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The Evaluation of Standard Expenditure Needs of Municipalities: The Case of Social Care Services in Italy

di Francesco Porcelli*

ABSTRACT

This paper is a policy report providing an overview of the recent Italian experience in the evaluation of the standard expenditure needs of municipalities (6702 elected local authorities of regions with ordinary statutes), discussing in detail the main technical choices and the final methodologies adopted in relation to the mainstream methods reported in the economic literature and developed by other countries. For simplicity, the paper is focused on the social care sector (which absorbs more than 20% of municipal current expenditure), the methodological approach being the same in the case of other local services.

JEL: H72, H77, H83

Keywords: standard expenditure needs, municipalities, Italy, social care

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SOSE Soluzioni per il Sistema Economico S.p.a. is a company, owned both by the Italian Ministry of Economy and Finance (88%) and Bank of Italy (12%), specialized in the provision of statistical and econometric analysis in any field of the private and public sector. Since 2011 SOSE, among its activities, elaborates the econometric models for the the evaluation of the standard expenditure needs of Italian local governments. This document does not necessarily reflect the official opinion of SOSE – Soluzioni per il Sistema Economico S.p.A. and commits only the author.

1. Introduction

Fiscal equalization, although absorbs roughly 5% of total public expenditure on average within OECD countries, represents a crucial aspect of all fiscal and administrative decentralization processes, since equalization grants limit the territorial imbalances that the devolution of a greater local autonomy tends to amplify. This aspect is of great importance in a country such as Italy, which is characterized by a marked economic duality between the north and the south of the country. The assessment of standard expenditure needs (SEN) for local authorities is, in turn, the main component of all fiscal equalization systems (Blöchliger *et al*., 2007).

In the end of 2013, the Italian government produced the first wave of the assessment of SEN for 6702 municipalities. This marked the beginning of a radical reform of intergovernmental relations in Italy, taking the first and necessary step towards the construction of a new and more efficient mechanism for the distribution of equalization grants to finance the essential services of municipalities (34 billion euros in 2010).

The essential functions of municipalities regards twelve services: tax office (0.50 billion euros), technical office (1.02 billion euros), civil registry (0.55 billion euros), general services (6.39 billion euros), public roads (2.21 billion euros), local public transport (1.00 billion euros), land management and planning (1.67 billion euros), waste management (7.61 billion euros), general social services (4.67 billion euros), nursery services (1.44 billion euros), local police (2.64 billion euros), complementary education services (3.57 billion euros). For simplicity, the paper is focused on the social care sector, the methodological approach being the same in the case of other services.

The Italian law (Legislative Decree 216/10) assigns the task of processing methodologies for the determination of SEN for local authorities to SOSE Soluzioni per il Sistema Economico S.p.A. an independent company owned both by the Italian Ministry of Economy and Finance (88%) and Bank of

Italy (12%) specialized in the provision of statistical and econometric analysis in any field of the private and public sector. This choice follows a governance model that is considered by the OECD among the best suited for the management of equalization grants: a model that assigns technical/methodological tasks to an impartial body in order to facilitate mediation between the central government and local authorities[1].

The calculation of SEN is based on the idea that the financial needs of a local authority are an expression of the services provided, of the territorial features and of the social-economic and demographic characteristics of the resident population. By following this general approach, SOSE has developed an econometric methodology specific to the Italian system based on the Regression-based Cost Approach (RCA) methodology recognized by the international scientific community as the most advanced one (see SOSE, 2012, 2013). This methodology, which has been adopted in many countries including the United Kingdom and Australia, implies the determination of SEN through the estimation of a cost function and/or an expenditure function using the technique of multiple linear regression.

