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Socio-economic impacts of different categories of state expenditure in urban and rural regions

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ABSTRACT

Decisions regarding the geographical allocation of state expenditure are important factors determining regional development and cohesion. However, the topic has received little scholarly attention due to limited data availability. Here such data were collected to uncover how state expenditure is allocated in Finland. The results reveal that while the Finnish state expenditure system is a redistributive one, the current structure of state expenditure does not stir convergence between the already socio-economically well-off and less advanced regions. This is because most of the funding received by the less developed municipalities is sustaining the current regional structure rather than regenerating economic development.

KEYWORDS

financial flows; public expenditure; redistribution; regional development; regional policy

JEL H50, R11

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1. INTRODUCTION

Decisions about where the state spends its expenditure (including consumption, investment and transfer payments) are anything but trivial. In the regional context, these (exogenous) financial flows can have important inducement effects for endogenous development. This is because they create externalities: due to increased private spending, local multiplier effects and spillovers the overall socio-economic benefits generally surpass the initial state expenditure and can, thus, trigger virtuous cycles of regional development (Rodríguez-Pose et al., 2012). Therefore, state expenditure is often considered among the most critical factors determining regional development – not to mention its impact on internal cohesion and social stability (Psycharis et al., 2021) – and, thus, of key interest to researchers and policymakers (Kataoka, 2005). In fact, as stated by Luca and Rodríguez-Pose (2015, p. 1518) the question of 'how to geographically allocate the public resources necessary for development, given each country's budget constraints' is 'one of the most important decisions that governments face'. Despite its importance, research on the topic is, however, rather limited, especially at the level of geographical detail provided by this paper. This is mostly due to data limitations (Blažek & Macešková, 2010). Indeed, the data-collection procedures needed for conducting the analysis of this paper were extremely laborious as the data are scattered over several different data sources and in most cases not readily offered in a format suitable for regional analyses.

Previous literature on the topic has suggested that public investments have positive impacts on regional development (Rodríguez-Oreggia & Rodríguez-Pose, 2004) and that the regional allocation of state expenditure are affected by 'pork-barrel politics' (Livert & Gainza, 2018).[1] As a point of departure, the issue is approached here from the relatively rarely studied perspective of balanced regional development and cohesion (the studies by Luca & Rodríguez-Pose, 2015, Morgenroth, 2010, and Blažek & Macešková, 2010, being the most notable exceptions). The value added is threefold: first, the existing studies have focused on larger geographical units, whereas here the focus is on the local level (LAU-2); second, state expenditure is expected to promote regional development,

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but little is known whether it does so equally in different types of regions across the country; and third, not all state expenditure can be expected to have the same effect, but there are very little research evidence based on a detailed geographically allocated state expenditure data per different expenditure categories. By focusing on public expenditure from the central government (state), the key research questions addressed with detailed data from Finland are as follows:

- Is the Finnish state expenditure system a redistributive one? (Hypothesis 1)
- Does it facilitate interregional convergence? (Hypothesis 2)
- Do the results vary according to different types of (rural and urban) regions? (Hypothesis 3)
- Do the results vary according to different categories of state expenditure? (Hypothesis 4)

Finland is an interesting case study for this research design. As a Nordic welfare state, most Finns have traditionally been accepting towards high state expenditure on, for example, social welfare. Therefore, Finland's state expenditure levels are one of the world's highest (Facchini, 2018). This constitutes a challenge as the ageing population of Finland expands expenditure on health services, pensions and other social welfare services. The related contemporary public discussion in Finland underlines the topicality of research on state expenditure and their spatial allocation.

2. THE GEOGRAPHY OF STATE EXPENDITURE

2.1. Regional allocation of state expenditure

According to public finance theory the regional allocation of state expenditure is primarily based on goals of achieving a balance between (potentially) higher returns from the allocated of resources and equitable (cross-regional) distribution of wealth (Musgrave, 1959; Oates, 1972). From a neoclassical perspective, state expenditure should facilitate development in every region of the country and, thus, promote convergence. However, some regions are better at transforming ('absorbing') external expenditure to regional development than others (Oughton et al., 2002). The commonly (but not unanimously) held view of higher efficiency of state expenditure in core urban regions favours such clustering development (Brenner & Pudelko, 2019). Therefore, from an endogenous growth (or a new economic geography) perspective state expenditure will give rise to increasing returns to scale, thus benefitting the already well-off regions and creating divergence between regions (Garretsen et al., 2013). This theoretical discussion lays the foundation for the research questions. Below these are discussed vis-à-vis the previous empirical literature on the topic.

The redistributive nature of state expenditure has been discussed, for example, by Blažek and Macešková (2010, p. 681): 'generally, it can be expected that a system of progressive taxation reduces revenues in more affluent regions, while social benefits tend to flow into the less well-off regions, representing an important mechanism for interregional redistribution'. However, in addition to goals related to spatial justice the regional allocation of state expenditure also has aims of achieving economic competence (Rodríguez-Oreggia & Rodríguez-Pose, 2004). The distributive politics of state expenditure are, thus, driven both by goals of efficiency and equity (Luca & Rodríguez-Pose, 2015) and the trade-offs between investing in those areas where the allocation of resources can be expected to yield higher returns and the moral and political unacceptability of great inequality in well-being between regions (Rodríguez-Oreggia & Rodríguez-Pose, 2004). Since Finland is a Nordic welfare state, it is expected that its state expenditure system is generally a redistributive one (Hypothesis 1).

In terms of interregional cohesion and convergence, the analysis of Turkish regions by Luca and Rodríguez-Pose (2015) shows how the state, consciously or unconsciously, has pursued to foster agglomeration in already well-off regions rather than allocating more resources to regions with the greatest socio-economic need for public investments. Similarly, the analysis by Blažek and Macešková (2010) revealed that in the Czech Republic state expenditure has favoured the most economically developed capital region of Prague. They conclude that state expenditure is one of the most important (cumulative) mechanisms of regional divergence. However, at the same time they acknowledge that the strict focus on state expenditure ignores the fact that 'Prague is very likely the most important net payer in the system of public finance due to its buoyant tax base and its relatively low share of persons receiving social benefits' (Blažek & Macešková, 2010, p. 694). In Ireland, while the well-performing regions contribute (via taxation) to a substantial resource transfer to less developed regions, the better-off regions still receive an above-average level of state expenditure and, thus, the state expenditure system only partially equalises regional disparities (Morgenroth, 2010). Thus, while there is clear evidence of the positive regional development impacts of public investment – but different policies and types of expenditure can have differing effects (Rodríguez-Pose et al., 2012) – there seems to be little evidence that they would have led to regional convergence between the already well-off and less developed regions (Rodríguez-Pose et al., 2016). Therefore, it is expected that the Finnish data will show that the state expenditure system does not lead to interregional convergence (Hypothesis 2).

Finally, it is important to note that there are also likely differences in the state expenditure a region receives depending on their position within the country's rural–urban continuum. For example, whereas innovation funding seems to favour urban areas (Makkonen & Mitze, 2024), rural areas are the logical destination for, for example, support to agriculture. Therefore, it is expected that there are distinct regional patterns in the state expenditure system according to the division of urban and rural regions (Hypothesis 3).

2.2. Narrow and broad regional policy

In relation to the different categories of state expenditure, one way to define regional policy is to view it from narrow and broad perspectives (Tervo, 2005). Narrow regional policy encompasses those policies that have been, at least to a certain extent, regionalised ('place-based policies'): they are adjusted to meet specific regional needs and conditions. From the broad perspective, regional policy encompasses all sectoral policies that have regional consequences despite lacking explicit definitions of regional goals ('spatially blind policies') commonly favouring the largest cities (McCann & Rodríguez-Pose, 2011). This means that while a specific public instrument has not been designed as a regional policy tool, the funding can nonetheless lead to geographically unequally distributed outcomes (Makkonen & Mitze, 2024). In fact, as stated by Blažek and Macešková (2010, p. 681), often 'the regional impact of vigorously pursued sectoral policies is much more profound than the regional impact of regional policy itself'. Further, the financial volumes of explicit regional policies cover an incomparably smaller portion of the overall state expenditure than sectoral (non-regional) policies. Additionally, the funding allocated via explicit regional policies does not always coincide with the mapping of regions most in need of such public investments (Mackay & Williams, 2005).

