Pisco Med Publishing

Human Resources Management and Services 2026, 8(3), 6756
https://doi.org/10.18282/hrms6756

Article

Fiscal Forecasting to Support Public Sector Human Resource Planning in European Countries

Ivan Milojević[1*], Nemanja Pantić[2]

[1] University of Business Studies, 78000 Banja Luka, Republic of Srpska, Bosnia and Herzegovina
[2] Faculty of Hotel Management and Tourism in Vrnjačka Banja, University of Kragujevac, 36210 Vrnjačka Banja, Serbia

*Corresponding author: Ivan Milojević, drimilojevic@gmail.com

CITATION

Milojević, I., Pantić, N. (2026). Fiscal forecasting to support public sector human resource planning in European countries. Human Resources Management and Services. 8(3): 6756.
https://doi.org/10.18282/hrms6756

COPYRIGHT

Copyright © 2026 by author(s).
Human Resources Management and Services is published by Piscomed Publishing Pte. Ltd. This work is licensed under the Creative Commons Attribution (CC BY) license.
https://creativecommons.org/licenses/by/4.0/

Abstract: Fiscal constraints can affect the affordability of public-sector workforce plans, but aggregate fiscal data do not identify staffing requirements. In this exploratory study, we examine whether historical revenue and expenditure shares jointly explain cross-country variation in their 2018 values and discuss a possible connection to personnel budgeting. We estimate two ordinary least-squares regressions using 28 countries belonging to the European Union in 2018 as observations, with nine annual fiscal shares from 2009–2017 as predictors. The data are percentages of GDP from a fixed Eurostat publication vintage, extracted by Eurostat on 12 May 2019. The revenue and expenditure specifications are jointly significant, with $R^2 = 0.995248$ and 0.976869, respectively. These results describe in-sample fit; we did not evaluate forecasting accuracy on independent data. Severe multicollinearity, the small sample, and influential expenditure observations constrain interpretation. In our proposed HRM framework, we link fiscal scenarios to approved personnel allocations and then to costed workforce options. We explain this connection through an illustrative example, but we do not empirically test the framework because the dataset contains no payroll, employment, vacancy, or service-demand indicators. Practical use therefore requires independent forecast validation and institution-specific financial and workforce information.

Keywords: debt sustainability; budgetary constraints; personnel budgeting; recruitment sequencing; workforce allocation; multiple regression

1. Introduction

Public institutions must maintain essential services while meeting recurrent expenditure commitments. Fiscal deficits and debt obligations can constrain the resources available for recruitment, training, and workforce development. However, the level of total expenditure alone does not identify the personnel budget or the staffing needed to deliver a service. Research on expenditure composition and government accountability provides a fiscal context for examining these constraints (Gupta et al., 2005; Morozumi and Veiga, 2016).

The managerial problem is to connect information about the fiscal environment with the affordability of institution-level workforce plans. Recruitment decisions can create commitments extending beyond the year of appointment, while redeployment and training depend on both available resources and service requirements. Fiscal information is one input to this process; it must be combined with approved allocations, personnel costs, workforce records, and operational priorities.

We examine two exploratory fiscal specifications using historical annual shares of revenue and expenditure in GDP. We ask whether the nine annual values for 2009–2017 jointly explain variation in the corresponding 2018 value across 28

countries. We also consider how independently validated fiscal scenarios could be translated into personnel affordability assessments. We do not test whether the specifications improve forecasting accuracy over simpler alternatives or whether their use improves HR decisions.

The historical window ends in 2018 and therefore excludes the COVID-19 pandemic and subsequent shocks. The findings describe this pre-pandemic period and do not establish a model suitable for current policy decisions. Other limitations include the small cross-sectional sample, dependence among yearly predictors, possible cross-country dependence, incomplete assessment of model assumptions, and the absence of independent forecast validation.

Analysis of expenditure under budget limitations helps frame the resource constraints faced by public institutions (Ćurčić, 2025). Research on monetary–fiscal interaction and public debt in the EU provides further context for fiscal pressures (Milojević and Rosić, 2026). Their relevance here is conceptual: these studies motivate alternative affordability scenarios and do not establish a direct relationship between our regressions and staffing decisions.

Our empirical contribution is an assessment of cross-country fiscal associations in a documented historical sample. Our managerial contribution is a proposed framework connecting fiscal scenarios, approved personnel budgets, and workforce options. We include no direct workforce indicators, so we cannot estimate staffing needs, skill shortages, payroll costs, or the effectiveness of HR practices. These boundaries apply to the research question, results, discussion, and conclusions.

In Section 2, we review the relevant fiscal and managerial literature. In Section 3, we describe the fiscal data. In Section 4, we explain the cross-country regression design and its limitations. In Section 5, we present the results and propose an application to public-sector human resource planning. We conclude in Section 6.

2. Literature review

The relevant literature distinguishes fiscal sustainability, the composition of public expenditure, and the evaluation of forecasts. These topics provide a context for workforce affordability, but evidence about fiscal aggregates cannot be transferred directly to staffing outcomes.

Brady and Magazzino (2018) examine fiscal sustainability in 28 EU countries over 1980–2015. Their panel analysis identifies a long-run relationship between revenues and expenditures, while their causality tests support the neutrality hypothesis between the two aggregates. Their finding that expenditure grows faster than revenue concerns a particular cluster of countries, rather than an undifferentiated conclusion for the entire EU. Greiner et al. (2007) examine debt sustainability in selected European Monetary Union countries. These studies address sustainability using designs that differ from the cross-sectional regressions estimated here.

Gupta et al. (2005) study fiscal consolidation, expenditure composition, and economic growth in 39 low-income countries during the 1990s. Their analysis concerns growth and the structure of public outlays, which differ from the fiscal-share outcomes examined here. Bayraktar and Moreno-Dodson (2015) likewise examine the relationship between public spending and growth in developing countries, emphasising country selection, expenditure composition, and the economic environment. These findings motivate attention to the composition and institutional context of expenditure rather than interpreting a total expenditure share as a personnel allocation.

Halásková and Halásková (2017) compare selected public expenditure functions in EU countries in 2005 and 2014. Their analysis identifies differences

in the volume and structure of resources allocated to social protection, health, education, recreation, and culture. Luković and Grbić (2014) examine the revenue–expenditure relationship in Serbia, while Iiyambo and Kaulihowa (2020) study public debt, expenditure, and revenue in Namibia. These country-specific and functional analyses do not validate the forecasting performance of the present specifications.

Bretschneider and Schroeder (1985) use a decision model to examine budget setting under uncertain revenues and apply it to revenue sources in Kansas City, Missouri. Their study is relevant to the use of forecast information in budgeting, but we do not use it as a numerical accuracy benchmark. Caruthers and Wentworth (1997) discuss methods and techniques of revenue forecasting. Alawneh (2017) examines the impact of public expenditure and public debt on taxes in Jordan. The outcomes and designs of these studies differ from those we examine here, so we discuss their results as context rather than numerical forecast-accuracy benchmarks.

Forecast evaluation requires a distinction between fitting observed data and predicting data outside the estimation sample. Tashman (2000) reviews out-of-sample evaluation designs, while Hyndman and Koehler (2006) examine measures of forecast accuracy and their limitations. Forecasting competitions are comparative evaluation exercises, not estimation methods. Neither their results nor shortcomings of particular error measures establish that OLS is the most accurate forecasting method for the present data.

2.1. Fiscal resources and sustainable human resource planning

Budget planning provides the institutional link between expected resources and operational capacity. Škrbić et al. (2023) examine this connection in the defense sector, where financing and budget execution are tied to organisational readiness. Milanović (2025) discusses the role of the budget as a plan of revenue sources and expenditure purposes within a legal accounting framework. Together, these perspectives motivate the proposed connection between fiscal estimates and personnel budgeting: an estimate becomes useful for HRM only after it is translated into an approved institutional allocation.

