64th ERSA Congress 2025

Time efficiency of cohesion projects in Europe: A regional panel and project-level analysis

Debora Gambina, Fabio Mazzola
Department of Economics, Business and Statistics - University of Palermo
Viale delle Scienze, Building 13, 90128 Palermo, Italy
debora.gambina@unipa.it, fabio.mazzola@unipa.it

Extended abstract

1. Literature and conceptual framework

Delays in public projects' implementation can impact negatively on society, by postponing the utilization of public goods (Lewis and Bajari, 2011) and dampen the positive effects of investment policies (Leeper et al., 2010).

The existing literature on time performance presents several shortcomings, such as the adoption of a country-specific perspective (see, among others, Assaf and Al-Hejji, 2006; Olawale and Sun, 2015; Senouci et al., 2016; Gori et al., 2017) and the limitation of the investigation to selected projects, such as large transport infrastructures, mainly relying on survey-based techniques (see, among others, Chevroulet et al., 2011; Kelly et al., 2015; Zidane and Andersen, 2018; Fashina et al., 2021). The focus on a specific country and a small sample of selected interventions may undermine the external validity of the policy implications.

Disclosing the drivers of timely completion and the determinants of delays is key for policymakers in order to condition the public funds allocation to the improvement of those factors associated with inefficiency.

The issue is crucial for European cohesion policy (ECP) due to the need to maximize the impact of supranational financing and justify its allocation. Lagging territories may experience obstacles due to a weak economic, social and institutional context. Therefore, the factors associated with implementation inefficiency should be carefully analysed at the regional level.

The European Commission highlighted the issue of timely completion (European Commission, 2014) and recently Crescenzi et al. (2021) and Marques Santos et al. (2023) introduced empirical considerations on time performance. However, the former still concentrated on a single country (Italy) and neglected regional variables, while the latter analysed the speed of absorption capacity of European funds, only indirectly linking absorption with duration.

There has been no supranational investigation on the explicit detection of factors associated with timely implementation of ECP projects. Our paper aims to fill this gap with the following novelties.

We identify the drivers of implementation delays in European cohesion projects by adopting a sub-national perspective. In particular, we evaluate the impact of regional context factors and project-specific features on the time performance of projects in European regions through both a regional panel and a project level assessment. We analyse the projects implemented by the recently concluded programming period (2014-20) specifically those included under the thematic objective 'low-carbon economy'.

In the regional level analysis, our key regional explanatory factors of time efficiency are development level (proxied by per capita GDP), urbanization (proxied by population density) and institutional quality (proxied by the European Quality of Government Index, or EQI) due to the following theoretical channels of influence.

More developed regions would manage projects efficiently (Carlucci et al., 2019), however, they may also invest in time consuming complex projects.

The potential obstacles faced by less-populated areas in completing works on time could be due to the shortage of basic infrastructures and access to resources (materials, skilled labour).

In corrupted regional contexts, the risk of adaptation costs is higher, which in turn, is associated with longer execution durations (Guccio et al., 2012). In ECP literature, there is a long-standing debate about the role of the institutional context and administrative capacity on the absorption rate and cohesion funds' outcomes (see, among others, Milio, 2007; Crescenzi et al., 2016; Mendez and Bachtler, 2022). However, the influence of government quality on time performance across EU regions has not yet been explicitly explored.

Moving on to the project-level assessment, we compare the influence of the regional context variables on implementation time with that exerted by variables reflecting specific project characteristics, namely project expenditure, to capture project dimensionality and complexity (Bajari et al., 2009; Baltrunaite et al., 2021); co-financing rate, whose effect on European projects' implementation has never been directly empirically explored in the literature; typology of interventions (infrastructural projects, incentive to SMEs and incentives to large firms). Moreover, we analyse potential changes in completion speed across the programming period.

2. Empirical framework

2.1 Data

Our investigation focuses on the Thematic Objective TO04, named '*Low-carbon economy*' financed by the European Regional Development Fund. Delays in projects with sustainability aims may defer the achievement of carbon emissions mitigation.