Considering the above, state expenditure can be divided from the narrow and broad regional policy perspectives. First, the narrow perspective relates to place-based state expenditure allocated directly to certain regions to facilitate development. In the Finnish case these include infrastructure funding, support to agriculture (due to its sectoral nature mainly directed to rural regions) and rural development and structural support mechanisms. This state expenditure category is termed here as *regionally based expenditure*.

A second place-based state expenditure category is the *central government's transfers* to local governments through which the state participates in the financing of basic municipal services (e.g., education). The goal of these transfers is to ensure the availability of municipal public services throughout Finland by equalising the differences between municipalities in the costs of organising the services and their tax revenue bases.

Third, *knowledge-intensive expenditure* can be considered as a spatially blind policy as they include allocation of funding to universities, universities of applied sciences, foundations and vocational schooling as well as competitive research funding from Business Finland, Academy of Finland and ministries. While several of the provincial universities in Finland have originally been established as a regional policy decision to spread development across the country (Tervo, 2005), the current funding system operates mainly through rewarding research excellence (publications, external research funding and graduates). Similarly, Business Finland (the main governmental organisation for research and development (R&D) funding) as well as Academy of Finland (the main governmental organisation for academic research funding) and contracted research through ministries operate under a spatially blind policy, meaning that their aim is to support the projects and organisations they consider most feasible irrespective of their home location within Finland (Luoto & Virkkala, 2017).

Fourth, state expenditure based on the *presence of the state* (including public procurement, wages of government employees and state pensions) in regions can be considered as a spatially blind policy for the following reasons. First, Finnish government organisations have been relocated in the past as a regional policy tool (Yliskylä-Peuralahti, 2004), but more recently they have been concentrating into the largest urban areas. As a result, many municipalities in Finland have witnessed a complete withdrawal of state agencies and institutions (Ministry of Finance, 2017). Second, public procurement decisions of the state are not based on the location of the supplier but on costs and the price–quality ratio of the bid: contracts are given to the 'most economically advantageous bidder' (Ministry of Finance, 2023).

Finally, the state expenditure allocated through social benefits (*individually based expenditure*) can be regarded as a spatially blind policy as these types of financial flows are allocated to individuals based on their socio-economic and well-being-related conditions that are not tied to geographical jurisdictions. These include such social benefits as unemployment benefits, income support, housing support, pensions, medical compensation, child benefits and study grants. Based on the above discussion it is expected that the different state expenditure categories have varying impacts on regional development (Hypotheses 4).

3. DATA AND METHODS

3.1. Collecting scattered threads: Finnish state expenditure data

As noted in previous studies (Blažek & Macešková, 2010), data availability issues are a significant complicating factor to regional analysis on state expenditure. In this study, municipalities were chosen as the analysed regional unit. The data cover the municipalities in mainland Finland ($N = 293$). A more detailed local level would have required the use of registers and limited the geographical coverage of the analyses due to data protection constraints. Focusing on municipalities as the regional unit of analysis is justified because many decisions regarding the regional allocation of state expenditure are made at the municipal level (central government's transfers being a prime example). Additionally, municipalities are the primary settings where state expenditure meets its targets, whether it be social benefits to individual citizens, transfers to enable statutory public service provision, state employees' salaries, or innovation promotion for companies.

The state expenditure data were collected from various sources (Table 1 and see Table A1 in Appendix A in the supplemental data online). Consequently, a significant

Table 1. Data used to construct the state expenditure categories and taxation data, 2018–21.

State expenditure categories and types	Data source
Regionally based expenditure	
Broadband investments	Ministry of the Economy and Employment
Road investments	Finnish Transport Infrastructure Agency
Support for agriculture	Finnish Food Authority
Rural development funding	Finnish Food Authority
Central government's contribution to structural funds	Ministry of the Economy and Employment
Central government's transfers	
Central government's transfers	Association of Finnish Municipalities; Ministry of Finance
Knowledge-intensive expenditure	
Business Finland funding	Business Finland
Competitive research funding (Finnish Academy and Ministries)	Ministry of Education and Culture
Funding for universities	Ministry of Education and Culture
Funding for universities of applied sciences	Ministry of Education and Culture
Funding for vocational schooling	Ministry of Education and Culture
Funding for associations and foundations	Ministry of Finance
Presence of the state	
Public procurement	Handata Oy
Wages of government employees	Statistics Finland; Financial statements of government organisations
State pensions	Social Insurance Institution of Finland; Tax Administration
Individually based expenditure	
Unemployment benefits	Social Insurance Institution of Finland
Income support	Social Insurance Institution of Finland
Housing support	Social Insurance Institution of Finland
Pensions	Social Insurance Institution of Finland
Medical compensation	Social Insurance Institution of Finland
Child benefits	Social Insurance Institution of Finland
Study grants	Social Insurance Institution of Finland
Other social benefits	Social Insurance Institution of Finland
Taxes	
Income and corporate taxes in state taxation	Tax Administration

effort was required to harmonise the data in terms of regional and temporal coverage. The data collection focused on obtaining the most recent years with good coverage, resulting in a four-year period from 2018 to 2021. Early in the data-collection process, it was noted that gathering data from numerous sources over a longer period was not feasible. Therefore, cross-sectional data from four-year averages were calculated to smooth yearly variations. While some of the data were readily available by municipalities, other regional allocations of state expenditure categories had to be performed manually using geocoding, as the original data were not suitable for regional analysis. This was done by using alternative sources of geotagged data, for example, by linking individual financial flows to specific municipalities via the business IDs of funded organisations. Additionally, municipal taxation data were collected. To control the obvious pitfalls of using absolute figures for municipality data, all state expenditure and taxation data were normalised per population.

The state expenditure allocated by the Finnish government serve a variety of socio-economic objectives. Table 1 lists the main state expenditure categories, broken down into 23 subcategories. The total amount of yearly state

Table 2. Variables used to construct the economic and dependency indices.

Indicator	Period	Definition	Source[a]
Dependency index			
Unemployment	2018–21	Unemployed people as a % of the labour force	Sotkanet
Youth unemployment	2018–21	Unemployed young people as a % of the labour force aged 18–24 years	Sotkanet
Elderly poverty	2018–21	Those receiving full national pension[b] as a % of the over-65-year age group	Sotkanet
Child poverty	2018–21	% of persons under 18 years who live in households with incomes below the at-risk-of-poverty rate	Sotkanet
Morbidity	2016–19	Regional differences in the prevalence of diseases and health problems at the population level	Sotkanet
Economic index			
Private research and development (R&D) spending	2016–19	Private R&D spending per population at the LAU-1 level	StatFin
Gross domestic product (GDP)	2017–20	GDP per population at the LAU-1 level	StatFin
Workplaces	2018–21	Change in the number of workplaces as a % from 2018 to 2021	StatFin
Income	2018–21	Median household disposable cash income	StatFin
Higher education	2018–21	Persons with at least a bachelor's degree as a % of the population aged 15 years or over	StatFin

Note: [a]Sotkanet = Finnish Institute for Health and Welfare (https://sotkanet.fi); StatFin = Statistics Finland (https://pxdata.stat.fi/PxWeb/pxweb/en/StatFin/).
[b]Given to those with little or no earnings-related pension describing low incomes in the retirement-age population.

expenditure scanned is about €45 billion, which covers approximately 70% of the average yearly total budget of the Finnish government. The most notable expenditure category that lies beyond the empirical scope of this paper is defence spending. Once expenditure that is for certain spent abroad (e.g., development aid, European Union contributions, international organisations, etc.) are excluded from the total budget, the coverage of the domestic regional allocation rises to 76%. Of the mapped state expenditure categories, the largest share is devoted to individually based expenditure (32.8%), followed by the presence of the state (31.1%), central government's transfers (22.6%), knowledge-intensive expenditure (9.8%) and, the smallest category, regionally based expenditure (3.7%). The dataset provides the most comprehensive available overview of the regional distribution of state expenditure in Finland to date, allowing for an exploratory regional data analysis within the country.