That translation requires reliable information. Vukša and Milojević (2024) discuss accounting as an information system for collecting, classifying, and reporting business information. Vašaš Kuručev (2026) considers the positioning of financial managers in relation to strategic planning, risk, and digital change. Applied to public-sector workforce planning, these contributions suggest coordination between finance and HR units and compatible records of payroll costs, staffing, and service demand. This application is a proposed managerial extension; neither source validates the fiscal regressions that we estimate in this study.

The HRM objective also includes maintaining workforce capability and employee well-being. In their study of maritime supply chains, Ugrinov et al. (2025) discuss sustainable HR practices involving training, health and safety, and employee well-being. Their sector-specific analysis provides a conceptual reason to evaluate the quality and sustainability of staffing arrangements alongside their cost. Avakumović et al. (2021) place changes in management and organisation within the broader transition toward sustainable development. These arguments motivate attention to skill development and organisational adaptation when fiscal conditions change; they do not establish effects for public institutions in the present sample.

Workforce allocation is also an organisational and legal decision. Rosić and Vilma Getman (2025) examine team roles, cohesion, development, and effectiveness, supporting attention to the composition of teams rather than

headcount alone. Winkler (2026) considers employee relations and protection through a comparative legal perspective, while Arsić (2026) discusses the public and private dimensions of financial law. These sources provide a basis for considering employee rights and financial authority when evaluating HR options. Consequently, a fiscal constraint should initiate a review of feasible staffing arrangements within the applicable legal framework, not mechanically determine recruitment restrictions or reductions in employment.

We propose a conceptual link with three stages: fiscal information informs an indicative resource envelope; the approved personnel allocation defines the affordability constraint; and workforce and service indicators guide the assessment of HR options. In our empirical analysis, we examine fiscal associations relevant to the first stage. We have not conducted forecast validation or empirically tested the linked personnel-allocation and workforce stages.

3. Public revenues and expenditures in the European Union

We measure revenue and expenditure as percentages of GDP to express fiscal aggregates relative to the size of each economy. This scaling supports comparison of fiscal shares across countries of different economic size. A higher revenue-to-GDP ratio indicates more revenue relative to GDP; it does not, by itself, demonstrate more efficient revenue collection. Similarly, total expenditure includes many categories other than personnel costs. The series describe consolidated general government under ESA 2010, rather than the supranational EU budget.

We report the verified annual series in Appendices A and B for 2009–2018. In 2018, revenue exceeded 50% of GDP in Belgium, Denmark, France, Finland, and Sweden. Their revenue shares were 51.7% , 51.9% , 53.5% , 52.5%, and 50.8% , respectively. **Figures 1 and 2** display the arithmetic mean for each country over 2009–2018, not the value for 2018 alone.

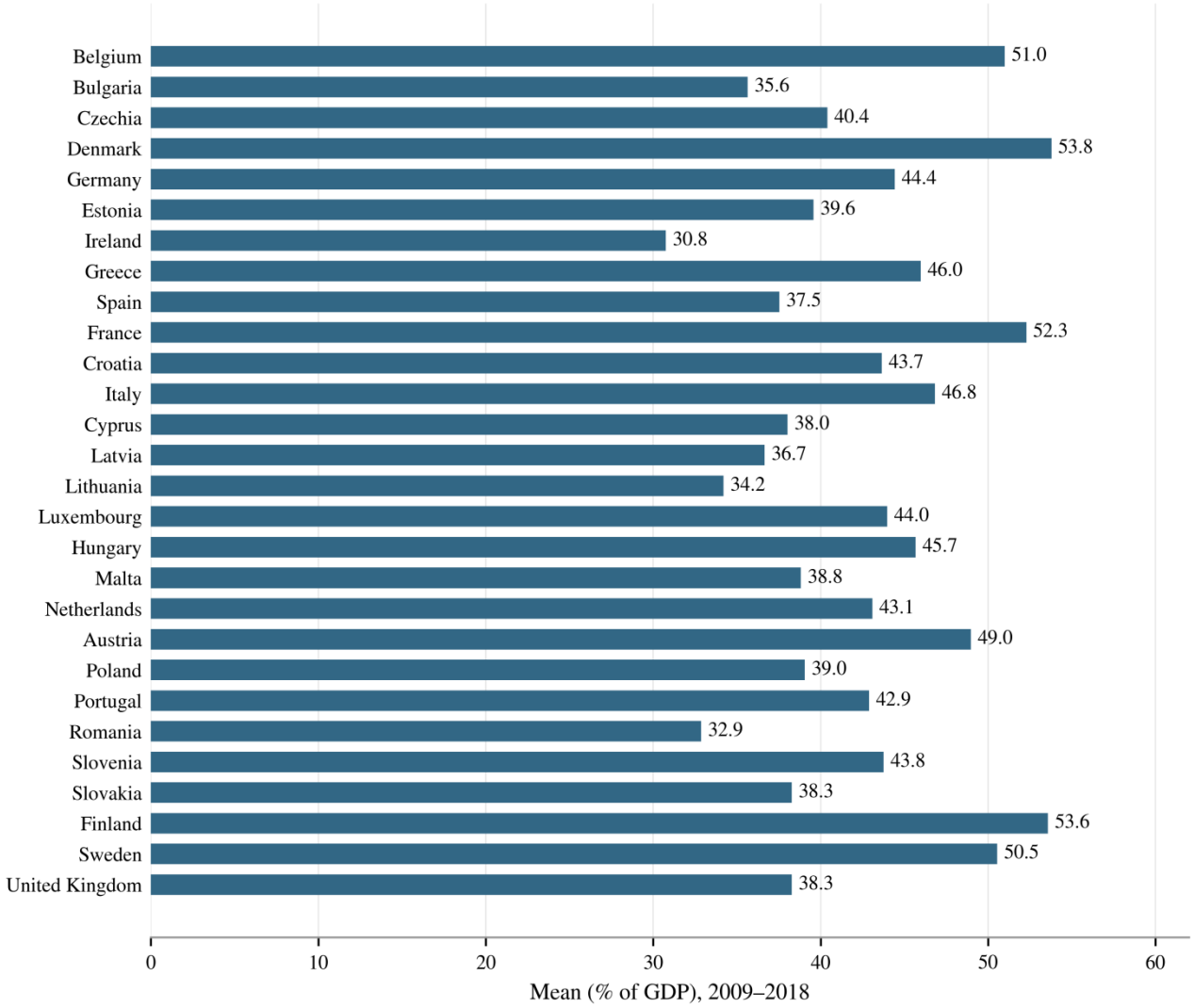


Figure 1. Mean general government revenue, 2009–2018 (% of GDP).

Source: Authors' calculations from Appendix A; Eurostat (2019), fixed 12 May 2019 data vintage.

In 2018, ten countries had revenue shares from 30% to below 40% of GDP: Bulgaria, Estonia, Spain, Cyprus, Latvia, Lithuania, Malta, Romania, Slovakia, and the United Kingdom. Ireland was below that interval at 25.8%. The remaining twelve countries were in the 40% to below 50% interval. Four countries had expenditure shares above 50% in 2018—Belgium, Denmark, France, and Finland—compared with ten in 2009. These are descriptive comparisons and do not identify the causes of fiscal changes.