One of the main difficulties of calculating SEN using statistical techniques is the lack of information. In order to overcome this obstacle, the information provided by official sources (Budget Sheets, Ministry of the Interior, ISTAT, Ancitel, Ministry of Education, Land Registry Office, etc.) has been integrated with new data by sending all authorities a specific questionnaire for each standardized function. In this way a new database was built that, for the first time in Italy, allows a detailed analysis of outputs, inputs, methods of management and organizational decisions made in the production process of local services by local governments. The amount of data collected and processed for the determination of SEN, in addition to representing valuable information in itself, gives the valuation procedure a considerable degree of robustness. In addition, the survey of structural data through the questionnaire represents an extraordinary innovation in international techniques to evaluate SEN.

In the Italian case the law has prescribed a top-down approach for the valuation of SEN[2]. This implies a two stage procedure. Firstly, the overall budget constraint (macro-budget) must be defined, that is the total amount of

[1] SOSE operates in collaboration with the Italian association of municipalities (ANCI) under the supervision of an independent governmental commission (COPAFF).

[2] Concerning the financial implications of introducing SEN, note that article 1, paragraph 2 of Legislative Decree 216/10 states that the total amount of the SEN relating to fundamental functions for municipalities cannot exceed the present expenditure for the corresponding sectors.

the equalization fund established by the central government. At a second stage, the resources must be allocated among local governments. Thus the valuation of SEN of local governments ends up in establishing a criterion for the distribution of a fixed amount of resources. SEN are primarily a relative concept. Even if the econometric procedure evaluates SEN in absolute monetary terms, this is functional to measuring the relative weight of any single service for any single local entity. Therefore, the entire procedure of calculation of the SEN ends up with the identification of a share in total expenditure, which can be named allotment coefficient[3]. In particular the total standard expenditure need of each municipality is composed of 12 allotment coefficients of expenditure (one for each function/service) and a comprehensive indicator, which is calculated as the ratio of the sum of the amount (in euro) of the SEN of all the essential services of the *i-th* municipality on the total standard expenditure of all municipalities.

In conclusion it is important to note that, although the gap between the standard and actual expenditure for each service provides a good reference point to judge the level of expenditure of each municipality, it is not a good indicator of local governments' efficiency in the provision of local services. The crude comparisons between standard expenditures and historic expenditures do not provide enough information to infer the ability of local governments and the effort they exert in the production of local services for two main reasons: the level of actual expenditures for a particular year may be affected by special events beyond the control of local governments such as earthquakes, floods etc.; and most importantly, the level of actual expenditures is influenced by quantity and/or the quality of services produced which can be above or below the standard level compatible with the standard expenditures. In order to make the comparison between standard and actual expenditure a good measure of efficiency, SOSE is developing a complementary methodology based on the evaluation of the level of services provided by each municipality through the estimation of a demand function which captures the relationship between context variables and output produced (see Porcelli *et al.*, 2016 for more details about the evaluation of the standard level of services).

[3] Given that 1 stands for the overall expenditure for a specific service, this allotment coefficient represents the share of expenditure attributable to each municipality. For example, if we refer to the education complementary services, Rome's allotment coefficient is equal to 0.086513706844, while Milan's one is equal to 0.050924900485. Thus, Rome's standard expenditure can be defined as 8.65% of the whole expenditure allocated for the education services that, in turn, is equal to 13.5% of the overall expenditure allocated for the fundamental municipal functions.

The rest of the paper is articulated as follows. Section 2 provides a short analysis of the international and methodological context that forms the background for the technical choices adopted by SOSE. Section 3 describes the main features of the Italian model, and section 4 shows how the model has been applied to the case of social care services, both sections are based on official documents produced by the Italian Ministry of Finance (MEF, 2014a 2014b). Section 5 discusses the evaluation of the standard level of services. Finally section 6 provides the main conclusions.

2. The international methodological context

2.1. Main institutional models

The list of possible methods for determining the expenditure needs of local governments is extremely varied. The level of heterogeneity is due not only to the variety of available techniques, but also to the manner in which they are applied by different countries which adopt variants and particular features based on their own historic and cultural traditions. Generally speaking, there are as many techniques as the number of countries that adopt fiscal equalization systems.

