Beyond Simple Success: Understanding Partial Achievement in EU-Funded Regional Development Projects in Slovakia (2014–2020)

Tomáš Výrost Eva Výrostová

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1 Motivation and contribution

European Union Cohesion Policy is implemented through thousands of individual projects, yet whether these projects deliver the outputs and results written into their grant agreements has received little systematic attention. The empirical literature concentrates on aggregate effects, relating regional growth or employment to Cohesion Policy spending with mixed conclusions (Rodríguez-Pose and Novak, 2013; Fiaschi et al., 2018), and on programme-level absorption, compliance and achievement of programme indicators (Mendez and Bachtler, 2024). Darvas et al. (2019) relate project characteristics to regional performance but do not observe whether projects met their declared targets. The project level matters because the Performance Framework of the 2014–2020 period (European Union, 2013) rests on it: programme milestones can be reached only if enough individual beneficiaries fulfil the measurable indicators assigned to their operations. These indicators are contractually binding: beneficiaries commit to quantified targets at contracting, and unfulfilled targets can lead to a reduction or recovery of support. Indicator fulfilment is therefore a consequential, incentive-compatible measure of delivery. Project-level data also open questions that programme aggregates cannot address. They allow for a more granular analysis of heterogeneity in implementation performance, its project- and beneficiary-level determinants, and the mechanisms underlying observed aggregate outcomes. Identifying where under-delivery concentrates is directly actionable for the design of selection criteria, delivery modes, differentiated conditionality and targeted implementation support.

This paper asks whether individual Cohesion Policy projects deliver what they contractually commit to, and what explains the variation. We analyse 14,533 projects completed under five Slovak operational programmes in 2014–2020, using administrative microdata from the ITMS2014+ monitoring system. Slovakia provides an informative setting. With an allocation of roughly EUR 14.3 billion it was among the largest per capita recipients in the Union (European Commission, 2025a). Implementation of the 2014–2020 period was marked by substantial delays: by the end of 2020, only about 43% of the allocation had been spent, placing the country among the slowest implementers (European Parliament, 2024). Absorption measured against the revised allocation nonetheless reached approximately 99.8% by closure, but with well-documented implementation challenges during this period. Six operational programmes under the Investment for Growth and Jobs goal, five of which are included in our sample, were implemented across multiple managing authorities in a context marked by high administrative burden, frequent regulatory change, and a strong emphasis on formal compliance over results (Office of the Government of the Slovak Republic, 2023; Výrostová and Nyikos, 2024). While the empirical analysis covers the 2014–2020 programming period, its policy implications are directly relevant for the implementation of the 2021–2027 framework and the design of subsequent programming periods.

Administrative capacity is an established determinant of how Cohesion Policy funds are absorbed (Milio, 2007; Incaltarau et al., 2020), but that literature works at the level of programmes, regions and

Member States, and offers no direct evidence on whether individual operations meet the targets. We therefore develop five expectations that structure the analysis, concerning the determinants of project-level delivery, grounded in the administrative demands placed on beneficiaries and in the institutional design of the Slovak portfolio. Delivery declines with project scale and with the number of assigned indicators, since both raise the coordination and reporting burden carried by the beneficiary (E1); conditional on under-delivery, hard investments exhibit larger shortfalls because physical outputs are indivisible, whereas soft outputs can be delivered partially (E2); delivery differs across beneficiary types with small and non-public organisations least equipped to manage the application process (OECD, 2025)(E3); projects starting after 2020 face a compressed timeline, with an ambiguous net effect (E4); and projects from pre-negotiated territorial strategies outperform open calls (E5), in part because such strategies pre-select beneficiaries with prepared project pipelines.

2 Data and measurement

The dataset links four registries of the ITMS2014+ system (project structure, financial intensity, measurable indicators and beneficiary records), retrieved from the open data portal in December 2025, after the end of N+3 eligibility and the submission of closure documentation. The Register of Legal Entities of the Slovak Statistical Office supplies ESA 2010 institutional sectors and regional identifiers. The unit of observation is the project. The sample covers the ERDF, the Cohesion Fund and the ESF, including the Youth Employment Initiative, under the Investment for Growth and Jobs goal. We exclude OP Technical Assistance, financial instruments, for which the Performance Framework requires no targets, and projects whose beneficiary lacks an ESA sector classification. After these filters, 16,344 projects remain, of which 1,982 ended in extraordinary termination; most terminated projects lack final indicator assessments and therefore fall outside the analytic sample. Listwise deletion on the outcome and the covariates removes 1,811 observations (11.1%), almost entirely because final indicator evaluations were unavailable at extraction; this group also contains the 1,144 projects with no assigned indicators, for which the outcome is undefined. The analytic sample has $N = 14{,}533$. Excluded observations are spread roughly proportionally across project types, thematic categories and regions, with larger projects modestly overrepresented, consistent with longer evaluation cycles.