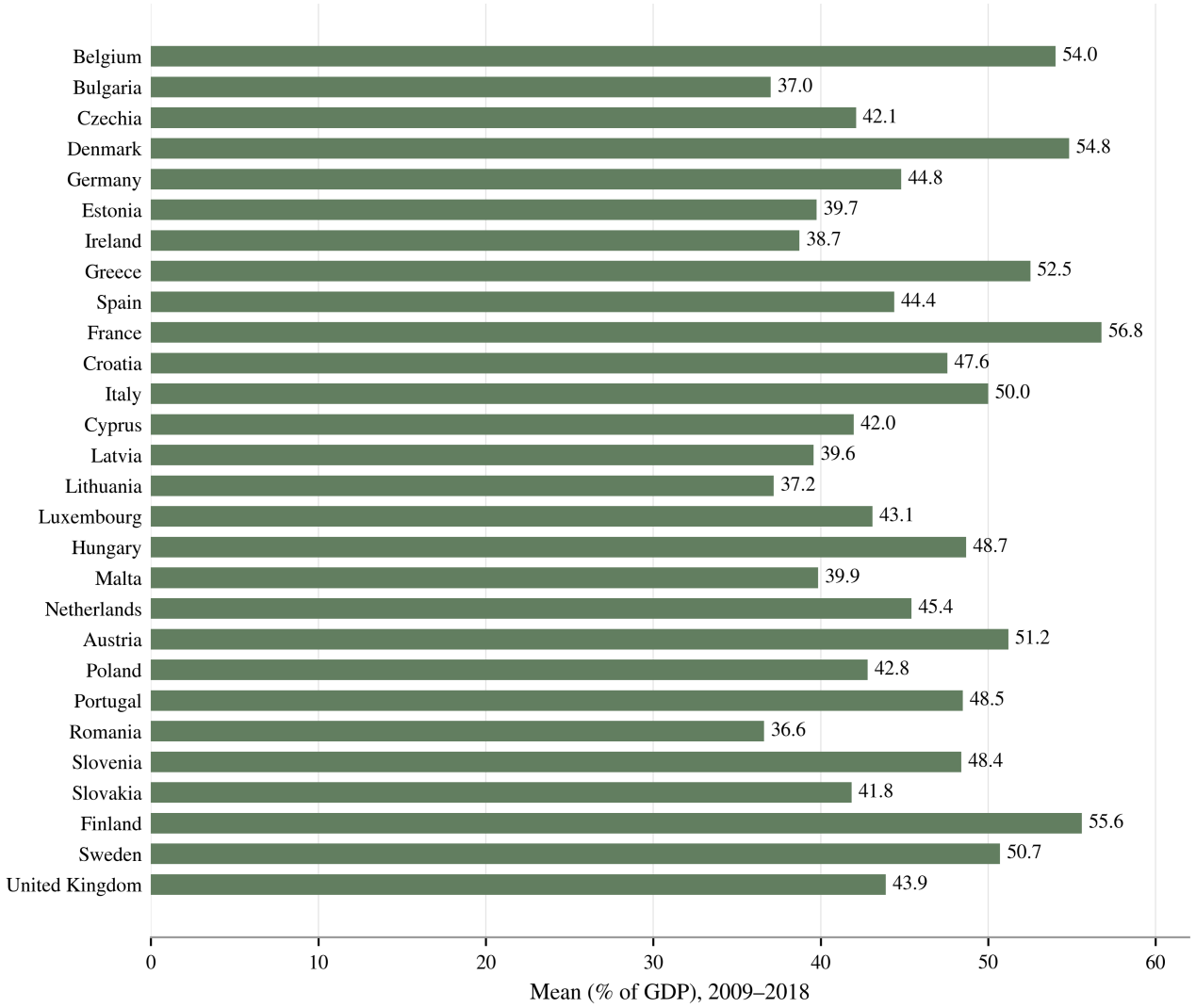


Figure 2. Mean general government expenditure, 2009–2018 (% of GDP).

Source: Authors' calculations from Appendix B; Eurostat (2019), fixed 12 May 2019 data vintage.

Seventeen countries (60.7% of the sample) had expenditure shares from 40% to below 50% of GDP in 2018. Greece's expenditure share was 62.3% in 2013 and 46.7% in 2018. Ireland's 65.1% expenditure share in 2010 was the maximum among the 280 expenditure observations in Appendix B. Country averages and changes in these ratios do not establish the effectiveness of specific fiscal or HR policies.

4. Materials and methods

We estimate two ordinary least-squares (OLS) regressions separately for revenue and expenditure. Each observation is one country: the dependent variable is its fiscal share in 2018, and the predictors are its nine corresponding annual shares for 2009–2017. This is a cross-sectional design with historical predictors, not a time-series regression with annual observations or a panel model. OLS provides a transparent exploratory description of their joint association with the 2018 outcome. We include all nine pre-2018 values to represent the full historical window used in the exploratory specification. We did not select the nine-year specification through forecast validation and do not claim that it is optimal.

With 28 countries, nine predictors, and an intercept, each model has 18 residual degrees of freedom. Correlation among adjacent annual shares can produce severe multicollinearity and unstable individual coefficients. We report conventional coefficient and joint F-tests under the usual linear-model

assumptions; possible cross-country dependence and departures from those assumptions constrain inferential interpretation. The use of aggregate statistical data does not require a survey questionnaire.

For reproducibility, we use a single fixed historical source: Eurostat's Government finance statistics—Summary tables, volume 1/2019 (Eurostat, 2019; DOI: 10.2785/75595). The publication explicitly records a data extraction date of 12 May 2019 and identifies the underlying series as gov_10a_main. For each country,**Table A** for consolidated general government (S.13), in % of GDP, supplies the 2009–2018 observations. The relevant selectors are annual frequency (A), general government (S13), percentage of GDP (PC_GDP), total revenue (TR), and total expenditure (TE). We downloaded and checked this documented vintage on 13 October 2026 and use it throughout our analysis, without mixing later database revisions into the sample.

The sample consists of the 28 countries belonging to the EU in 2018, including the United Kingdom. We include Croatia's pre-accession years as historical country observations. General government covers central, state and local government and social security funds, as applicable, on a consolidated basis; it excludes public corporations outside S.13. Revenue includes taxes, net social contributions, sales, other current revenue, and capital transfers receivable. Expenditure includes employee compensation, intermediate consumption, interest, subsidies, social benefits, other current expenditure, and capital expenditure. Borrowing is not revenue, and total expenditure is not a payroll budget. Values follow the publication's one-decimal presentation; changes in shares and residuals are expressed in percentage points of GDP.

We verified all input series against the same fixed vintage. In particular, UK revenue is 37.7% of GDP in 2014 and 39.1% in 2017. The complete verified series are in Appendices A and B. We recalculated both models, all descriptive statistics, fitted equations, diagnostic tables, and **Figures 1 and 2** from those series. No missing values occur in the selected 2009–2018 data. The source's fixed extraction date identifies the data vintage; values in later database releases may differ because of historical statistical revisions.

Figure 3 is a general analytical workflow. We verified the source, estimated the models, and assessed multicollinearity, leverage, residuals, and influence. We did not establish normality, constant error variance, or cross-country error independence. Independent forecast evaluation and practical HRM implementation remain proposed future steps. The dashed part of the figure must therefore not be read as a record of completed procedures.