3.2. Socio-economic indices and structural heterogeneity

Taking stock on previous research on regional development in Finland (e.g., Makkonen & Inkinen, 2023) two indices were constructed: dependency index (DI) and economic index (EI) (Table 2 and see Table A2 in Appendix A in the supplemental data online). They were constructed to distinguish between the fact that whereas some categories of state expenditure can be expected to spur regional growth (e.g., knowledge-intensive expenditure), others are more redistributive in that they are designed to alleviate social inequality (e.g., individually based expenditure). High values in the DI indicate regions with disadvantaged populations based on unemployment, youth unemployment, elderly poverty, child poverty and morbidity. High values in the EI indicate economically strong regions based on private R&D spending and gross domestic product (GDP) (at the LAU-1 level, as these data are not available at the municipal LAU-2 level), change in the number of workplaces, median income and educational attainment. The socio-economic variables were normalised per population, labour force or by other appropriate means. The variables were calculated as an average of a four-year period based on the most recent data available to correspond to the time period of the state expenditure data. The indices were constructed with principal component analysis meeting the requirements (Jolliffe, 2002) for an acceptable solution (eigenvalues > 1; Kaiser–Meyer–Olkin test > 0.6, Bartlett's test < 0.001; communalities and loadings > 0.3).

In addition to the DI and EI, an alternative typology – depicting the structural heterogeneity of regions (Hjaltadóttir et al., 2020) – was employed to test for potential urban–rural differences in the regional allocation of state expenditure in Finland. To this end data that divide Finnish municipalities according to their demographic characteristics and land-use patterns into urban areas, rural areas close to urban areas (RCAs), core rural, that is, rural heartland areas (RHAs) and sparsely populated rural areas (SPAs) were utilised. This research-based typology[2] is actively used in Finland for both policy purposes as well as for academic research. The typology was utilised here to detect differences in the state financial flows to municipalities according to their standings in the urban–rural continuum.

3.3. Methodological choices

To answer the first and third research question (and corresponding hypotheses), the data were first approached via descriptive comparative analysis to uncover where state expenditure is allocated in Finland. This was done by comparing whether state expenditure is allocated to municipalities that are in a vulnerable position in terms of their economy and well-being of their inhabitants or towards the more well-off regions. The non-parametric analyses (as the state expenditure data are non-normally distributed) were carried out separately per the different state expenditure categories to disentangle whether certain categories of expenditure are oriented more to the already well-off regions (or vice versa to the less developed regions) than others. Spearman's correlation analyses were performed to detect whether there are linear associations between state expenditure, taxation and the DI and EI. Kruskal–Wallis tests were performed to assess whether the distribution of state expenditure categories differ significantly between the four groups of urban and rural municipalities discussed above.

To answer the second and fourth research questions (and corresponding hypotheses), a more complex analysis of the association of the state expenditure categories and the DI ($Dependence_i$) and EI ($Economic_i$) in municipalities were done with multivariate regression modelling using R and the following models:

$$Dependence_i = \alpha + \beta Regional_i + \beta Government_i + \beta Knowledge_i + \beta State_i + \beta Individual_i + \beta C_i + \varepsilon_i$$

$$Economic_i = \alpha + \beta Regional_i + \beta Government_i + \beta Knowledge_i + \beta State_i + \beta Individual_i + \beta C_i + \varepsilon_i$$

where *Regional* indicates regionally based expenditure, *Government* refers to central government's transfers, *Knowledge* refers to knowledge-intensive expenditure,[3] *State* describes the presence of the state and *Individual* refers to individually based expenditure. In the model, the term ε indicates the error term, and C the group of control variables. The control variables (see Table A3 in Appendix A in the supplemental data online) were selected – by taking stock on previous studies on public spending (e.g., Grisorio & Prota, 2015; Makkonen et al., 2024) – to describe various demographic and locational characteristics of the municipalities as well as their political orientation and fiscal decentralisation that could be related to their development but are not included in the constructed indices (DI or EI). Although several control variables have been added in the models, the set is not necessarily exhaustive. Therefore, the analysis is prone to omitted variables bias which is a relevant problem for research based on a short cross-sectional dataset. This is considered in the interpretation of the results: instead of causal inferences, the regression results are interpreted as associations between the state expenditure categories and the DI and EI. Additionally, a spatially weighted variable, that is, a spatial lag (based on neighbouring spatial units[4] sharing a common edge or vertex), was also calculated for each variable by using the *st_contiguity* function from the *sf-package* (Pebesma, 2018). That is, the purpose of the regression modelling is to identify both spatially direct and indirect (spatial lags) associations related to state expenditure and the development of municipalities' socio-economic status.

The regression models were estimated using regularisation techniques in linear regression modelling (LM) because state expenditure is often linked to each other, and therefore, the traditional ordinary least square (OLS) coefficient estimations would lead to unreliable predictions. Thus, in the estimation Ridge and LASSO regression techniques were utilised as they help reduce variance at the cost of introducing some bias in a model and avoid the overfitting issue. In these techniques the regularisation is based on two different cost functions regarding the model complexity: the $L1$ norm (least absolute deviations) and the $L2$ norm (least squares) (Bickel et al., 2006). The Ridge regression applies the $L2$ penalty term to control the coefficient of each independent variable in a linear regression model (Hoerl & Kennard, 1970). Therefore, the coefficients of correlated predictors are similar. The LASSO regression has a similar cost function to minimise the sum of the squared differences, but it applies the $L1$ penalty term to regularise the coefficient of each independent variable (Tibshirani, 1996). It tends to pick one predictor from a few very correlated predictors and set the coefficients of the others close to zero. By shrinking some coefficients with cost functions, the Ridge and LASSO regression models can control the multicollinearity in the model. Therefore, the regularisation techniques are helpful when there are many intercorrelated features necessitating selection. These techniques were used because the cross-sectional nature of the data does not allow for the use of advanced panel regressions or the investigation of Granger causality between state expenditure and the DI and EI.

Both regularisation techniques were estimated here, since neither one of the regression models is overall better. The regression models were estimated by using the *lmridge* package for Ridge regression (Imdad & Aslam, 2023) and *glmnet* package for LASSO regression (Friedman et al., 2010). In Ridge regression the biasing parameter (K) was estimated with the Ridge package (Cule et al., 2022). In LASSO models the lambda parameter was cross-validated with the *cv.glmnet* function from the *glmnet* package. This technique was used as an elimination process because the statistical significance of the regressors is based on the final selected variables. In addition to statistical significance, the regressors were evaluated based on their relative importance which was calculated with the Lindeman, Merenda and Gold (LMG) index by using the *relaimpo* package (Groemping, 2006). This calculation expands the possibilities for interpretation of traditional regression models, because in addition to detecting the significant associations of the single regression coefficients, also interpretation of their relative importance in explaining the DI and EI can be made by quantification

of an individual regressor's contribution to a multiple regression model (Johnson & Lebreton, 2004).

Finally, to conclude the descriptive analysis and complement the answer to the third research question (and corresponding hypothesis), the regional patterns and structure of state expenditure categories, as well as the EI and DI, were analysed using cluster analysis. Clustering techniques are exploratory methods that can group municipalities with similar allocations of state expenditure when there is no prior knowledge or preconception concerning the classification of data. Therefore, this analysis is well-suited to the purpose of exploring the types of clusters formed by state expenditure within the Finnish municipality structure. The cluster analysis was conducted in *R* using the *pam* algorithm (Partitioning Around Medoids) available in the cluster package (Maechler et al., 2022). Due to the lack of prior knowledge on the 'right' number of clusters, validation analyses from the *clValid* package (Brock et al., 2008) were performed to objectively identify the number of clusters formed from the state expenditure data of the municipalities (Jain & Dubes, 1988).