However, two essential dimensions emerge in all methodologies used to assess the expenditure needs of local governments when a top-down approach is followed as in the Italian case. The first defines the overall budget constraints (macro-budget), that is the global amount of transferable resources, and the second identifies the allotment mechanism adopted to allocate these resources among local governments.

This initial distinction is important, since the main purpose of the valuation of local governments' expenditure needs is to determine an allotment criteria for a predetermined amount of resources. In fact, standard expenditure needs are primarily a relative concept (relative needs), which only secondarily take on a validity in absolute monetary terms, particularly when used to finance basic levels of specific services.

Moreover, in spite of the extreme level of heterogeneity, the international literature (OECD, 1981, Blöchliger *et al*., 2007, Reschovsky, 2007, Dafflon and Mischler, 2007) discerns two main methodologies to which it is possible to relate the practical experiences of different countries. The first based on actual expenditure needs (AEN), the second based on standard expenditure needs (SEN).

The two major approaches of AEN and SEN differ greatly in terms of information and calculation requirements. The AEN approach does not require the support of any statistical and/or econometric methodology, thus minimizing the need for data: expenditure needs are determined in relation to what was previously accounted for in the last available budget or in a certain number of past financial statements. However, though this approach has the unquestionable advantage of simplicity, it nonetheless presents some notable inconveniences such as elements of randomness in the distribution of equalization grants, the risk of perpetuating inequity in the distribution of grants over time, and the possibility of financial non-sustainability in the long run, as a result of soft budget constraints imposed on local governments.

For these reasons, the AEN approach is considered the least suitable system for the allotment of equalization grants over the long run. It can, however, play a useful role in the short term, when the transition towards more valid equalization formulas can require long and complex adjustment phases.

The SEN approach, though it may be adopted on the basis of different techniques, contrasts sharply from the AEN approach in that it aims to measure the expenditure needs of local authorities taking into account different characteristics of each local authority. The level of accuracy with which these expenditure differentials are taken into account depends on the quantity and quality of data used, as well as on the statistical tools adopted.

2.2. Standard expenditure needs

The criteria for SEN are based on the concept that the financial needs of a local authority are an expression of the territorial and socio-demographic characteristics of the resident population. These aspects, on the one hand, impact the needs of citizens and thus the demand for services; on the other hand, they directly influence production costs. In the case of municipal police services, for instance, a higher level of expenditure needs can be generated either by a greater number of vehicles, which increases the need for controls and the risk of accidents, or by an increased length of municipal roads, since it is more costly to patrol a vaster territory.

The advantage of overcoming the principle of AEN is linked to the allotment of equalization grants according to SEN, thereby combining equity and efficiency, two goals that are often difficult to achieve simultaneously. In terms of equity, the advantage is that of providing intergovernmental grants based on the real needs of each territory, guaranteeing that all authorities have enough resources to provide local services with uniform standards of

quality and quantity. From the efficiency point of view, the advantage is that of stimulating higher electoral accountability of local administrators, because expenditure level above standard expenditures cannot be covered by intergovernmental grants and must thus be financed directly by citizens through local taxes.

The OECD includes the adoption of the calculation of SEN within the best practices related to the planning of financing systems for local government. In particular, it is argued that the provision of equalization grants based on mathematical formulas that measure institutions' expenditure needs is preferable to systems based on actual expenditures or the discretion of the central government, since the mathematical formula approach guarantees greater transparency in the flow of grants, greater equity in the redistribution of resources, and greater efficiency in managing public expenditures, thanks to more rigid budget constraints for local governments.