The dependent variable is the proportion of contractually assigned measurable indicators that a project fulfilled, $y_i = n_i/k_i$, where n_i counts the indicators assessed as fulfilled at final project completion, or at least one year later for indicators measured with a lag, and $k_i \geq 1$ is the number assigned at contracting. The mean is 0.912 (standard deviation 0.209). The distribution is dominated by the upper boundary: 77.2% of projects fulfil every indicator, 3.0% fulfil none, and the remaining 19.8% lie in the interior with a conditional mean of 0.705. Complete success declines steeply with the number of indicators, from 95.4% for projects with a single indicator to 73.3% at three indicators and below 15% at eleven or more, while the mean proportion declines much more gently. Whether a project is perfect (all indicators are fulfilled) and how far an imperfect project falls short therefore behave as two distinct margins, and the modelling strategy is built around this distinction.

Covariates comprise the beneficiary sector, contracted duration, the log of the contracted grant, the number of project activities, an indicator for implementation starting after 2020, an indicator for hard investment (capital and infrastructure operations), the beneficiary's own co-financing share, the number of indicators k_i, the project selection type, thematic objective fixed effects (thirteen categories) and NUTS 3 region fixed effects (eight regions). The selection type distinguishes demand-driven projects chosen in open competitive calls (84.0% of the sample), national projects implemented by designated state bodies, large projects requiring separate Commission approval, and projects selected through the Regional Integrated Territorial Strategies (RIÚS), the integrated territorial investment track of the Integrated Regional Operational Programme, under which self-governing regions drew projects from pre-negotiated regional pipelines. Table 1 reports fulfilment by selected characteristics. The unconditional gaps are large: 94.4% of RIÚS projects fulfil everything against 74.6% of demand-driven projects, and complete fulfilment ranges from 26.7% in the low-carbon economy objective (TO4) to 99.7% in the technical assistance axes (TO13).

Table 1: Indicator fulfilment by selected project characteristics

	N	% of sample	Mean y_i	% with $y_i = 1$
All projects	14,533	100.0	0.912	77.2
Project selection type				
Demand-driven	12,207	84.0	0.904	74.6
RIÚS	1,924	13.2	0.977	94.4
National project	388	2.7	0.853	73.2
Large project	14	0.1	0.780	57.1
Beneficiary sector (ESA 2010)				
Local government	9,080	62.5	0.928	80.2
Private firms	3,196	22.0	0.870	71.2
State administration	1,072	7.4	0.892	68.2
Non-profit organisations	846	5.8	0.924	81.7
Other	339	2.3	0.890	71.7
Selected thematic objectives				
TO4 — Low-carbon economy	2,225	15.3	0.809	26.7
TO2 — ICT	830	5.7	0.991	98.9
TO13 — Technical assistance axes	1,460	10.0	0.997	99.7

Notes: y_i is the share of contractually assigned measurable indicators fulfilled by project i. TO codes follow the thematic objectives of the Common Provisions Regulation as coded in ITMS2014+; TO13 denotes the dedicated technical assistance priority axes within the five retained operational programmes.

3 Econometric approach

The outcome is bounded on the unit interval, discrete with project-specific support, and inflated at both boundaries. Linear regression is unsuited to these features, and no single bounded-outcome estimator accommodates all of them, so we estimate five complementary specifications with clearly assigned roles. A quasi-binomial generalised linear model on the count pair (n_i, k_i) is the primary specification; it models $\text{logit}(\mu_i) = \mathbf{x}_i'\beta$ with variance $\phi\, k_i \mu_i (1-\mu_i)$ and HC1 robust standard errors. A two-part hurdle model provides the substantive decomposition, following the logic of Cragg (1971): a logit for the probability of complete success on the full sample, and a quasi-binomial model for the degree of fulfilment on the 3,313 projects with $y_i < 1$. Three further estimators probe sensitivity to modelling assumptions. A beta-binomial regression parameterises the within-project correlation of indicator outcomes. The fractional logit of Papke and Wooldridge (1996) operates on the proportion directly and weights every project equally, whereas the count-based models weight by k_i. A zero-one inflated beta (ZOIB) model specifies the full mixture of both boundary probabilities and the interior beta component (Ospina and Ferrari, 2012). Average marginal effects (AMEs) place the estimates on a common probability scale. Robustness checks cover generalised variance inflation factors, re-estimation with and without k_i, a sample split at the median indicator count, and a consistency check between the two overdispersion structures.