4. RESULTS

4.1. Comparative analyses

As expected, based on Blažek and Macešková (2010), the DI is positively while taxes and the EI are negatively correlated with the level of total state expenditure (Table 3). Economically well-off regions can and do contribute to the state budget via taxation the most but get less than regions that are not in a similarly advantaged position (according to their standing in the DI) to contribute to state taxes. In other words, the Finnish state expenditure system is a redistributive one. Further disentangling the Finnish regions per their urban–rural type (Figure 1) shows that both indices and taxes have distinct regional patterns. Generally, urban areas and RCAs are the most economically advanced regions and, thus, also the ones that contribute to the state budget the most via taxation. Contrarily, RHAs and SPAs are generally defined by their poor EI and DI scores and, thus, are naturally not among the highest state tax paying regions in Finland. According to the Kruskal–Wallis test these differences are statistically significant,[5] except in the case of the DI where the distribution of urban areas and RHAs is relatively similar.

The above linkage between the DI and state expenditure holds particularly for the central government's transfers and individually based expenditure (Table 4), which are meant to secure a balanced coverage of municipal services across the country and alleviate social inequalities among the population. The former are directed particularly towards RHAs and SPAs, while the latter are more evenly dispersed but still show a clear tendency for SPAs as the main receivers (Figure 1) as evidenced also by the Kruskal–Wallis tests. The other state expenditure categories have a less pronounced, while still statistically significant, connection to the DI. A notable result is, however, that all the state expenditure categories have a positive correlation with the DI – roughly meaning that more financial flows are directed towards regions with socio-economically less well-off populations in terms of poverty, morbidity and unemployment – except for the knowledge-intensive expenditure (Table 4). These latter financial flows seem to be directed more towards regions with socio-economically well-off populations.

When it comes to the EI, it can be observed that it correlates strongly and negatively with central government's transfers and individually based expenditure as well as with regionally based expenditure aimed at stirring (economic) development (Table 4). Thus, these categories of financial flows are directed more towards economically less fortunate regions. Regionally based expenditure is directed particularly towards RHAs and SPAs (Figure 1) verified by the Kruskal–Wallis test. Again, in the case of knowledge-intensive expenditure the sign of the correlation coefficient differs from the other state expenditure categories. Thus, in the case of knowledge-intensive expenditure the financial flows are more directed towards the already well-developed areas. A deeper investigation into the regions receiving the bulk of this type of expenditure reveals that they are consistently large university cities. Rural areas receive very little of this type of state expenditure (Figure 1) as verified by the Kruskal–Wallis test.

The correlation between both the DI and EI and the presence of the state are statistically significant but remain rather low compared to the other state expenditure categories (Table 4). The reason behind this outcome becomes clearer once looking at the list of top-receiving regions. In this case, in addition to large cities, the proportionally largest beneficiaries of state presence are sites of the defence forces (military bases) or the customs and the border guard (border stations) that are not among the most economically developed Finnish regions. When looking at the urban–rural typology (Figure 1), these latter regions show as outliers within the rural area types, whereas urban areas are more consistently the locations of strong state presence. However, most rural regions do not receive significant amounts of financial flows through the presence of the state. The Kruskal–Wallis test statistics support this interpretation. The above results, naturally, get repeated when looking at the correlations (Table 4) between the individual state expenditure categories.

The results of the comparative analyses are in line with what was expected based on the hypotheses. As stated in Hypothesis 1, generally the state expenditure system in Finland is a redistributive one. However, some expenditure categories – notably, knowledge-intensive expenditure – are heavily concentrated to the already well-off urban regions as implied in Hypothesis 3.

4.2. Multivariate regression analyses

The multivariate regression models detecting the association of state expenditure categories, and the DI and EI demonstrate the significance of the role of the state in socio-economic development of the municipalities and their vulnerability to disadvantaged positions (Table 5). On total, state expenditure explain 40% (DI) and 51%

Table 3. Spearman correlation statistics between total expenditure, taxes, and deprivation and economic indices.

Variables	Total expenditure	Dependency index	Economic index
Dependency index	0.653***		
N	281		
Economic index	−0.672***	−0.699***	
N	293	281	
Taxes	−0.532***	−0.611***	0.638***
N	293	281	293

Note: Significant at ***$p < 0.001$.

(EI) of the total variance of the indices which corresponds to 58% and 76% of the total R^2 of the LM models underlying the importance of state expenditure as an indicator of the socio-economic conditions of the municipalities.

The regression results for the DI show relatively small differences between the Ridge and LASSO models (Table 5). The DI scores of municipalities are connected with high individually based expenditure and their spatial

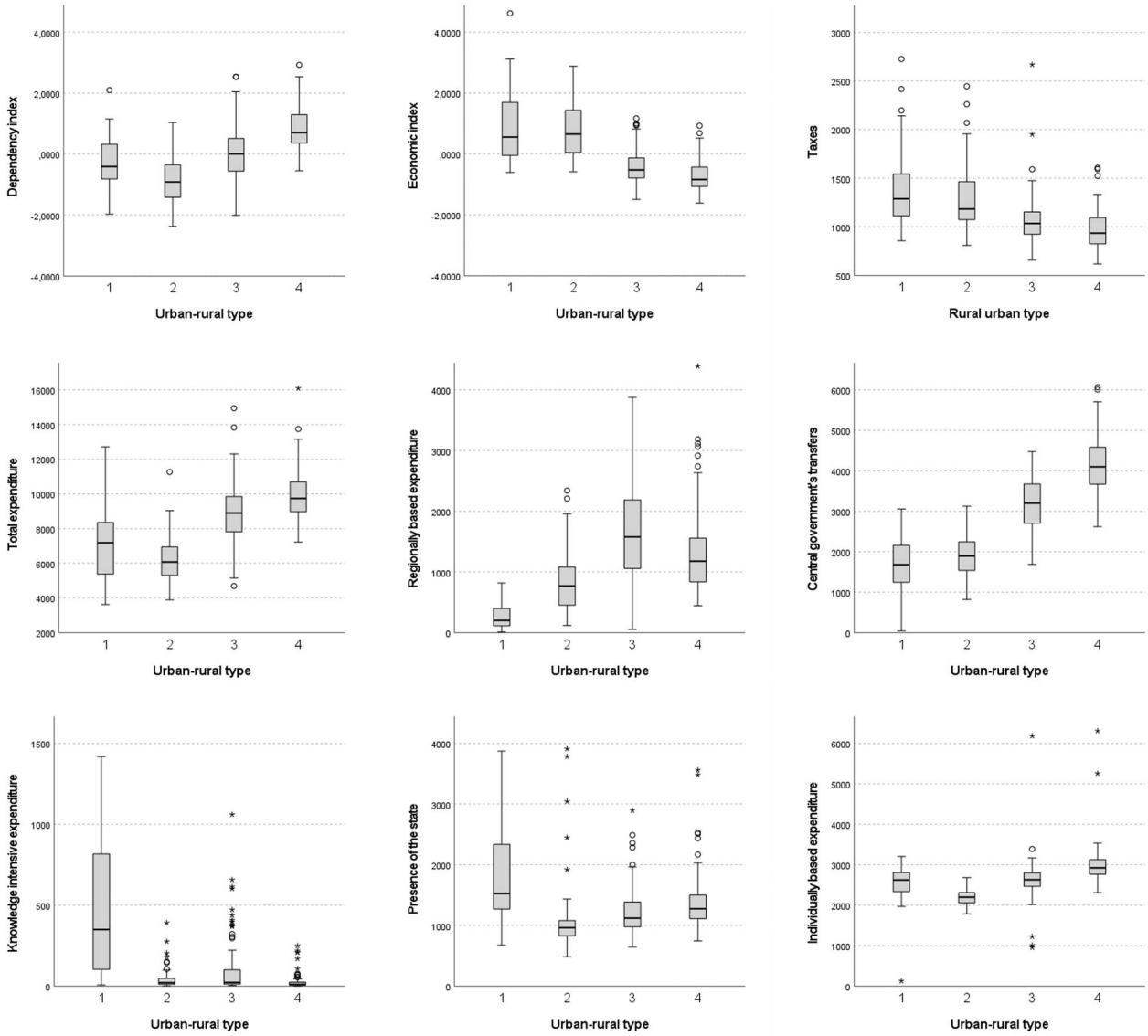

Figure 1. Dependency and economic indices, taxes (€/inhabitant), state expenditure categories (€/inhabitant) and regional types. Note: 1, Urban areas; 2, rural areas close to urban areas (RCA); 3, rural heartland areas (RHA); and 4, sparsely populated areas (SPA). Notice the varying scales for state expenditure categories. For reasons of visualisation, anomalous observations are not shown in the figures (see Table A1 in Appendix A in the supplemental data online).
Source: Authors' own elaboration.