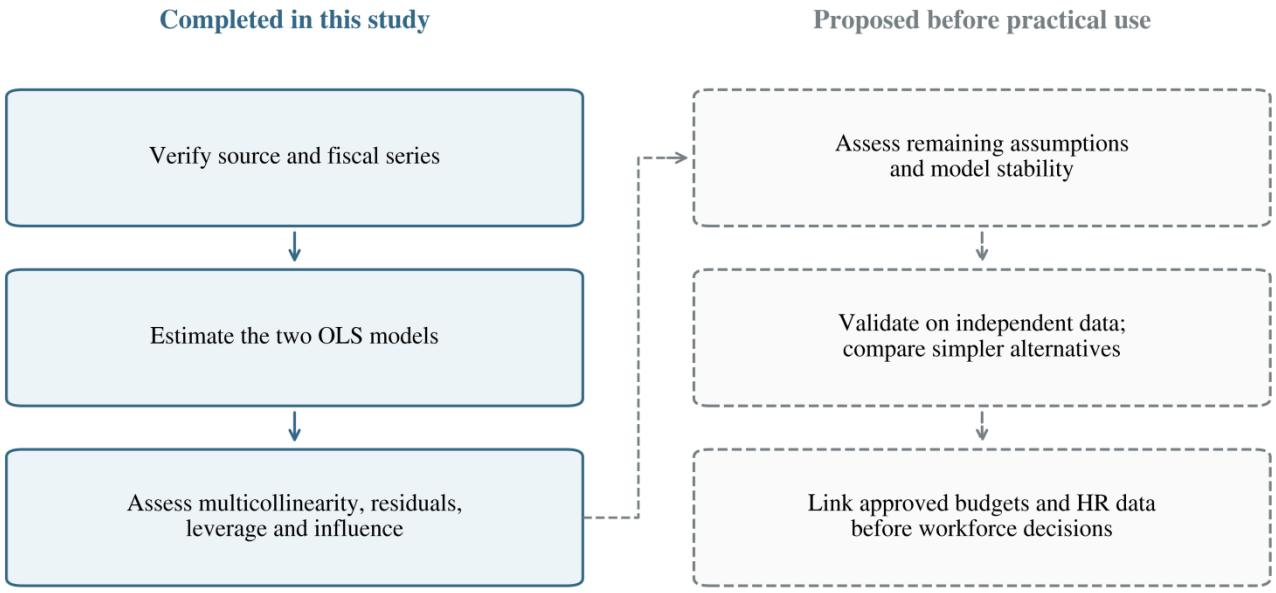


Figure 3. General analytical workflow: completed exploratory analysis and proposed validation before application.
Source: Authors' schematic, informed by Sarstedt and Mooi (2014). Solid boxes show work completed in this study; dashed boxes show proposed future steps.

For each fiscal variable, let i identify a country and j identify one of the nine historical years. The dependent and explanatory variables are expressed in the same unit, percentage of GDP. We write the regression as follows:

$$Y_i = \beta_0 + \sum_{j=1}^{9} \beta_j X_{ji} + \varepsilon_i \quad (1)$$

where:

Y_i —revenues or expenditures in 2018 for country i;

X_{ji} —the corresponding revenue or expenditure share for country i in year 2008 + j, where j = 1, …, 9;

ε_i —the error term;

$\beta_0, \beta_1, \ldots, \beta_9$ —unknown model parameters.

We express the fitted regression function as follows:

$$\hat{Y}_i = b_0 + \sum_{j=1}^{9} b_j X_{ji} \quad (2)$$

Here, $b_0, b_1, \ldots, b_9$ are ordinary least-squares estimates of the model parameters, and $\hat{Y}_i$ is the fitted value for country i.

The residual is the difference between the observed and fitted values:

$e_i = Y_i - \hat{Y}_i$

The estimates minimise the sum of squared residuals over the 28 countries:

$$S(b_0, \ldots, b_9) = \sum_{i=1}^{28} \left(Y_i - b_0 - \sum_{j=1}^{9} b_j X_{ji} \right)^2$$

We evaluate the sum over the 28 countries. The 280 country-year values reported descriptively for each fiscal variable are not 280 independent observations in either regression. We recalculated the estimates from the source values using numerical linear algebra and rounded the reported tables after calculation.

We define the in-sample mean squared error as $MSE = \frac{\sum_{i=1}^{28} e_i^2}{28}$. The residual variance estimate used for coefficient standard errors and influence diagnostics is $s^2 = \frac{\sum_{i=1}^{28} e_i^2}{18}$.

MSE is an in-sample average squared residual, in squared percentage points, and s^2 is the residual variance estimate with 18 degrees of freedom. Neither quantity is an independently validated forecast-error measure. We did not perform a holdout or rolling-origin evaluation or compare our models against simpler forecast specifications.

We evaluate two model-fit hypotheses using the joint F-test against the null hypothesis that all nine slope coefficients equal zero:

H1: Revenues in 2009–2017 jointly explain cross-country variation in revenues in 2018.

H2: Expenditures in 2009–2017 jointly explain cross-country variation in expenditures in 2018. Both hypotheses concern in-sample joint model fit, not forecasting certainty, causal effects, or improvements in staffing decisions.

5. Results and discussion

We present descriptive statistics for the verified annual fiscal shares in **Table 1**.

Table 1. Descriptive statistics for fiscal shares, 2009–2018 (% of GDP).

	N	Minimum	Maximum	Mean	Std. Deviation
Revenue, 2009–2018	280	25.80	56.40	42.5196	6.3825
Expenditure, 2009–2018	280	25.70	65.10	45.6389	6.7076
Valid N (listwise)	280				

Source: Authors' calculations from Appendices A and B; Eurostat (2019), fixed 12 May 2019 data vintage.

Table 1 summarises 280 country-year values for each variable. Mean revenue is 42.5196% of GDP (sample SD 6.3825), while mean expenditure is 45.6389% (sample SD 6.7076). Each regression contains 28 country observations. The 2018 revenue and expenditure means are 42.8857% and 43.1821%, with sample SDs of 6.5336 and 6.6234, respectively.

We report OLS coefficients for the cross-country revenue specification in **Table 2**. Individual coefficients are conditional on the other eight historical revenue predictors.

Table 2. Cross-country OLS model for revenue in 2018 (n = 28).

			$R = 0.997621$; $R^2 = 0.995248$; adjusted $R^2 = 0.992872$; $F(9, 18) = 418.8460$; $p < 0.001$		
Predictor	**B**	**SE(B)**	**β**	**t(18)**	**p**
Intercept	2.856604	0.887576	—	3.218	0.004765
2009	-0.005238	0.103227	-0.005057	-0.051	0.960090
2010	-0.144691	0.236401	-0.132857	-0.612	0.548155
2011	0.154156	0.168655	0.146733	0.914	0.372782
2012	0.073253	0.255518	0.072571	0.287	0.777629
2013	-0.177418	0.214282	-0.178323	-0.828	0.418532
2014	-0.076485	0.147230	-0.074689	-0.519	0.609747
2015	0.066628	0.104721	0.066141	0.636	0.532627
2016	-0.129534	0.194995	-0.134777	-0.664	0.514922
2017	1.181352	0.166269	1.228801	7.105	< 0.001

Source: Authors' calculations from the verified revenue series in Appendix A.

The revenue specification has $R^2 = 0.995248$ and adjusted $R^2 = 0.992872$, with $F(9, 18) = 418.8460$, $p < 0.001$. It explains 99.5248% of cross-country variation in 2018 revenue in sample. Only the 2017 slope is significant at the 5% level ($B = 1.181352$, $\beta = 1.228801$, $p < 0.001$). The other annual slopes are not significant at that level. Five slopes are negative and four are positive, conditional on the other predictors; their signs do not identify causal effects. SSE $= 5.477416$, in-sample MSE $= 0.195622$, and $s^2 = 0.304301$. VIFs range from 37.62 to 242.71, indicating severe multicollinearity. The joint F-test supports H1 within the exploratory specification, but does not show that nine predictors improve forecast accuracy over a simpler model.

When comparing our results with earlier studies, we account for their different designs and outcomes. This regression relates historical revenue shares to the corresponding 2018 share across countries; it does not estimate a causal revenue–expenditure relationship or a validated sequence of country-level forecasts.

We present the fitted revenue equation below. $R_{i,t}$ denotes the revenue share for country i in year t; the hat denotes the in-sample fitted 2018 value. We display coefficients to six decimal places.

$$\begin{aligned}\hat{R}_{i,2018} = {} & 2.856604 - 0.005238 \cdot R_{i,2009} - 0.144691 \cdot R_{i,2010} + 0.154156 \cdot R_{i,2011} \\ & + 0.073253 \cdot R_{i,2012} - 0.177418 \cdot R_{i,2013} - 0.076485 \cdot R_{i,2014} \\ & + 0.066628 \cdot R_{i,2015} - 0.129534 \cdot R_{i,2016} + 1.181352 \cdot R_{i,2017}\end{aligned}$$

Table 3. Observed revenue, fitted values, residuals, and influence diagnostics for 2018.