The data on concluded projects were extracted from 'Kohesio', a database managed by the European Commission that tracks each cohesion investment in European member states during the 2014-2020 programming period.

We computed the project implementation time by calculating the difference in the number of days between the starting and the completion dates. Previous studies have used other measures, such as the difference between actual and expected completion dates (Guccio at al., 2012; Guccio et al., 2014). However, contrasting the predicted completion with the actual one can introduce biases if the

predicted duration is over- or underestimated (Chadee et al., 2021). Our duration measure is, instead, based on actual time.

We standardized the duration by the amount of eligible expenditure to control for the project dimension. We aggregated the data at the NUTS-2 level by calculating the regional average. The sample includes projects started between 2014 and 2021.

Our regional context explanatory variables are per capita GDP (Eurostat Regional Database); population density (Eurostat Regional Database) and EQI (Charron et al., 2015; Charron et al., 2019).

From the Kohesio database, we extracted the project-specific characteristics for the project-level assessment, namely expenditure, national cofinancing rate, typology of intervention and starting year.

2.2 Model specification

For the regional level analysis, we consider a panel specification (eq.1) with two different sub-periods. The first sub-period includes projects that started and were completed between 2014 and 2017 while the second one includes those that started and were completed between 2018 and 2021. The model is performed through random effects GLS methodology with standard errors clustered at the regional level.

$$Reg\_impl\_time_{it} = \beta_0 + \beta_1 Development_{it} + \beta_2 Urbanization_{it} + \beta_3 Institutions_{it} + \lambda_i + \varepsilon_{it} \quad (1)$$
$$i = 1,\ldots, n;\ t=1, 2$$

where *Reg_impl_time:* regional average time standardized by eligible expenditure; *Development:* regional per capita GDP; *Urbanization:* regional population density; *Institutions:* regional institutional quality*;* λ_i*:* random effect; ε_{it}: error term. To account for potential endogeneity issues, the explanatory variables for the first period were calculated in 2013 year and, for the second period, in 2017 year.

The model specification of the project-level analysis follows (eq.2):

$$Proj\_impl\_time_j = \beta_0 + \beta_1 Exp_j + \beta_2 Cofin_j + \beta_3 Development_j + \beta_4 Urbanization_j + \beta_5 Institutions_j + Typology + Starting\ year + \varepsilon_j \quad (2)$$
$$j = 1,\ldots, J$$

Proj_impl_time: duration in years of each project *j*; *Exp:* project expenditure; *Cofin:* project co-financing rate; *Development, Urbanization, Institutions* have the same meaning as in eq.1; *Typology:* dummies referred to the three different categories of the projects; *Starting year:* dummies for each starting year; ε_j: error term. The explanatory variables have been calculated at the project starting year to account for potential endogeneity. We applied OLS (here reported) and survival techniques for robustness.

3. Selection of results and some policy implications

From the regional level analysis (Table 1), population density and institutional quality are associated with a faster implementation time while per capita GDP with a slower one. All the coefficients are statistically significant in the specification (b) estimated with the addition of time fixed effect whose coefficient shows that the implementation time appears to be reduced in the second period.

Thus, regions with higher level of per capita GDP seem to invest in more complex projects. The more time efficiency in urban areas may reflect, beyond the presence of high quality

infrastructure and a more dynamic labour market, a greater consciousness of the social relevance of sustainability-related projects. In less populated contexts, with low levels of human capital, stagnation is likely; therefore, it may turn out to be demanding to prevent climate change-related disruptions. The institutional context seems to be a crucial factor of efficiency, due to a close link between government quality and administrative capacity.

Table 1 Drivers of implementation speed of low-carbon economy projects - Regional level panel evaluation

Variables	**(a)**	**(b)**
Development	0.0027	0.0038*
	(1.39)	(1.87)
Urbanization	-0.0022**	-0.0023**
	(-2.27)	(-2.35)
Institutions	-0.0013**	-0.0015**
	(-1.83)	(-2.14)
2nd period dummy		-0.0011
		(-1.23)
N. Obs	324	324
Breusch-Pagan LM test	62.46***	62.46***
Hausman test	0.16	
R^2	0.0396	0.0493

Notes: Robust t-test in parentheses. Standard errors clustered at the regional level.
***: p-value<0.01, **: p-value<0.05, *: p-value<0.10.