The possibility of obtaining the concrete advantages attributed to the adoption of SEN criteria is strictly linked to the accuracy with which expenditure needs are calculated, as well as to the interpretability of results and the consequent possibility of transmitting them to the institutional entities concerned. For this reason, in order for the adoption of SEN criteria to prove effective, it is essential, first and foremost, to build broad ranging databases that provide the most accurate possible picture of the socio-economic context and territorial characteristics of each local authority. Secondly, advanced statistical and econometric techniques must be used to transform this information into expenditure needs as accurately as possible.

The calculation of SEN allows for the equitable and efficient provision of equalization grants, but also requires adequate technological support in order to work correctly. For this reason, it is employed mainly in economically developed countries, and rarely used by developing countries. Within the OECD, the method is used successfully in Denmark, Finland, Norway, Sweden, the United Kingdom, Holland, Portugal, Japan and Australia.

Among European countries, the United Kingdom is the one that has been using sophisticated statistical and econometric techniques to determine the SEN of local authorities the longest. After more than a decade of debate and experimentation, the introduction of standardization techniques for the valuation of expenditures needs of local governments became operational during the early '90s, together with a process of renewal across the local public sector. This program has placed the UK at the forefront of countries that are most attentive to issues related to efficiency and performance measurement in the delivery of local services.

In the broader global scenario, the fiscal equalization system adopted in Australia is considered one of the most complete and is used as a model for countries such as Italy which are undertaking reforms in this direction. One of the aspects of the Australian system that is generally appreciated is its choice to entrust the technical responsibility of determining standards to an independent agency, the Commonwealth Grants Commission.

2.3. The main techniques for determining standard expenditure needs

The methodologies for determining SEN are characterized, on the one hand, for the quantity of data used to capture the environmental and socio-economic characteristics of the territories of the local authorities being analyzed, and on the other hand for the statistical techniques used to select and evaluate the weight these variables have in determining differentials expenditure needs.

The simplest and least refined standardization approach is that of *uniform per capita expenditure*, in which the size of the resident population is used as the sole determining factor for expenditure needs. Costs are standardized based on a uniform per capita amount for all authorities, equal to the macro-budget divided by the resident population: expenditure needs for each authority are obtained by multiplying this per capita value by the resident population.

A more complete approach to the calculation of expenditure needs, which includes other variables in addition to the size of resident population, is the *Representative Expenditure System* (RES). In this approach, the expenditure needs for each authority are determined by the linear combination of a series of load factors obtained in relation to the weight these factors have in determining expenditure needs. Load factors can include environmental characteristics such as surface area, number of residents, composition of the resident population by age, length of roads, etc., or structural elements related to the quantity of services produced and the inputs employed for supplying local public services. Usually, the choice of these factors is entrusted to experts or to decisions of a political nature, while weights are normally determined using statistical methods.

A very simple case of RES occurs when the SEN for a given region depend only on two factors with pre-established weights: the resident population and surface area. For example, given a region where 10% of the national population live and whose surface area amounts to 50% of the country's overall surface area, if the weights are 0.8 for the population and 0.2 for the

surface area, the region's SEN will be equal to $0.18 = 0.8 \times 0.1 + 0.2 \times 0.5$. The result is that the region will be entitled to 18% of all equalization grants (supposing the equalization is determined solely in relation to expenditure needs).

The RES approach can provide acceptable results when the authorities analyzed are few in number and economically and socially similar. However, its application becomes less effective when the mixture of local authorities has markedly varied characteristics. The immediacy and flexibility of the RES are not supported by a theoretical model that can act as a guide in the selection of load factors and weights, which, in essence, are discretionary.

For these reasons, the majority of developed countries that allot equalization grants based on SEN adopt an approach that is similar to the RES but more sophisticated in its application. This is the *Regression-based Cost Approach* (RCA), based on which the SEN of each authority are assessed as the expected value for a cost function (i.e. linked to the efficient behavior of the local government), estimated using multiple linear regression techniques.

