES	YES
<i>Time effects</i>	YES	YES	YES	YES	YES	YES	YES
<i>Observations</i>	120	120	120	120	120	120	120
<i>Wald statistics</i>	48,013[0.000]	41,799[0.000]	58,097[0.000]	54,043[0.000]	41,292[0.000]	47,391[0.000]	63,743[0.000]
$\chi^2_{(k)}$							

Note: Results include a constant term, regional and time annual effects; Robust standard errors are in parentheses (.); * implies significance at 10%, ** significance at 5%, *** significance at 1%; Figures in brackets [.] are p-values.

relation between the EU funds and regional exports (Mohl and Hagen 2010) does not modify the main results.

We have also checked our results to alternative definitions of the variable measuring regional trade resilience, given the presence of different trade measures in the existing literature (Alcalá and Ciccone, 2004). Specifically, we have used the following trade indexes discussed in Liargovas and Skandalis (2012): (i) the ratio of export to GDP; (ii) the ratio of the sum of import and export to GDP (nominal); (iii) the ratio of the sum of import and export to GDP (real); (iv) the ratio of import on GDP (nominal and real); (v) the ratio of the sum of import and export to GDP per capita (nominal and real); (vi) and, a modified version of the index in (v) that accounts for differences in import dimension. As reported in the Appendix, all these measures show high (>0.65) and significant correlation with our main dependent variable describing regional exports in Italy. The positive, significant relation between the EU cohesion policy and regional trade during the Great Recession is confirmed when using the alternative dependent variables (Tables B4–B6 in the Appendix).

5.2. Discussion and limits of regional trade adjustment scenarios

Our regional trade adjustment scenarios can be interpreted as good approximations of short-term forecasting at time of Covid-19 provided that the two crises show some similarities (Feroni et al., 2020). In detail, the relation between the EU cohesion policy and regional exports during the pandemic shock is not substantially different from that working during the Great Recession, though the presence of exceptional circumstances at time of Covid-19. To include data observed during the Covid-19 shock for constructing more reliable simulations, our adjustment scenarios have been obtained by using actual information on the progress of the EU funds in Italy during the pandemic crisis. Therefore, the calculations of regional net export losses as formulated in (3) are able to describe the potential short-term adjustments of Italian trade (i.e. reasonably one year after the baseline) when considering the impact of the EU cohesion policy.

The Covid-19 crisis, however, shows some peculiarities with respect to previous downturns (Baldwin 2020). The timing of the economic disruption caused by the pandemic is different, that is, in few months the Covid-19 produced very negative effects that in previous crises were recorded over different years (Moreira and Hick, 2021). The health emergency has registered different waves in 2021 and 2022, with continuing implications on production, consumption, and trade. As for international trade, the effects of the Covid-19 crisis have been amplified by other recent shocks such as the Russia–Ukraine war and the raise of energy prices (Anayi et al.,

2022). Given the different international context, therefore, the positive role of the cohesion policy for smoothing the adverse trade effects of the pandemic shock can take more than one year – the reference period of our simulations – to be fully realised. The effects of the cohesion policy on regional exports during the Covid-19 shock can be higher/lower than those registered during the Great Recession depending on the influence of additional unexpected factors.

Although we recognise the possible influence of exogenous variables not included in the model on the expected variation of exports due to the cohesion policy, the ex-post observation of regional export data for the year 2021 can be useful to check for the soundness of our results (Ho 2021). Between 2021 and 2020, data from ISTAT, Italian exports increased by about 77 billion euro, with almost 75% of export growth registered in the North of the country. In the same period, the absorption of the EU funds in Italy registered a positive 10% variation (MEF 2022). Other things being equal, our results suggest that part of this positive export growth, about 10%, can be due to the effective usage of cohesion funds in Italy. Interestingly, these findings are in line with recent estimates on the impact of the EU funds allocated for the period 2021–27 for promoting the recovery of exports in the EU countries in the aftermath of the Covid-19 shock (Bańkowski et al., 2021).

The construction of regional economic adjustment scenarios operated in this paper has two main drawbacks (Ng 2021), which can be useful starting points for future research. First, we use data on annual frequency that are often unable to capture the effective timing of the shock under investigation and, most importantly, they are less appropriate to build short-term forecasts scenarios (Ho 2021). However, we have preferred to use annual data on the EU funds in order to construct the regional cohesion policy absorption index more punctually by using consolidated information on EU payments. Second, the simulations regarding net export losses need to be interpreted with cautions, given that our projections combines elasticity scores from the Great Recession and observed information for the Covid-19 crisis, without introducing additional hypotheses on the forecasts of economic variables at time of pandemic (Foroni et al., 2020). In the Appendix, we discuss how the trade adjustment scenarios are modified when including official forecasts in our calculations.

6. Conclusions

There are high expectations on the role of the EU funds allocated for the period 2021–27 for promoting the recovery of economic activities across Europe, by supporting smart, sustainable and inclusive growth strategies. The effective usage of EU financial resources across and within EU member states is particularly important today when the fragility of international trade is undermined by different challenges, including new waves of the Covid-19 pandemic, the Russia-Ukraine war, and global inflation. In this uncertain environment, it is important to provide evidence on the expected impact of the EU funds on economic variables and, specifically, on trade resilience in order to help policymakers to design more effective recovery policies. The findings presented in this work act in this direction. In detail, our results confirm that during the start phase of the pandemic crisis the resilience of regional economies in Italy was uneven, by reflecting differences in economic structures and resistance across territories (Arbolino and Di Caro 2021). We also find that the export losses registered in the first wave of the Covid-19 shock are reduced once the effects of the progress of cohesion policy funds are considered. This is in line with recent evidence for the EU countries, which suggests that in the next years about one-third of total effects of the EU Next Generation funds will contribute to the export recovery performance of the EU (Pfeiffer and Varga 2021). That said, the absorption of the EU funds has to be set as a priority as relevant as the allocation of cohesion funds.

Despite our results have to be interpreted with caution, particularly due to the uncertainty of data collection at time of the Covid-19 shock, we can derive some policy messages from them. First, the most relevant adverse trade effects of the pandemic crisis were localised in the regions more exposed to international global value chains and external demand shocks (Accetturo and Giunta 2018; Bonadio et al., 2021). Second, the effectiveness of the cohesion policy to sustain regional trade resilience is amplified when the regions show timely implementation of the EU projects, that is, the financial and non-financial progress of the cohesion funds are both relevant aspects to be considered. Third, we support the view that the cohesion policy is able to produce countercyclical consequences, particularly when flexible rules are introduced at the national and the EU levels, as well. Finally yet importantly, our evidence claims for a proper management of cohesion funds during the current recovery phase, which is a necessary conditions to meet the expectations related to the programming period 2021–27 (Barbier-Gauchard et al., 2021).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.inteco.2022.09.008>.

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