Table 4. Spearman correlation statistics between state expenditure categories and deprivation and economic indices.

	Dependency index	Economic index	Regionally based expenditure	Central government's transfers	Knowledge-intensive expenditure	Presence of the state
Regionally based expenditure (*N*)	0.275** (281)	−0.474*** (293)				
Central government's transfers (*N*)	0.678*** (281)	−0.787*** (293)	0.662*** (293)			
Knowledge-intensive expenditure (*N*)	−0.127* (281)	0.301*** (293)	−0.437*** (293)	−0.390*** (293)		
Presence of the state (*N*)	0.217*** (281)	−0.133* (293)	−0.221*** (293)	0.036 (293)	0.266*** (293)	
Individually based expenditure (*N*)	0.842*** (281)	−0.715*** (293)	0.258*** (293)	0.688*** (293)	−0.063 (293)	0.308*** (293)

Note: Significant at ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

concentration in neighbouring municipalities (lag). Similar association is found in the case of central government's transfers to individual municipalities as well as to their neighbouring municipalities. Both variables show that state expenditure are allocated to those municipalities with high proportions of disadvantaged populations. Also, the spatial lag of knowledge-intensive expenditure is positively associated with the DI scores in municipalities. The result is driven by provincial university towns that do well in terms of per capita knowledge-intensive expenditure but have neighbouring municipalities with high shares of disadvantaged populations. The regionally based expenditure and presence of the state (and their spatial lags) have negative regression coefficients, and thus, negative association with the DI. The background to the former association is that the agricultural support expenditure forms the most significant part of the regionally based state expenditure category. The highest per capita allocation for agricultural support funding is directed to municipalities in western Finland, where dependency is not as high as in the eastern and northern parts of Finland. The latter association is driven by the concentration of state presence to urban areas and the good standing of the neighbouring RCAs in the DI.

In the case of the EI, the results from Ridge and LASSO models are, again, very similar (Table 5). While the connection between state expenditure categories and the EI are less pronounced an interesting pattern emerges. The results are almost the direct opposite to the ones depicting the DI. Individually based expenditure and central government's transfers as well as the spatial lag of the latter have a statistically significant negative connection to the EI. That is, lower EI values are obtained by those municipalities, where the allocation of social benefits or central government's transfers is high. It should be noted that only the spatial lag of knowledge-intensive expenditure directly strengthens the performance of municipalities in the EI as it has a positive relationship with the index. The result is in line with recent findings indicating that public research, development and innovation funding creates significant positive spatial spillover effects to neighbouring localities (Myers & Lanahan, 2022). An implication can be drawn that the state expenditure do not alter the 'big picture' of regional development in Finland: those municipalities that are doing well, would likely be doing the best even without the state expenditure, whereas the state expenditure received by less well-off municipalities is not enough to renew their economic structures.

While there are small differences in the explanatory power of the models, the central government's transfers variable (associated with poor performance) has the highest relative importance for both the DI and EI in both indices. It and its spatial lag explain 26% (DI) and 34% (EI) of the total variance of the indices, which corresponds to 38% and 51% of the total R^2 of the sum of the regression models underlining the importance of central government transfers as an indicator of the socio-economic conditions of a municipality. The results containing to spatial lags indicate that also the type of funding received by neighbouring municipalities matters for local socio-economic development and highlights the importance of adjacent localities in the development of an individual municipality; an issue that will be further elaborated in the next section.

These results confirm what was expected based on the hypotheses. In line with Hypothesis 2, while there is a link between state expenditure and regional socio-economic development, the state expenditure system has not contributed to interregional convergence in Finland. Moreover, there are differences how the categories of state expenditure are tied to local socio-economic conditions, meaning that certain categories have a stronger connection that others, as implied in Hypothesis 4.

4.3. Mapping regional clusters of state expenditure

In order to detect and map regional structures of state expenditure and the DI and EI a cluster analysis was

Table 5. Results of the regression analyses.

	Dependency index							Economic index						
	LM			Ridge		LASSO		LM			Ridge		LASSO	
Variable	***B***	***t***	**LMG**	***B***	***t***	***B***	***t***	***B***	***t***	**LMG**	***B***	***t***	***B***	***t***
Intercept	1.394	2.880***	0.036	1.163	9.088***	1.387	2.860***	1.250	4.132***	0.029	1.320	2.751***	1.373	5.440***
Regionally based expenditure	−0.072	−2.037**	0.003	−0.062	−1.932*	−0.067	−2.017**	−0.018	−0.178	0.012	−0.082	−0.948		
Central government's transfers	0.223	3.690***	0.010	0.216	4.797***	0.217	3.710***	−0.517	−8.432***	0.040	−0.395	−9.738***	−0.524	−9.351***
Knowledge-intensive expenditure	0.053	0.410	0.049	0.056	0.500	0.041	0.390	0.036	0.240	0.022	0.092	0.718		
Presence of the state	−0.101	−2.001**	0.142	−0.086	−1.867*	−0.092	−2.031**	−0.074	−1.418	0.223	−0.063	−1.374	−0.070	−1.403
Individually based expenditure	0.065	1.716*	0.003	0.070	1.993**	0.063	1.714*	−0.048	−1.184	0.003	−0.068	−1.964**	−0.045	−1.132
Regionally based expenditure, spatial lag	−0.156	−1.971**	0.014	−0.124	−1.780*	−0.141	−1.939**	0.001	0.016	0.026	−0.009	−0.126		
Central government's transfers, spatial lag	0.256	3.352***	0.021	0.237	4.088***	0.247	3.299***	−0.041	−0.495	0.032	−0.122	−2.284**	−0.010	−0.141
Knowledge-intensive expenditure, spatial lag	0.882	4.240***	0.036	0.750	3.977***	0.839	3.910***	0.456	2.185**	0.029	0.471	2.607***	0.484	2.380**
Presence of the state, spatial lag	−0.247	−2.472**	0.115	−0.212	−2.308**	−0.231	−2.396**	0.102	0.951	0.117	0.063	0.681	0.110	1.036
Individually based expenditure, spatial lag	0.140	1.676*	0.003	0.156	2.079**	0.139	1.681*	0.092	1.030	0.003	0.054	0.708		
Adjusted R^2	0.681			0.639		0.680		0.664			0.600		0.668	
K				0.051							0.085			

Note: LM, linear regression modelling; LMG, Lindeman, Merenda and Gold.
Significant at ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

Table 6. Cluster statistics.