Country	Observed share	Fitted share	Residual	Standardised fitted share	SE(fitted mean)	Squared Mahalanobis	Deleted residual	Cook's distance
Belgium	51.700	51.120	0.580	1.263	0.234	3.911	0.708	0.030
Bulgaria	36.800	36.587	0.213	-0.966	0.462	17.982	0.713	0.117
Czechia	41.700	41.095	0.605	-0.275	0.226	3.584	0.727	0.029
Denmark	51.900	52.010	-0.110	1.400	0.369	11.105	-0.199	0.006
Germany	45.600	45.424	0.176	0.389	0.277	5.855	0.236	0.005
Estonia	39.000	39.340	-0.340	-0.544	0.357	10.367	-0.586	0.047
Ireland	25.800	25.970	-0.170	-2.595	0.513	22.346	-1.246	0.440
Greece	47.800	48.205	-0.405	0.816	0.461	17.876	-1.339	0.411
Spain	38.900	38.403	0.497	-0.688	0.234	3.908	0.607	0.022
France	53.500	53.556	-0.056	1.637	0.236	3.958	-0.069	0.000
Croatia	46.600	46.644	-0.044	0.577	0.352	10.049	-0.075	0.001
Italy	46.400	46.448	-0.048	0.546	0.254	4.775	-0.061	0.000
Cyprus	39.900	39.884	0.016	-0.461	0.391	12.629	0.032	0.000
Latvia	37.500	37.944	-0.444	-0.758	0.250	4.596	-0.559	0.021
Lithuania	34.700	34.234	0.466	-1.327	0.356	10.266	0.798	0.087
Luxembourg	45.500	44.700	0.800	0.278	0.262	5.136	1.033	0.079
Hungary	44.200	44.613	-0.413	0.265	0.316	7.919	-0.615	0.041
Malta	38.800	39.916	-1.116	-0.456	0.332	8.803	-1.748	0.363
Netherlands	43.600	43.887	-0.287	0.154	0.218	3.235	-0.340	0.006
Austria	48.600	48.221	0.379	0.819	0.223	3.448	0.453	0.011
Poland	41.200	40.648	0.552	-0.343	0.293	6.634	0.768	0.054
Portugal	43.500	42.885	0.615	-0.000	0.265	5.268	0.799	0.048
Romania	32.000	31.861	0.139	-1.691	0.438	16.095	0.378	0.030

Continued table:

Country	Observed share	Fitted share	Residual	Standardised fitted share	SE(fitted mean)	Squared Mahalanobis	Deleted residual	Cook's distance
Slovenia	43.100	43.321	-0.221	0.067	0.251	4.611	-0.278	0.005
Slovakia	39.900	40.359	-0.459	-0.388	0.430	15.408	-1.165	0.271
Finland	52.500	52.959	-0.459	1.545	0.276	5.775	-0.612	0.031
Sweden	50.800	50.761	0.039	1.208	0.318	7.987	0.058	0.000
United Kingdom	39.300	39.805	-0.505	-0.473	0.343	9.475	-0.824	0.086

Source: Authors' calculations from the verified revenue series in Appendix A.

Table 3 identifies countries by name. Residuals are observed minus fitted values. Standardised fitted values describe the distribution of fitted responses across countries; they are not standardised residuals. SE(fitted mean) is the standard error of the conditional fitted mean, not a prediction interval for a new observation. Deleted residuals are $e_i/(1 - h_{ii})$. Diagnostic values use unrounded estimates.

Our fitted values refer to the same 28 countries we used to estimate the coefficients. They are not forecasts validated on independent data. Source rounding and multicollinearity also limit the practical precision implied by the fitted equations.

Diagnostics distinguish unusual predictor profiles, residual deviations, and influence on the fit. A country can be influential without crossing a Mahalanobis-distance reference. A flag calls for source verification and sensitivity analysis; it does not automatically justify removing a country or a predictor.

The squared Mahalanobis distance measures the distance of a country's nine-predictor vector from the sample mean, using the sample covariance matrix (Mahalanobis, 1936).

For comparison, the squared Euclidean distance is:

$$d_{\mathrm{E}}^2 = (\mathbf{x} - \boldsymbol{\mu})^{\mathrm{T}}(\mathbf{x} - \boldsymbol{\mu})$$

The squared Mahalanobis distance is:

$$d_{\mathrm{M}}^2 = (\mathbf{x} - \boldsymbol{\mu})^{\mathrm{T}} S_{\mathrm{X}}^{-1} (\mathbf{x} - \boldsymbol{\mu})$$

Here, x is a country's predictor vector, μ is the sample mean vector, and S_x is the sample covariance matrix. The diagnostic tables report squared Mahalanobis distances.

For an approximate chi-square screening rule with nine predictors and $\alpha = 0.001$:

$$\chi^2_{9,\,0.999} = 27.877165$$

This threshold is an approximate screening reference because the mean and covariance matrix are estimated from a small sample.

The largest squared Mahalanobis distance for revenue is 22.345675 for Ireland, below the approximate threshold of 27.877165. Internally studentised residuals range from -2.532 to 1.648. These are screening results, not evidence that all model assumptions have been satisfied.

Cook's distance quantifies the change in the fitted response vector when observation i is omitted (Cook, 1977):

$$D_i = \frac{\sum_{j=1}^{n} \left(\hat{Y}_j - \hat{Y}_{j(i)}\right)^2}{qs^2}$$

Here, $\hat{Y}_j$ is the fitted response using all observations, $\hat{Y}_{j(i)}$ is the fitted response after omitting observation i, $q = 10$ is the number of estimated coefficients including the intercept, and s^2 is the full-model residual variance estimate. An equivalent expression is:

$$D_i = \frac{e_i^2 h_{ii}}{qs^2(1-h_{ii})^2}$$

Here, e_i is the residual and h_{ii} is the leverage. Cook's distance is non-negative. The maximum revenue value is 0.440441 for Ireland; none exceeds the reference value of 1 that we use here. The UK value is 0.086178. When we omit the UK as an influence check, we obtain $R^2 = 0.995557$. This check does not provide forecast validation or remove the multicollinearity limitation.

In **Table 4**, we report OLS coefficients for the separate expenditure specification, using 2009–2017 expenditure shares as predictors of the 2018 share.

Table 4. Cross-country OLS model for expenditure in 2018 ($n = 28$).

Predictor	B	SE(B)	β	t(18)	p
Intercept	6.207439	3.202569	—	1.938	0.068437
2009	0.033858	0.224675	0.025225	0.151	0.881891
2010	-0.326673	0.130341	-0.308741	-2.506	0.022017
2011	0.226307	0.200494	0.199582	1.129	0.273825
2012	0.154550	0.177539	0.153606	0.871	0.395482
2013	-0.155513	0.109327	-0.177547	-1.422	0.171990
2014	0.395067	0.126758	0.393467	3.117	0.005957
2015	-0.479840	0.248086	-0.500324	-1.934	0.068971
2016	0.370388	0.414112	0.394334	0.894	0.382904
2017	0.651576	0.334848	0.684317	1.946	0.067453

Note: $R = 0.988367$*;* $R^2 = 0.976869$*; adjusted* $R^2 = 0.965304$*;* $F(9, 18) = 84.4651$*;* $p < 0.001$.
Source: Authors' calculations from the verified expenditure series in Appendix B.

The expenditure specification has $R^2 = 0.976869$ and adjusted $R^2 = 0.965304$, with $F(9, 18) = 84.4651$, $p < 0.001$. It explains 97.6869% of cross-country variation in 2018 expenditure in sample. The 2010 slope is significant and negative ($B = -0.326673$, $\beta = -0.308741$, $p = 0.022017$); the 2014 slope is significant and positive ($B = 0.395067$, $\beta = 0.393467$, $p = 0.005957$). Other slopes are not significant at the 5% level. Three slopes are negative and six positive, conditional on the other annual shares. SSE $= 27.397899$, in-sample MSE $= 0.978496$, and $s^2 = 1.522106$. VIFs range from 11.81 to 151.26. The joint test supports H2 as an in-sample model-fit hypothesis. It does not establish unique predictive contributions, forecasting superiority, or causal effects.