Overdispersion is substantial: the quasi-binomial dispersion is $\hat{\phi} = 1.612$, the beta-binomial within-project correlation is $\hat{\rho} \approx 0.184$, and a likelihood ratio test rejects the plain binomial decisively (LR = 2,118.5). Indicator outcomes within a project are strongly correlated, and a binomial model would understate uncertainty throughout.

4 Results

Table 2 reports AMEs for the main covariates from the quasi-binomial model, both parts of the hurdle model and the fractional logit. Six results stand out.

First, project scale reduces delivery in every overall specification (E1). The coefficient on the log grant lies between -0.119 and -0.190 across the quasi-binomial, beta-binomial and fractional logit models (all $p < 0.001$), an AME of about -1.4 percentage points per log unit in the fractional logit. The hurdle model locates the effect on the perfection margin: a larger grant lowers the probability of fulfilling everything by 1.7 percentage points per log unit and leaves the depth of the shortfall unchanged. A sample split at the median indicator count qualifies this: the scale penalty is strong among projects with one or two indicators

Table 2: Average marginal effects: selected covariates

	Quasi-binomial	Hurdle model		Fractional logit
		$\Pr(y_i = 1)$	$y_i \mid y_i < 1$	
Log grant amount	-0.0103^{***}	-0.0166^{***}	-0.0043	-0.0143^{***}
Late start (post-2020)	-0.0020	-0.0502^{***}	0.0850^{***}	-0.0063
Hard investment	-0.0431^{***}	-0.0010	-0.1559^{***}	-0.0260^{***}
Own co-financing	-0.0194	-0.1563^{***}	-0.1458^{*}	0.0002
No. of indicators (k_i)	-0.0008	-0.0332^{***}	0.0187^{***}	-0.0027^{***}
RIÚS	0.0785^{***}	0.1553^{***}	0.0300	0.0705^{***}
Private firms	0.0028	-0.0458^{***}	0.1002^{***}	-0.0278^{***}
State administration	0.0250^{***}	0.0332^{**}	0.0229	0.0233^{***}

Notes: $N = 14{,}533$ (Part 2: $N = 3{,}313$). All models also include duration, the number of activities, thematic objective and NUTS 3 region fixed effects. Reference categories: demand-driven projects; local government. Part 2 effects are conditional on $y_i < 1$ and are not directly comparable in magnitude to the unconditional columns. Robust standard errors (HC1 for M1 and M3, HC0 for M4). Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

($\hat{\beta} = -0.272$, $p < 0.001$) and absent among more complex projects (-0.036, insignificant).

Second, hard investment projects show the clearest asymmetry, in line with E2. Their overall AME is -4.3 percentage points, yet the hurdle decomposition attributes essentially none of it to the perfection margin. Conditional on falling short, investment projects fulfil 15.6 percentage points less of their indicator set than non-investment projects, and the subsample analysis confines the penalty to projects with more than two indicators ($\hat{\beta} = -0.974$ against -0.020). Three mechanisms are consistent with this pattern. Physical outputs are indivisible, so a road is either finished or it is not, and any shortfalls is therefore large. Investment projects also depend on a procurement and permitting chain that soft interventions do not: land settlement, building permits, tendering for works and its review by the managing authority, and the performance of a contractor. Finally, investment projects may carry indicators, whose realised values depend on the behaviour of users and on conditions outside the beneficiary's control.

Third, the number of indicators acts as a deconcentration force. Each additional indicator lowers the probability of complete success by 3.3 percentage points but raises the fulfilled proportion among imperfect projects by 1.9 percentage points. In the ZOIB model, each additional indicator cuts the odds of landing at either boundary by roughly 40–50%. Part of the positive conditional effect is mechanical: the attainable proportion below one grows with k_i, and an imperfect single-indicator project must record zero, so we read the second-margin coefficient with this ceiling in mind.