The effect of the regional drivers remains confirmed in the project-level analysis (Table 2, full specification d). Furthermore, the coefficient associated with project expenditure is positive and statistically significant. This result, together with the positive sign of the per capita GDP coefficient, supports the conclusion that the more developed regions could invest in more complex projects. The effect of national co-financing slows down the implementation speed according to our results which could be due to longer bureaucratic processes. With respect to the baseline 'Infrastructure', the incentives to SMEs and to large firms are less time consuming. Efficiency seems to increase monotonically as we approach the end of the programming period, which may be associated with the pressure to lose the financing.

Several robustness checks based on survival techniques, not reported for brevity, support our results. Moreover, we carry out an assessment on the three different subsamples of intervention according to which regional context indicators seem to be more relevant for infrastructural interventions than for incentives. National cofinancing mainly slows down the implementation speed of incentives to large firms that can be associated to a stricter bureaucratic control applied by member states in these cases.

Table 2 Drivers of implementation speed of low-carbon economy projects - Project-level evaluation

Variables	(a)	(b)	(c)	(d)
Expenditure	0.4173***	0.4200***	0.3524***	0.3610***
	(21.10)	(23.84)	(14.58)	(16.66)
Cofinancing rate	0.0086***	0.0096***	0.0030	0.0045**
	(3.00)	(3.94)	(1.30)	(2.18)
Development	-0.0019	0.3940	0.1869	0.5438**
	(-0.01)	(1.54)	(0.76)	(2.27)
Urbanization	0.0343	-0.0669	-0.0207	-0.1113*
	(0.44)	(-0.96)	(-0.28)	(-1.72)
Institutions	-0.1990*	-0.2086*	-0.1978**	-0.2075**
	(-1.72)	(-1.81)	(-2.04)	(-2.11)
Dummy 2015		-2.1207***		-2.0519***
		(-9.57)		(9.32)
Dummy 2016		-2.5936***		-2.4816***
		(-12.01)		(-12.16)
Dummy 2017		-2.7376***		-2.6296***
		(-13.84)		(-13.57)
Dummy 2018		-2.7630***		-2.6079***
		(-14.30)		(-13.63)
Dummy 2019		-3.0370***		-2.8922***
		(-15.82)		(-15.20)
Dummy 2020		-3.1818***		-3.0374***
		(-16.15)		(-15.56)
Dummy 2021		-3.7358***		-3.5888***
		(-18.74)		(-17.66)
Dummy LARGE			-1.0265***	-0.9085***
			(-10.48)	(-9.38)
Dummy SME			-0.6619***	-0.6028***
			(-7.36)	(-6.42)
N. Obs	37,212	37,212	37,212	37,212
R^2	0.2749	0.3590	0.3161	0.3923
VIF	1.35			

Notes: Robust t-test in parentheses. Standard errors clustered at the regional level.
Baseline year: 2014. Baseline category: Infrastructure. ***: p-value<0.01, **: p-value<0.05, *: p-value<0.10.

Our findings push for monitoring the speed of investment flows in less populated areas where popular discontent with slow and unfinished works as well as the sensitivity to climate change issues may be lacking. European policymakers should also be concerned about the regional institutional

context during the EU funds allocation. In contexts characterized by low institutional standing, projects selection is likely to be mediated by political cycles, self-interest and rent seeking and not in line with social welfare considerations. Investment in human capital accumulation is crucial to address these challenges. The faster implementation of projects started towards the final years of the programming period could be linked to the preference of policymakers to launch projects that guarantee quick completion. Therefore, pressures to avoid fund losses may compromise the quality of the project selection process.

References

Assaf S.A., Al-Hejji S. (2006) Causes of delay in large construction projects. International Journal of Project Management, 24(4):349-357.