Gupta et al. (2005) provide evidence about expenditure composition and growth, and Alawneh (2017) examines expenditure and debt in relation to taxes. We retain their studies as contextual literature rather than numerical benchmarks for the expenditure model. The present F-test evaluates joint slopes for the specified cross-country model and cannot be interpreted as a test of improved HR planning.

We present the fitted expenditure equation below. $E_{i,t}$ denotes the expenditure share for country i in year t; the hat denotes the in-sample fitted 2018 value. We display coefficients to six decimal places.

$$\hat{E}_{i,2018} = 6.207439 + 0.033858 \cdot E_{i,2009} - 0.326673 \cdot E_{i,2010} + 0.226307 \cdot E_{i,2011} + 0.154550 \cdot E_{i,2012} - 0.155513 \cdot E_{i,2013} + 0.395067 \cdot E_{i,2014} - 0.479840 \cdot E_{i,2015} + 0.370388 \cdot E_{i,2016} + 0.651576 \cdot E_{i,2017}$$

Table 5. Observed expenditure, fitted values, residuals, and influence diagnostics for 2018.

Country	Observed share	Fitted share	Residual	Standardised fitted share	SE(fitted mean)	Squared Mahalanobis	Deleted residual	Cook's distance
Belgium	52.400	52.621	-0.221	1.442	0.478	3.094	-0.260	0.001
Bulgaria	34.800	36.273	-1.473	-1.055	0.966	15.597	-3.810	0.585
Czechia	40.800	40.196	0.604	-0.456	0.495	3.384	0.720	0.005
Denmark	51.400	51.184	0.216	1.222	0.692	7.538	0.315	0.002
Germany	43.900	43.657	0.243	0.072	0.498	3.438	0.291	0.001
Estonia	39.500	39.258	0.242	-0.600	0.962	15.463	0.619	0.015
Ireland	25.700	25.561	0.139	-2.692	1.210	25.021	3.703	0.867
Greece	46.700	45.144	1.556	0.300	1.009	17.108	4.705	0.973
Spain	41.300	42.644	-1.344	-0.082	0.614	5.721	-1.786	0.052
France	56.000	55.283	0.717	1.848	0.605	5.531	0.945	0.014
Croatia	46.400	45.986	0.414	0.428	0.660	6.773	0.581	0.006
Italy	48.600	48.708	-0.108	0.844	0.366	1.406	-0.118	0.000
Cyprus	44.700	41.686	3.014	-0.228	0.943	14.814	7.251	2.019
Latvia	38.500	37.118	1.382	-0.926	0.620	5.856	1.849	0.057
Lithuania	34.000	34.706	-0.706	-1.295	1.094	20.264	-3.304	0.564
Luxembourg	43.100	43.030	0.070	-0.023	0.757	9.209	0.112	0.000
Hungary	46.500	46.233	0.267	0.466	0.631	6.091	0.361	0.002
Malta	36.800	37.623	-0.823	-0.849	0.622	5.908	-1.104	0.020
Netherlands	42.200	43.259	-1.059	0.012	0.318	0.832	-1.134	0.006
Austria	48.500	49.068	-0.568	0.899	0.569	4.772	-0.721	0.007
Poland	41.500	41.519	-0.019	-0.254	0.492	3.332	-0.023	0.000
Portugal	44.000	45.743	-1.743	0.391	0.807	10.574	-3.043	0.260
Romania	35.000	34.968	0.032	-1.255	0.732	8.537	0.049	0.000
Slovenia	42.400	43.044	-0.644	-0.021	1.087	19.991	-2.879	0.423
Slovakia	40.600	39.534	1.066	-0.557	0.821	11.001	1.915	0.107
Finland	53.100	53.838	-0.738	1.628	0.672	7.047	-1.050	0.021
Sweden	49.900	49.547	0.353	0.972	0.488	3.255	0.419	0.002
United Kingdom	40.800	41.670	-0.870	-0.231	0.368	1.444	-0.955	0.005

Source: Authors' calculations from the verified expenditure series in Appendix B.

In **Table 5**, for expenditure, Ireland's squared Mahalanobis distance is 25.020892, below the approximate threshold of 27.877165. Cyprus has an observed share of 44.700 and a fitted share of 41.686392, producing a residual of 3.013608 and an internally studentised residual of 3.789. Cook's distance is 2.018762 for Cyprus and 0.973475 for Greece. Cyprus exceeds the reference value of 1 and warrants particular attention. When we omit Cyprus, R^2 increases to 0.995309; this sensitivity check illustrates the dependence of the fit on the estimation sample and does not justify deleting the observation from the main model.

Both models describe in-sample cross-country associations. Predictor persistence contributes to multicollinearity, while the sample size and expenditure influence diagnostics constrain interpretation. Country row order is not a chronological residual series, so it cannot support a serial-correlation conclusion. We have not verified normality, homoscedasticity, or cross-country error independence. We have not completed an independent forecast evaluation or comparison with simpler alternatives. Conventional p-values are conditional on model assumptions, and practical forecasting requires separate validation.

5.1. Implications for public sector human resource planning

We propose the following framework as a managerial application, not as an empirical result about staffing. The regressions estimate fiscal shares and contain no payroll, vacancy, employment, or service-demand indicators. Their high in-sample fit therefore cannot demonstrate an improvement in recruitment, workforce allocation, or personnel budgeting. The three stages below correspond to the conceptual link we developed in Section 2.1.

At the first stage, independently validated fiscal scenarios inform an indicative resource envelope. A revenue or expenditure share must be combined with a compatible GDP assumption to obtain a nominal amount. Debt-service costs, transfers, non-personnel commitments, and allocation rules must be considered before an institutional budget can be determined. Total revenue and total expenditure are not equivalent to funds available for salaries. The budget-constraint and accounting perspectives of Ćurčić (2025) and Milanović (2025) provide context for this translation.

At the second stage, an approved personnel allocation is compared with a costed workforce plan. Inputs include salaries and employer contributions, employment by occupational group, vacancies, turnover, retirements, recruitment costs, and training expenditure. Finance and HR units need consistent records and assumptions, as suggested by the information-system perspective of Vukša and Milojević (2024). Affordability must be assessed over the duration of employment commitments, rather than only in the appointment year.

At the third stage, institutions assess recruitment sequencing, critical vacancies, lawful redeployment, and training against service-demand and workforce-capability indicators. The budget-planning discussion of Škrbić et al. (2023) and team-management discussion of Rosić and Vilma Getman (2025) provide organisational context. These options require institution-specific evidence; none follows mechanically from a fiscal coefficient or from the overall R^2.

Legal feasibility, workforce capability, and employee well-being are considerations across all three stages. Sector-specific sustainable HRM research draws attention to training, safety, and employee well-being (Ugrinov et al., 2025), while comparative discussions of employment relations and financial law motivate attention to employee protection and financial authority (Winkler, 2026; Arsić, 2026). Their transfer to public institutions requires contextual assessment.

Illustrative example (hypothetical, not estimated from the regressions). We consider a scenario in which an institution's approved annual personnel allocation falls from €10.0 million to €9.7 million, while existing payroll commitments are €9.5 million. Four planned appointments costing €80,000 each for a full year would require €320,000, exceeding the remaining €200,000 by €120,000. Finance and HR staff could assess whether two critical appointments (€160,000) and the sequencing of the other two would meet service requirements, leaving €40,000 within the stated allocation. Redeployment or training could also be assessed where feasible. The fiscal constraint initiates an affordability review; occupational requirements, employee rights, and service needs determine whether any option is suitable. All amounts and staffing options are hypothetical planning inputs. The regressions

neither produce these amounts nor identify which positions should be filled.