Fourth, timing effects are two-sided (E4). Projects that started after 2020 are 5.0 percentage points less likely to fulfil everything but, conditional on falling short, fulfil 8.5 percentage points more of their targets than earlier imperfect projects. The ZOIB boundary submodels show late starters avoiding both extremes, with the reduction in complete failure about twice as large as the reduction in complete success. Compressed timelines and closure pressure under the N+3 rule appear to have blocked perfection while preventing collapse. Single-equation estimates of the timing effect are fragile because late projects carry fewer indicators and the estimators weight observations differently.

Fifth, beneficiary types differ on distinct margins (E3). Private firms are 4.6 percentage points less likely than local governments to fulfil every indicator, yet when they fall short they miss by narrower margins, with conditional fulfilment 10.0 percentage points higher. Firms fail more often but less badly, a pattern that, to our knowledge, has not been documented in this literature before. State administration bodies outperform on the overall and the perfection margin alike, consistent with accumulated experience of EU fund procedures; non-profit organisations behave much like local governments.

Sixth, the selection mechanism matters (E5). RIÚS projects are 7.9 percentage points ahead of demand-driven projects overall and 15.5 percentage points ahead on the probability of complete success, conditional on scale, duration, thematic category, sector and region. Pre-negotiated pipelines, predominantly public beneficiaries and comparatively simple indicator structures plausibly all contribute. Entry into the track is not random, so we do not read the premium causally, but its size is directly relevant to the 2021–2027

architecture, in which integrated territorial strategies organise a substantial share of Programme Slovakia. A related territorial pattern calls for caution: all seven non-capital regions record higher fulfilment than Bratislava, with Žilina and Prešov the largest and most stable effects, but the regional variable records the beneficiary's headquarters rather than the place of implementation, and state bodies and firms based in Bratislava run projects across the whole country.

5 Relevance and limitations

Existing EU-level evaluation (European Commission, 2025b) assesses target attainment primarily at the programme and aggregate indicator level, leaving project-level compliance with contracted output targets largely unexplored. The study addresses this gap at the project level, focusing on the degree of indicator fulfilment and its variation.

Slovakia ultimately absorbed close to its full allocation, and 77% of completed projects delivered every contractual target. Beneath that aggregate, close to a quarter of completed projects missed at least one binding indicator, and the misses are systematic: they concentrate in large, investment-heavy operations with complex indicator structures, among private firms on the perfection margin, and in specific thematic areas. This pattern is consistent with retrospective assessments by the Supreme Audit Office of the Slovak Republic (2026), which identify persistent implementation weaknesses, including administrative complexity, bureaucracy,insufficient coordination, weak project preparation and appraisal, time pressure, and missing or poorly designed measurable indicators. Delivery risk is thus legible in advance from characteristics observable at contracting. That argues for monitoring intensity and technical support scaled to project risk profiles, and for parsimonious, well-calibrated indicator sets. Private firms, which fail often but by narrow margins, are natural candidates for the targeted beneficiary assistance that the OECD has recently outlined for managing authorities (OECD, 2025).

Three qualifications matter for interpretation. First, indicator fulfilment measures whether beneficiaries delivered what they contracted for, not whether what they contracted for was worth delivering. A project may meet every assigned target while being poorly designed or without effect on the outcomes the intervention was meant to influence. Fulfilment is therefore a necessary but not a sufficient condition for effectiveness, and the analysis speaks to delivery rather than to impact or value for money. Second, even as a measure of delivery, the benchmark is negotiated rather than externally imposed. Targets are proposed by beneficiaries and agreed with the managing authority, so the data record the negotiated value rather than the ambition behind it, and a high fulfilment rate is consistent both with strong delivery capacity and with conservatively set targets. The European Court of Auditors reports that more than half of the 5,802 performance framework indicators and their milestones in the EU, and 45% of those in Slovakia, were revised before the 2019 performance review (European Court of Auditors, 2021), and conservative target-setting can inflate measured success (Molica et al., 2025; Heinemann et al., 2024). Third, because extraordinarily terminated projects mostly lack final assessments, the estimates describe delivery conditional on completion. Modelling the termination margin on the same data is the natural next step.

Within these limits, and with the usual caution in generalising from a single member state and programming period, the results give the performance debate in Cohesion Policy a project-level empirical footing as the 2021–2027 period strengthens its performance orientation. They show that territorial selection mechanisms and beneficiary capacity shape whether European policy commitments turn into delivered outputs.

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