	Cluster average					Variance analysis	
Variable	**1 ($n = 47$)**	**2 ($n = 108$)**	**3 ($n = 79$)**	**4 ($n = 40$)**	**5 ($n = 19$)**	***F***	***p*-value**
Economic index	−0.667	−0.264	1.055	−0.922	0.704	19.471	0.011**
Dependency index	0.262	0.139	−1.055	1.373	0.053	0.862	0.354
Regionally based expenditure	2293	771	504	1329	330	21.570	< 0.001***
Regionally based expenditure, spatial lag	1564	808	474	963	930	27.610	< 0.001***
Central government's transfers	3903	2944	1748	4426	1778	14.010	< 0.001***
Central government's transfers, spatial lag	3596	2974	1906	3753	2624	9.905	0.001***
Knowledge-intensive expenditure	21	100	66	42	1320	94.091+	< 0.001***
Knowledge-intensive expenditure, spatial lag	81	173	252	237	147	10.841	0.001***
Presence of the state	1180	1375	1203	1470	2661	27.090	< 0.001***
Presence of the state, spatial lag	1252	1462	1380	1563	1347	3.424	0.065*
Individually based expenditure	2769	2766	2175	3462	2648	0.629	0.428
Individually based expenditure, spatial lag	2780	2795	2354	3131	2532	0.460	0.498

Note: Significant at ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

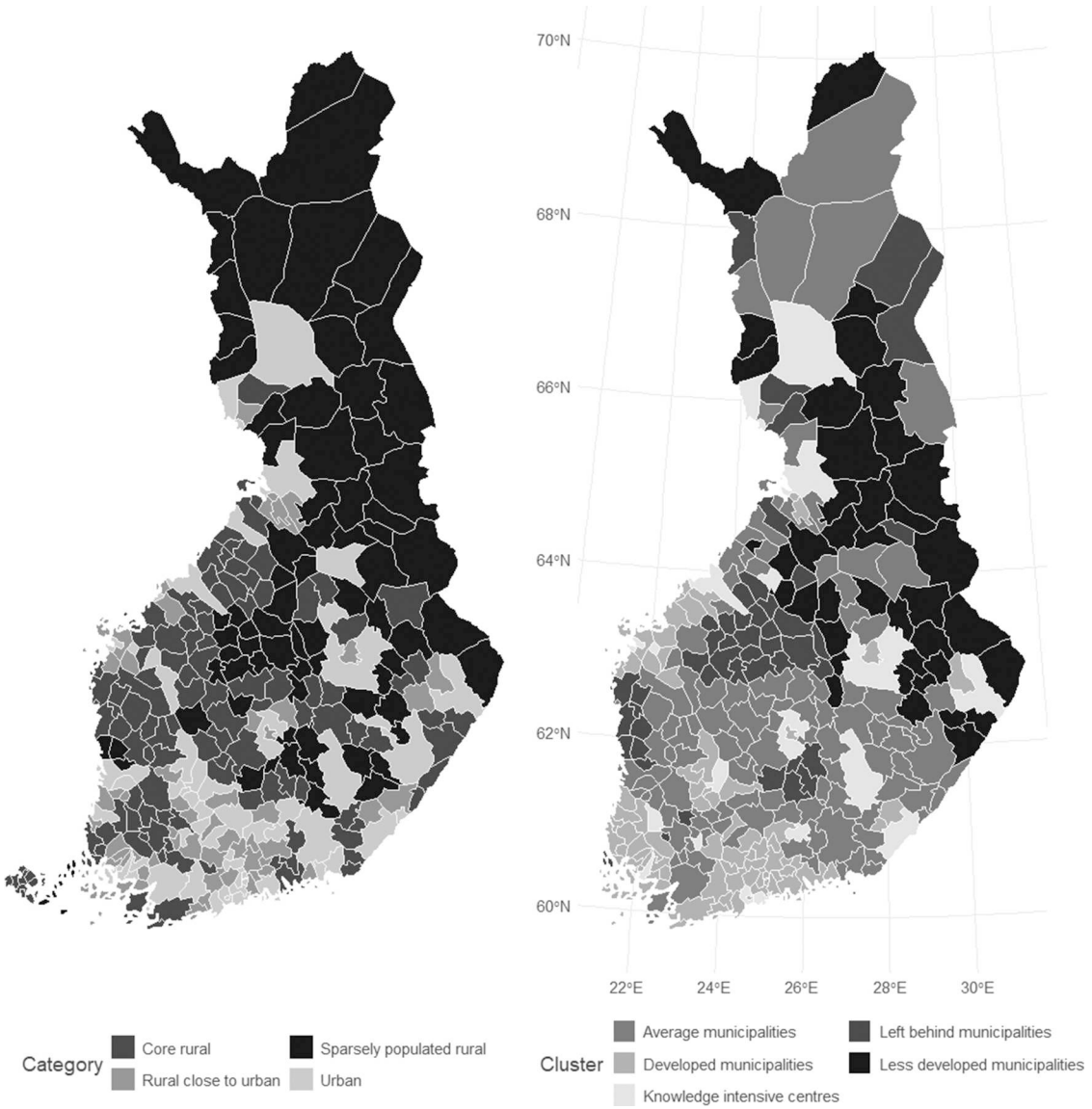

Figure 2. Geographical pattern of the identified clusters.
Source: Authors' own elaboration.

performed. The cluster analysis was conducted by using the *pam* algorithm. It detected five homogenous clusters which were named according to their common characteristics (Table 6). Three of these clusters were identified mostly based on their values in the EI: 'developed municipalities' (cluster 3), 'less developed municipalities' (cluster 4) and 'average municipalities' (cluster 2). The other two clusters differentiated more based on the state expenditure and were named as: 'left behind municipalities' characterised by a low presence of state (cluster 1) and 'knowledge-intensive centres' (cluster 5). The identified clusters illustrate regional differentiation in the structure of state expenditure and socio-economic development in Finland.

With regard to the different state expenditure categories, the largest differences between the identified clusters can be found in the knowledge-intensive expenditure, regionally based expenditure and government's transfers (and their spatial lags) as well as in the presence of the state (Table 6): in addition to the EI, these state expenditure categories constitute the factors that differentiate Finnish municipalities into the identified clusters. Geographically, the clusters seem to be spatially concentrated except for the knowledge-intensive centres, where the cluster members are scattered around the country (Figure 2). All the other clusters have a clear tendency to concentrate in space as confirmed by the spatial autocorrelation tests. The performed BB join count test[6] for spatial autocorrelation verifies that knowledge-intensive centres form the only cluster that is not spatially autocorrelated.[7] The results show that there is a high spatial dependency in the regional structure of Finland (i.e., regional differentiation) based on the EI and state expenditure.

According to Chi-square statistics, the identified clusters have also a strong connection to the urban–rural categories ($\chi^2 = 215.6$, $p < 0.001$): 84% of the municipalities belonging to knowledge-intensive centres are urban. Similar patterns can be found for rural municipality types: 49% of the municipalities forming the developed municipalities' cluster are RCAs; 73% of the municipalities making up the less developed municipalities' cluster are SPAs; 47% of the municipalities that are part of the left behind municipalities' cluster are RHAs. This clear division of municipal categories into clusters also reflects the regional differentiation between the less developed northern and eastern parts and the more developed western and southern parts of the country identified also in previous studies on regional development in Finland (Makkonen & Inkinen, 2015). In summary, as expected based on Hypothesis 3, there are distinct regional patterns in the state expenditure system based on the rural–urban division of municipalities.

5. CONCLUSIONS

5.1. Synthesis and discussion

The allocation of public investments has been noted to be among the most critical factors determining regional development. Despite its recognised importance, relatively little is known about the geography of state expenditure mainly due to issues in data availability. Here a significant effort was made to collect and regionally allocate state expenditure to Finnish municipalities (LAU-2 regions). While compiling such regionally allocated data on state expenditure is an achievement in itself, a further step was taken here to use these data to test whether state expenditure is allocated to socio-economically developed regions or to regions with poorer socio-economic status. That is, whether state expenditure is directed towards the already well-off core regions that are often considered to be in the best position to turn these financial flows into further economic growth or whether they are used to alleviate cross-regional differences in wellbeing and socio-economic conditions. This was done by comparing the state expenditure data to regional socio-economic variables used to construct two indices to describe the economy of the regions (EI) and the socio-economic well-being of their inhabitants (DI). Further, a regional typology that divides Finnish municipalities into urban areas and three different types of rural areas was utilised as an additional means for comparing regions and their underlying structural heterogeneity.