We propose testing the framework with linked fiscal, institutional, workforce, and service-performance data. Evaluation should distinguish forecast error from personnel-budget deviations, vacancy duration, retention, training participation, and service capacity. We recommend considering a longer series and simpler fiscal specifications in future validation, without assuming that better in-sample fit improves HR decisions.

6. Conclusion

Using the verified historical data, we find cross-country variation in general government revenue and expenditure relative to GDP. Both nine-predictor OLS specifications are jointly significant, with $R^2 = 0.995248$ for revenue and 0.976869 for expenditure. We find support for H1 and H2 as in-sample model-fit hypotheses, subject to the stated assumptions and limitations. Severe multicollinearity, a small sample, and the influential expenditure observation for Cyprus limit interpretation. The UK revenue observation does not exceed the Cook's-distance reference value of 1. These findings do not demonstrate out-of-sample accuracy, superiority over simpler forecasts, or causal effects.

The historical window excludes the pandemic and subsequent shocks, and the conventional regression assumptions have not been fully established. Direct workforce indicators are absent. Consequently, we do not forecast staffing needs or empirically establish better personnel budgeting, recruitment, retention, or workforce allocation. Our proposed HRM application requires independently validated fiscal scenarios and institution-specific payroll, employment, vacancy, skills, and service-demand information.

Our managerial contribution is a three-stage framework connecting fiscal information, approved personnel allocations, and costed workforce options. Through our illustrative example, we explain the affordability logic without deriving a staffing recommendation from the regressions. We recommend evaluating this framework in future research using linked financial and HR data and distinguishing statistical forecast performance from workforce and service outcomes.

Author contributions: Writing—original draft preparation, I.M. and N.P.; writing—review and editing, I.M. and N.P. We contributed equally to this work and have both read and approved the final manuscript.

Funding: This research received no external funding.

Conflict of interest: We declare no conflict of interest.

Data availability statement: We reproduce the complete verified analytical inputs in Appendices A and B. We transcribed them from the country**Table A**, consolidated general government (S.13), in % of GDP, in Eurostat (2019), Government finance statistics—Summary tables, volume 1/2019, DOI: https://doi.org/10.2785/75595. The publication records data extraction on 12 May 2019 and identifies dataset gov_10a_main. We checked the fixed publication vintage on 13 October 2026. Each appendix contains 28 countries and ten annual values (2009–2018), enabling reproduction of**Tables 1–5** and **Figures 1–2**. These public aggregate data contain no personal information.

Institutional review board statement: Not applicable. We use publicly available aggregate country-level statistics and involve no human participants.

Informed consent statement: Not applicable. We did not collect or analyse individual-level participant data.

Acknowledgments: We thank the anonymous reviewers for their constructive comments.

References

[1] Alawneh, A. (2017). The impact of public expenditure and public debt on taxes: A case study of Jordan. Accounting and Finance Research, 6(3), 10–23. https://doi.org/10.5430/afr.v6n3p10

[2] Arsić, I. (2026). Financial law between public and private law. The Journal Law Review of Public Sector, 6(1), 75–86. https://doi.org/10.59864/rpjs060105IA

[3] Avakumović, J., Tešić, R., & Karić, D. (2021). Menadžment tranzicionim procesima u funkciji održivog razvoja [Management of transition processes in the function of sustainable development]. Održivi razvoj, 3(1), 7–16. https://doi.org/10.5937/OdrRaz2101007A

[4] Bayraktar, N., & Moreno-Dodson, B. (2015). How can public spending help you grow? An empirical analysis for developing countries. Bulletin of Economic Research, 67(1), 30–64. https://doi.org/10.1111/j.1467-8586.2012.00473.x

[5] Brady, G. L., & Magazzino, C. (2018). Fiscal sustainability in the EU. Atlantic Economic Journal, 46(3), 297–311. https://doi.org/10.1007/s11293-018-9588-4

[6] Bretschneider, S., & Schroeder, L. (1985). Revenue forecasting, budget setting and risk. Socio-Economic Planning Sciences, 19(6), 431–439. https://doi.org/10.1016/0038-0121(85)90017-5

[7] Caruthers, J. K., & Wentworth, C. L. (1997). Methods and techniques of revenue forecasting. New Directions for Institutional Research, 1997(93), 81–93. https://doi.org/10.1002/ir.9306

[8] Cook, R. D. (1977). Detection of influential observation in linear regression. Technometrics, 19(1), 15–18. https://doi.org/10.1080/00401706.1977.10489493

[9] Ćurčić, M. (2025). Legal and economic analysis of public expenditures in conditions of budget limitations. The Financial Advisor, 30(1), 75–93. https://fa-journal.com/index.php/fa/en/article/view/4

[10] Eurostat. (2019). Government finance statistics—Summary tables: Data 1995–2018 (Vol. 1/2019; data extracted 12 May 2019). Publications Office of the European Union. https://doi.org/10.2785/75595

[11] Greiner, A., Köller, U., & Semmler, W. (2007). Debt sustainability in the European monetary union: Theory and empirical evidence for selected countries. Oxford Economic Papers, 59(2), 194–218. https://doi.org/10.1093/oep/gpl035

[12] Gupta, S., Clements, B., Baldacci, E., & Mulas-Granados, C. (2005). Fiscal policy, expenditure composition, and growth in low-income countries. Journal of International Money and Finance, 24(3), 441–463. https://doi.org/10.1016/j.jimonfin.2005.01.004

[13] Halásková, M., & Halásková, R. (2017). Public expenditures in areas of public sector: Analysis and evaluation in EU countries. Scientific Papers of the University of Pardubice, Series D, 25(1), 39–50. https://editorial.upce.cz/1804-8048/25/1/855

[14] Hyndman, R. J., & Koehler, A. B. (2006). Another look at measures of forecast accuracy. International Journal of Forecasting, 22(4), 679–688. https://doi.org/10.1016/j.ijforecast.2006.03.001

[15] Iiyambo, H., & Kaulihowa, T. (2020). An assessment of the relationship between public debt, government expenditure and revenue in Namibia. Public Sector Economics, 44(3), 331–353. https://doi.org/10.3326/pse.44.3.3

[16] Luković, S., & Grbić, M. (2014). The causal relationship between government revenue and expenditure in Serbia. Economic Themes, 52(2), 127–138. https://doi.org/10.1515/ethemes-2014-0009

[17] Mahalanobis, P. C. (1936). On the generalised distance in statistics. Proceedings of the National Institute of Sciences of India, 2, 49–55.

[18] Milanović, A. (2025). Legal framework of modern budget accounting. The Journal Law Review of Public Sector, 5(2), 53–66. https://rpjs-journal.com/index.php/rpjs/en/article/view/4

[19] Milojević, I., & Rosić, M. (2026). Monetary–fiscal interaction and public debt in the European Union under conditions of the global economic crisis. The Financial Advisor, 32(2), 29–55. https://doi.org/10.59864/FinAdv310202IM

[20] Morozumi, A., & Veiga, F. J. (2016). Public spending and growth: The role of government accountability. European Economic Review, 89, 148–171. https://doi.org/10.1016/j.euroecorev.2016.07.001

[21] Rosić, M., & Vilma Getman, R. (2025). Managerial aspects of teams and groups. The Financial Advisor, 30(1), 95–105. https://fa-journal.com/index.php/fa/en/article/view/5

[22] Sarstedt, M., & Mooi, E. (2014). A concise guide to market research: The process, data, and methods using IBM SPSS Statistics (2nd ed.). Springer. https://doi.org/10.1007/978-3-642-53965-7

[23] Škrbić, S., Malešić, S., & Gojkov, D. (2023). Budget planning process. The Journal Law Review of Public Sector, 3(2), 21–35. https://rpjs-journal.com/index.php/rpjs/en/article/view/18

[24] Tashman, L. J. (2000). Out-of-sample tests of forecasting accuracy: An analysis and review. International Journal of Forecasting, 16(4), 437–450. https://doi.org/10.1016/S0169-2070(00)00065-0

[25] Ugrinov, S., Ćoćkalo, D., & Bakator, M. (2025). Održive prakse upravljanja ljudskim resursima u pomorskim lancima snabdevanja [Sustainable human resource management practices in maritime supply chains]. Održivi razvoj, 7(1), 7–30. https://doi.org/10.5937/OdrRaz2501007U

[26] Vašaš Kuručev, D. (2026). Modern models of positioning financial managers. The Financial Advisor, 32(2), 57–76. https://doi.org/10.59864/FinAdv310203DVK

[27] Vukša, S., & Milojević, I. (2024). Održivost računovodstva kao informacionog sistema [Sustainability of accounting as an information system]. Održivi razvoj, 6(2), 23–33. https://doi.org/10.5937/OdrRaz2402023V

[28] Winkler, M. (2026). Public legal status of employee relations in companies—Comparative view. The Journal Law Review of Public Sector, 6(1), 7–18.