Bajari P., McMillan R., Tadelis S. (2009) Auctions versus negotiations in procurement: an empirical analysis. J. Law Econ. Org, 25(2):372-399.

Baltrunaite A., Orlando T., Rovigatti G. (2021) The implementation of public works in Italy: institutional features and regional characteristics. Questioni di Economia e Finanza 659, Bank of Italy.

Carlucci C., Giorgiantonio C., Orlando T. (2019) Tempi di realizzazione delle opere pubbliche e loro determinanti. Questioni di Economia e Finanza, Bank of Italy, 538.

Chadee A., Hernandez S.R., Martin H. (2021) The influence of optimism bias on time and cost on construction projects. Emerging Science Journal, 5(4):429-442.

Charron N., Dijkstra L., Lapuente V. (2015) Mapping the regional divide in Europe: A measure for assessing quality of government in 206 European regions. Social indicators, 315-346.

Charron N., Lapuente V., Annoni P. (2019) Measuring Quality of Government in EU Regions Across Space and Time. Papers in Regional Science, 98:1925-1953.

Chevroulet T., Giorgi L., Reynaud C. (2011) New Approach for the Assessment of High-Speed Rail Projects and How to Contain Cost Overruns: Lessons from the EVA-TREN Project. Journal of Infrastructure Systems, 18.

Crescenzi R., Di Cataldo M., Rodríguez-Pose A. (2016) Government quality and the economic returns of transport infrastructure investment in European regions. Journal of Regional Science, 56:555-582.

Crescenzi R., Giua M., Sonzogno G.V. (2021) Mind the Covid-19 crisis: An evidence-based implementation of Next Generation EU. Journal of Policy Modeling, 43(2):278-297.

European Commission (2014) 6th Report on Economic, Social and Territorial Cohesion.

Fashina A.A. Omar M.A., Sheikh A.A., Fakunle F.F. (2021) Exploring the significant factors that influence delays in construction projects in Hargeisa, Heliyon, 7(4).

Gori G., Lattarulo P., Mariani M. (2017). Understanding the procurement performance of local governments: A duration analysis of public works. Environment and Planning C: Politics and Space, 35(5):809-827.

Guccio C., Pignataro G., Rizzo I. (2012) Determinants of adaptation costs in procurement: an empirical estimation on Italian public works contracts. Applied Economics, 44(15):1891-1909.

Guccio C., Pignataro G., Rizzo I. (2014) Do local governments do it better? Analysis of time performance in the execution of public works. European Journal of Political Economy, 34: 237-252.

Kelly C., Laird J., Costantini S., Richards P., Carbajo J., Nellthorp, J. (2015) Ex post appraisal: What lessons can be learnt from EU cohesion funded transport projects?. Transport Policy, 37:83-91.

Leeper E. M., Walker T. B., Yang S.S. (2010) Government investment and fiscal stimulus. Journal of Monetary Economics, 57(8):1000-1012.

Lewis G., Bajari P. (2011) Procurement Contracting With Time Incentives: Theory and Evidence. The Quarterly Journal of Economics, 126(3):1173-1211.

Marques Santos A., Conte A., Molica F. (2023) Money talks, but can it run? Assessing the territorial dynamics of EU funds absorption capacity. JRC WP on Territorial modelling and analysis, Joint Research Centre.

Mendez C., Bachtler J. (2022) The quality of government and administrative performance: explaining Cohesion Policy compliance, absorption and achievements across EU regions. Regional Studies, 58(4):690-703.

Milio S. (2017) Can Administrative Capacity Explain Differences in Regional Performances? Evidence from Structural Funds Implementation in Southern Italy. Regional Studies, 41(4):429-442.

Olawale Y., Sun M. (2015) Construction project control in the UK: Current practice, existing problems and recommendations for future improvement. International Journal of Project Management, 33(3):623-637.

Senouci A., Ismail A., Eldin N. (2016) Time Delay and Cost Overrun in Qatari Public Construction Projects. Procedia Engineering, 164:368-375.

Zidane Y. J-T., Andersen B. (2018) The top 10 universal delay factors in construction projects. International Journal of Managing Projects in Business, 11.