The results indicate that the Finnish state expenditure system shows strong redistributive patterns even in the case of spatially blind policies. Regions with the most socio-economically well-off populations are naturally in a position to be able to contribute the most to the state budget via taxation, while regions with the least well-off populations are not in similarly advantaged position and, thus, receive more state expenditure (particularly individually based expenditure and central government's transfers). Thus, in Finland the allocation of state expenditure closely follows the mapping of regions that need such financial flows the most. However, while state expenditure are tied to regional development, it seems that state expenditure system has not helped the disadvantaged municipalities to improve their socio-economic conditions. While state expenditure is allocated to municipalities with poor 'performance' in the DI, this funding is negatively correlated or uncorrelated with the EI scores. That is, rather than closing the gap between the well-off and less advanced municipalities, regional differentiation persists despite the allocated state expenditure. Indeed, there is an evident rural–urban divide in state expenditure due to the type of funding received by the well-off contra the disadvantaged municipalities. For example, while individually based expenditure and central government's transfers are important channels for securing (at least) the minimum living standards of disadvantaged populations and municipal services they do not help to renew local economic structures. Without state expenditure directed for developing the economy, it is unlikely that the state funding will advance the socio-economic situation of the less advanced municipalities.

Conceptually, the results underscore that the linkages between state expenditure and regional development vary greatly depending on the type of expenditure received by the locality. Therefore, generalised notions about the importance of state expenditure for regional development

need to be reconsidered. Public discussion on state expenditure often focuses on total sums rather than the type of expenditure, which is problematic. It is not the amount of euros a region receives from the state that matters most, but rather the purpose to which these euros are directed. Most state expenditure categories, particularly individually based expenditure and central government transfers, can be considered more sustaining than regenerative. In contrast, knowledge-intensive expenditure holds potential for innovation and the renewal of economic structures, as evidenced, for example, by studies focusing on green transition (Feng et al., 2022). However, this category of financial flow is concentrated in cities benefitting some RCAs via spillovers but leaving most rural areas behind in terms of innovative development. The interpretation is supported by the fact that knowledge-intensive expenditure and the EI are non-correlated: the per capita values of this category of state expenditure are very close to zero for most rural regions.

Regionally based expenditure is also intended to stimulate regional development, but its contribution from the state budget in Finland is minuscule (3.7% of regionally allocated state expenditure) and it is not connected to the EI. The analyses also revealed that the EI, along with state expenditure, cluster geographically, forming an unequal regional structure of municipalities and adding to the regional differentiation between Finnish municipalities. Based on the results, it seems that state expenditure, while contributing to regional development, does not promote convergence between well-off and socio-economically less advanced regions. In other words, the current structure of state expenditure in Finland does not decentralise growth from urban cores to socio-economically less developed municipalities. This interpretation is supported by the new economic geography perspective. Thus, from a conceptual standpoint, it is important to stress that not all regions are affected equally by state expenditure.

5.2. Implications

The results lead to a number of interesting policy implications in terms of regional socio-economic development. First, the state should continue to allocate funds (individually based expenditure and central government's transfers) according to the vulnerabilities and needs of the population to balance regional inequalities and to secure an acceptable level of service provision across the country. However, second, if the goal is to develop the economic structure of lagging regions knowledge-intensive expenditure should be channelled also to non-core urban regions. As of now, the state expenditure received by less well-off municipalities can be described as sustaining rather than renewing. This can lead to vicious cycles of shrinking local economies and higher dependence on the state. At the same time, decisions regarding the location of state workplaces and public procurement should be made keeping in mind their regional consequences. At the moment, the economic benefits of the presence of the state are concentrated in only a few specific regions. Third, regionally based expenditure is meant to balance regional development, but their share of the total state expenditure is minuscule. While unlikely in the contemporary times of economic austerity, raising the prominence of this expenditure category in the state budget would favour regional cohesion. Fourth, the regionally differentiated outcomes of state expenditure encourage utilising place-based policies (Kim, 2024) and especially existing rural proofing methods more systematically (European Union, 2022), since at least in the Finnish case, the less advanced municipalities are most often located in rural areas.

5.3. Limitations

The empirical approach taken in this paper has its limitations particularly due to limited temporal coverage of the data. Firstly, the cross-sectional nature of the analysis prevents us from making causal statements about the relationship between regional development and state expenditure. Second, although the regression models used control variables, the results may still be vulnerable to omitted variable bias. Third, more focused research settings are needed to explicitly test the mechanisms of specific state expenditure categories on the regional development of municipalities. Finally, while the results allow making statements concerning the direction of the impacts (positive or negative) of state expenditure on regional development, the exact magnitude of these effects cannot be assessed based on the data at hand. Consequently, the focus here was on discussing associations rather than pinpointing exact effects between the socio-economic status of municipalities and state expenditure: it is important to emphasise that the aim of this study was to explore a novel topic rather than to test theory. To draw more definitive conclusions, a panel data analysis with causal impact assessment would be required. Therefore, future research should aim to update the state expenditure data to allow for an improved analysis of the causal impacts of state expenditure on regional socio-economic variables using time-series data.

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DATA AVAILABILITY STATEMENT

The raw data are available from the original sources identified in the manuscript.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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NOTES

1. Political parties and powerful politicians have been shown to favour disproportionally regions that elected them in hopes of re-election or alternatively invest in areas controlled by their opposition to win over new votes (Rodríguez-Pose et al., 2016).
2. Available from the Finnish Environment Institute; https://www.syke.fi/en/environmental-data/downloadable-spatial-datasets/.
3. Knowledge-intensive and regionally based expenditure were normalised using a square root transformation.
4. On average the municipalities had 5.5 neighbouring municipalities.
5. The (Bonferroni corrected) Kruskal–Wallis statistics are not reported in detail due to space limitations.
6. The BB join count test for spatial autocorrelation analyses whether same-colour joins (i.e., spatial clusters) occur more frequently than would be expected for randomly distributed regions (Cliff & Ord, 1981).
7. Same-colour statistics (p-values): knowledge-intensive centres: 0.662 (0.416); left-behind municipalities: 12.507 (< 0.001); average municipalities: 32.232 (< 0.001); developed municipalities 26.274 (< 0.001); and less developed municipalities 9.444 (< 0.001).

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REFERENCES

Bickel, P., Li, B., Tsybakov, A., van de Geer, S., Yu, B., Valdés, T., Rivero, C., Fan, J., & van der Vaart, A. (2006). Regularization in statistics. *Test*, *15*(2), 271–344. https://doi.org/10.1007/BF02607055

Blažek, J., & Macešková, M. (2010). Regional analysis of public capital expenditure: To which regions Is public capital expenditure channelled – To 'rich' or to 'poor' ones?. *Regional Studies*, *44*(6), 679–696. https://doi.org/10.1080/00343400903002713

Brenner, T., & Pudelko, F. (2019). The effects of public research and subsidies on regional structural strength. *Journal of Evolutionary Economics*, *29*(5), 1433–1458. https://doi.org/10.1007/s00191-019-00626-x

Brock, G., Pihur, V., Datta, S., & Datta, S. (2008). An R package for cluster validation. *Journal of Statistical Software*, *25*(4), 1–22. https://doi.org/10.18637/jss.v025.i04

Cliff, A., & Ord, J. (1981). *Spatial processes*. Pion.