Appendix A

General government revenue, 2009–2018 (% of GDP).

	Years									
Country	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Belgium	48.8	49.3	50.3	51.6	52.7	52.2	51.4	50.7	51.3	51.7
Bulgaria	35.3	33.1	31.9	34.1	37.3	37.7	38.8	35.2	36.2	36.8
Czechia	38.7	39.3	40.3	40.5	41.4	40.3	41.1	40.2	40.5	41.7
Denmark	53.7	54.0	54.4	54.5	54.6	56.4	53.2	52.6	52.6	51.9
Germany	44.3	43.0	43.8	44.3	44.5	44.5	44.5	44.8	45.0	45.6
Estonia	43.9	40.7	38.6	39.0	38.3	38.5	39.7	39.1	38.9	39.0
Ireland	33.2	33.0	33.7	34.0	34.2	33.8	27.0	26.9	26.0	25.8
Greece	38.9	41.3	43.8	46.9	49.1	46.6	47.9	49.4	48.1	47.8
Spain	34.8	36.2	36.2	37.6	38.6	38.9	38.5	37.7	37.9	38.9
France	50.0	50.0	51.1	52.1	53.1	53.3	53.2	53.0	53.6	53.5
Croatia	42.3	41.7	40.6	42.5	42.4	42.9	45.2	46.3	46.1	46.6
Italy	45.9	45.7	45.7	47.9	48.1	47.9	47.7	46.5	46.5	46.4
Cyprus	36.7	37.3	36.7	36.4	36.7	39.8	39.3	38.3	39.1	39.9
Latvia	35.0	36.8	36.2	36.8	36.6	36.6	36.9	37.0	37.2	37.5
Lithuania	35.8	35.4	33.5	33.0	32.9	34.0	34.6	34.4	33.6	34.7
Luxembourg	44.5	43.5	42.9	44.4	44.3	43.3	43.3	43.7	44.4	45.5
Hungary	45.9	44.8	44.1	46.1	46.7	46.9	48.2	45.1	44.7	44.2
Malta	38.6	38.7	38.8	39.2	39.5	39.4	38.5	37.4	39.2	38.8
Netherlands	42.5	42.6	42.4	42.8	43.6	43.6	42.6	43.6	43.7	43.6
Austria	48.8	48.4	48.3	49.0	49.7	49.7	50.1	48.7	48.4	48.6
Poland	37.8	38.5	39.1	39.1	38.5	38.7	39.0	38.9	39.7	41.2
Portugal	40.4	40.6	42.6	42.9	45.1	44.6	43.8	42.8	42.7	43.5
Romania	30.3	33.1	34.1	33.7	33.3	34.1	35.4	31.8	30.9	32.0
Slovenia	42.4	43.6	43.3	44.5	44.8	44.4	44.9	43.4	43.2	43.1
Slovakia	36.3	34.7	36.5	36.3	38.7	39.3	42.5	39.2	39.4	39.9
Finland	52.2	52.1	53.3	54.0	54.9	54.9	54.3	54.2	53.4	52.5
Sweden	52.0	50.7	50.1	50.3	50.6	49.5	49.8	50.8	50.9	50.8
United Kingdom	37.2	38.3	38.4	37.7	38.6	37.7	38.0	38.5	39.1	39.3

*Source: Eurostat (2019), Government finance statistics—Summary tables, volume 1/2019, country **Table A** (S.13, % of GDP), fixed data extraction date 12 May 2019. Verified on 13 October 2026.*

Appendix B

General government expenditure, 2009–2018 (% of GDP).

	Years									
Country	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Belgium	54.2	53.3	54.5	55.9	55.8	55.3	53.7	53.1	52.1	52.4
Bulgaria	39.4	36.2	33.8	34.5	37.7	43.2	40.5	35.1	35.0	34.8
Czechia	44.2	43.5	43.0	44.5	42.6	42.4	41.7	39.5	38.9	40.8
Denmark	56.5	56.7	56.4	58.0	55.8	55.2	54.5	52.7	51.2	51.4
Germany	47.6	47.3	44.7	44.3	44.7	44.0	43.7	43.9	43.9	43.9
Estonia	46.1	40.5	37.4	39.3	38.5	37.8	39.6	39.5	39.3	39.5
Ireland	47.0	65.1	46.6	42.1	40.4	37.5	29.0	27.6	26.3	25.7

Continued table:

	Years									
Greece	54.1	52.5	54.1	55.7	62.3	50.2	53.5	48.9	47.3	46.7
Spain	45.8	45.6	45.8	48.1	45.6	44.8	43.7	42.2	41.0	41.3
France	57.2	56.9	56.3	57.1	57.2	57.2	56.8	56.6	56.4	56.0
Croatia	48.3	48.0	48.5	47.8	47.6	48.1	48.3	47.3	45.3	46.4
Italy	51.2	49.9	49.4	50.8	51.1	50.9	50.3	49.0	48.9	48.6
Cyprus	42.1	42.0	42.3	41.9	41.9	48.8	40.6	38.0	37.4	44.7
Latvia	44.6	45.4	40.5	38.0	37.7	38.1	38.2	37.0	37.8	38.5
Lithuania	44.9	42.3	42.5	36.1	35.5	34.6	34.9	34.1	33.1	34.0
Luxembourg	45.1	44.1	42.4	44.1	43.3	42.0	41.9	41.9	43.0	43.1
Hungary	50.4	49.3	49.5	48.5	49.4	49.5	50.1	46.8	46.9	46.5
Malta	41.9	41.1	41.2	42.7	41.9	41.1	39.6	36.5	35.7	36.8
Netherlands	47.6	47.9	46.8	46.8	46.5	45.7	44.6	43.6	42.5	42.2
Austria	54.1	52.8	50.9	51.2	51.6	52.4	51.1	50.3	49.2	48.5
Poland	45.0	45.8	43.9	42.9	42.6	42.4	41.7	41.1	41.2	41.5
Portugal	50.2	51.8	50.0	48.5	49.9	51.8	48.2	44.8	45.7	44.0
Romania	39.4	40.0	39.5	37.3	35.4	35.3	36.1	34.5	33.6	35.0
Slovenia	48.2	49.3	50.0	48.5	59.5	49.9	47.7	45.3	43.2	42.4
Slovakia	44.1	42.1	40.8	40.6	41.4	42.0	45.1	41.5	40.2	40.6
Finland	54.8	54.8	54.4	56.2	57.5	58.1	57.0	55.9	54.2	53.1
Sweden	52.7	50.8	50.3	51.3	52.0	51.1	49.8	49.8	49.4	49.9
United Kingdom	47.3	47.6	45.9	45.7	43.9	43.0	42.2	41.4	41.0	40.8

Source: Eurostat (2019), Government finance statistics—Summary tables, volume 1/2019, country Table A (S.13, % of GDP), fixed data extraction date 12 May 2019. Verified on 13 October 2026.