Cule, E., Moritz, S., & Frankowski, D. (2022). *Ridge regression with automatic selection of the penalty parameter*. https://CRAN.R-project.org/package=ridge

European Union. (2022). *A framework of rural proofing actions*. https://ec.europa.eu/enrd/sites/default/files/enrd_publications/enrd_report_tg_rp_a_framework_of_rural_proofing_actions.pdf

Facchini, F. (2018). What are the determinants of public spending? An overview of the literature *Atlantic Economic Journal*, *46*(4), 419–439. https://doi.org/10.1007/s11293-018-9603-9

Feng, H., Liu, Z., Wu, J., Iqbal, W., Ahmad, W., & Marie, M. (2022). Nexus between government spending's and green economic performance: Role of green finance and structure effect. *Environmental Technology & Innovation*, *27*, 102461. https://doi.org/10.1016/j.eti.2022.102461

Friedman, J., Tibshirani, R., & Hastie, T. (2010). Regularization paths for generalized linear models via coordinate descent. *Journal of Statistical Software*, *33*(1), 1–22. https://doi.org/10.18637/jss.v033.i01

Garretsen, H., McCann, P., Martin, R., & Tyler, P. (2013). The future of regional policy. *Cambridge Journal of Regions, Economy and Society*, *6*(2), 179–186. https://doi.org/10.1093/cjres/rst013

Grisorio, M., & Prota, F. (2015). The impact of fiscal decentralization on the composition of public expenditure: Panel data evidence from Italy. *Regional Studies*, *49*(12), 1941–1956. https://doi.org/10.1080/00343404.2013.859665

Groemping, U. (2006). Relative importance for linear regression in R. *Journal of Statistical Software*, *17*(1), 1–27. https://doi.org/10.1360/jos170001

Hjaltadóttir, R., Makkonen, T., & Mitze, T. (2020). Inter-regional innovation cooperation and structural heterogeneity: Does being a rural, or border region, or both, make a difference?. *Journal of Rural Studies*, *74*, 257–270. https://doi.org/10.1016/j.jrurstud.2019.10.008

Hoerl, A., & Kennard, R. (1970). Ridge regression: Biased estimation for nonorthogonal problems. *Technometrics*, *12*(1), 55–67. https://doi.org/10.1080/00401706.1970.10488634

Imdad, M., & Aslam, M. (2023). *Linear Ridge regression with Ridge penalty and Ridge statistics*. https://CRAN.R-project.org/package=lmridge

Jain, A., & Dubes, R. (1988). *Algorithms for clustering data*. Prentice-Hall.

Johnson, J., & Lebreton, J. (2004). History and use of relative importance indices in organizational research. *Organizational Research Methods*, *7*(3), 238–257. https://doi.org/10.1177/1094428104266510

Jolliffe, I. (2002). *Principal component analysis*. Springer.

Kataoka, M. (2005). Effect of public investment on the regional economies in postwar Japan. *Review of Urban & Regional Development Studies*, *17*(2), 115–139. https://doi.org/10.1111/j.1467-940X.2005.00100.x

Kim, G. (2024). The dynamic and persistent effects of tax increment financing as an example of place-based policy: Evidence from cook county, Illinois. *Regional Studies*, *58*(6), 1339–1355. https://doi.org/10.1080/00343404.2023.2242401

Livert, F., & Gainza, X. (2018). Distributive politics and spatial equity: The allocation of public investment in Chile. *Regional Studies*, *52*(3), 403–415. https://doi.org/10.1080/00343404.2017.1309013

Luca, D., & Rodríguez-Pose, A. (2015). Distributive politics and regional development: Assessing the territorial distribution of Turkey's public investment. *Journal of Development Studies*, *51*(11), 1518–1540. https://doi.org/10.1080/00220388.2015.1028536

Luoto, I., & Virkkala, S. (2017). *Paikkaperustainen aluekehittäminen strategisena ohjenuorana*. Ministry of Economic Affairs and Employment.

Mackay, R., & Williams, J. (2005). Thinking about need: Public spending on the regions. *Regional Studies*, *39*(6), 815–828. https://doi.org/10.1080/00343400500213812

Maechler, M., Rousseeuw, P., Struyf, A., Hubert, M., & Hornik, K. (2022). *Cluster analysis basics and extensions*. https://CRAN.R-project.org/package=cluster

Makkonen, T., & Inkinen, T. (2015). Geographical and temporal variation of regional development and innovation in Finland. *Fennia*, *193*(1), 134–147. https://fennia.journal.fi/article/view/46476

Makkonen, T., & Inkinen, T. (2023). Benchmarking the vitality of shrinking rural regions in Finland. *Journal of Rural Studies*, *97*, 334–344. https://doi.org/10.1016/j.jrurstud.2022.12.023

Makkonen, T., & Mitze, T. (2024). The geography of innovation in times of crisis: A comparison of rural and urban RDI patterns during COVID-19. *Geografiska Annaler: Series B, Human Geography*, *106*(1), 96–118. https://doi.org/10.1080/04353684.2022.2093252

Makkonen, T., Vartiainen, N., Rauhut, D., & Rautiainen, S. (2024). Local government expenditure and quality of life in Finnish municipalities. *Review of Regional Research*, *44*(4), 457–478. https://doi.org/10.1007/s10037-024-00218-8

McCann, P., & Rodríguez-Pose, A. (2011). Why and when development policy should be place-based. In Harris, J. (Ed.), *OECD regional outlook 2011* (pp. 203–213). OECD Publ. https://doi.org/10.1787/9789264120983-en

Ministry of Finance. (2017). *Alueellistamisen koordinaatioryhmän selvitys*. https://vm.fi/documents/10623/3779937/Alueelistamisen+koordinaatioryhm%C3%A4n+selvitys+24022017/

Ministry of Finance. (2023). *Public procurement handbook 2023*.

Morgenroth, E. (2010). Regional dimension of taxes and public expenditure in Ireland. *Regional Studies*, *44*(6), 777–789. https://doi.org/10.1080/00343400802093839

Musgrave, R. (1959). *The theory of public finance*. McGraw-Hill.

Myers, K., & Lanahan, L. (2022). Estimating spillovers from publicly funded R&D: Evidence from the US department of energy. *American Economic Review*, *112*(7), 2393–2423. https://doi.org/10.1257/aer.20210678

Oates, W. (1972). *Fiscal federalism*. Harcourt Brace Jovanovich.

Oughton, C., Landabaso, M., & Morgan, K. (2002). The regional innovation paradox. *Journal of Technology Transfer*, *27*(1), 97–110. https://doi.org/10.1023/A:1013104805703

Pebesma, E. (2018). Simple features for R: Standardized support for spatial vector data. *The R Journal*, *10*(1), 439–446. https://doi.org/10.32614/RJ-2018-009

Psycharis, Y., Rodríguez-Pose, A., & Tselios, V. (2021). Ministers and distributive politics: Political influences in the regional allocation of public investment in Greece. *Territory, Politics, Governance*, *9*(2), 276–305. https://doi.org/10.1080/21622671.2019.1677265

Rodríguez-Oreggia, E., & Rodríguez-Pose, A. (2004). The regional returns of public investment policies in Mexico. *World Development*, *32*(9), 1545–1562. https://doi.org/10.1016/j.worlddev.2004.05.002

Rodríguez-Pose, A., Psycharis, Y., & Tselios, V. (2012). Public investment and regional growth and convergence: Evidence from Greece. *Papers in Regional Science*, *91*(3), 543–568. https://doi.org/10.1111/j.1435-5957.2012.00444.x

Rodríguez-Pose, A., Psycharis, Y., & Tselios, V. (2016). Politics and investment: Examining the territorial allocation of public investment in Greece. *Regional Studies*, *50*(7), 1097–1112. https://doi.org/10.1080/00343404.2015.1009027

Tervo, H. (2005). Regional policy lessons from Finland. In D. Felsenstein, & B. Portnov (Eds.), *Regional disparities in small countries* (pp. 267–282). Springer. https://doi.org/10.1007/3-540-27639-4_15

Tibshirani, R. (1996). Regression shrinkage and selection via the LASSO. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, *58*(1), 267–288. https://doi.org/10.1111/j.2517-6161.1996.tb02080.x

Yliskylä-Peuralahti, J. (2004). *Valtion laitosten siirrot ja aluepolitiikka*. Finnish Society of Sciences and Letters.