With the RCA approach, the selection of variables to be inserted in the estimation model is guided by a theoretical framework based on the interaction between the demand for public services expressed by citizens and the supply of public services expressed by the local government (see Porcelli *et al*., 2016 and also Barabaschi *et al*., 2014) for more details about the theoretical framework). The result is that the efficient cost of supplying a given service depends on three essential groups of variables: the optimal quantity of service offered[4]; prices for the inputs used in the production process (primarily labour costs); and the context variables related to the supply side, i.e. external factors that, with other conditions being equal, can favor or hinder the supply of local public goods (e.g. the morphological characteristics of the territory, or the extension of its surface area).

The weight with which each variable affects the determination of SEN is estimated in a statistically robust manner through the use of multiple regression techniques. In this way all factors for calculating cost differentials are determined within a model that is capable of correctly representing the variables that identify the real determinants of expenditure needs, especially in the case of extremely heterogeneous local authorities.

Compared to the RES approach, the RCA approach provides greater accuracy, but also requires greater quantity and quality of data, particularly in

[4] Optimal service quantity refers to services that best satisfy the preferences and/or needs of resident citizens.

the measurement of input prices and the correct identification of output variables that can be used to measure the optimal quantity of public services supplied in equilibrium.

In particular, the presence of public service output variables within the estimation model for SEN presents two orders of problems. Firstly, the outputs are not always measurable and there may be therefore a very serious lack of information. Secondly, even if the public service outputs are observable with extreme accuracy (e.g. in situations in which the state establishes basic levels of services to which individual local authorities must conform) they can be endogenous, since the supplied quantity is determined jointly with the level of expenditures. In this last case, to correctly estimate the weight of an output in determining expenditure needs, it would be necessary to employ a two-stage estimation techniques based on the use of instrumental variables that cannot always be adopted successfully.

A commonly used solution for resolving both problems reported above is to estimate a variant of the cost function, known as an *expenditure function*. In essence, an expenditure function is a cost function in which the optimal quantity of the service provided is substituted by its determinants, represented by the background variables that impact the demand of citizens (e.g. the composition of the population by age, since an older population will express a larger demand for social support services).

For this reason, in the end, an RCA methodology based on the estimate of an expenditure function is the most complete and robust approach for evaluating SEN, and it is therefore the approach that is commonly used globally. This variant to the pure RCA approach is very similar to the RES approach in appearance, with the essential difference that the selection of variables used for the calculation is supported by a theoretical model and that the weights of these variables are determined by a multiple regression analysis, which leaves little space for discretionary interventions, thereby rendering the estimate of expenditure needs more robust and objective.

Compared to the pure RCA approach, the RCA approach based on the estimate of an expenditure function has the advantage of not having to adopt any further econometric instruments, other than basic multiple regression, in correctly estimating the impact exercised by the quantity and quality of outputs in determining standard expenditure levels. On the other hand, due to this simplification, it does not allow for the measurement of the direct relationship between expenditure needs and outputs, and thus it does not allow the direct estimation of expenditure needs based on the level of optimal public services that should be supplied in equilibrium.

3. Determining standard expenditure needs in Italy

3.1. Expenditure functions vs Cost functions

The assessment methodology for SEN deemed most suitable for Italy was the RCA Approach, both in its pure form based on the estimation of a cost function and in its reduced form based on the estimation of an expenditure function (see SOSE, 2012, 2013). This method was preferred over the RES approach given the heterogeneity and complexity of municipalities. Moreover, the RCA approach, which is supported by a theoretical model that allows for the valuation of expenditures needs through the estimation of a cost function, fully embodies the legislative provisions that impose to valuate SEN, taking into account the degree of efficiency in the provision of local services.

However, faced with the extreme heterogeneity of the essential services being assessed, it is necessary to adapt the RCA to the specific characteristics of each function, adopting diverse estimation models. The discriminating element for the choice of a specific model is the characteristic of the variables, which can be used for measuring the output provided, i.e. the possibility of considering the quantity of services provided in calculating SEN.

The two main characteristics of the essential services implemented by local authorities are the level of measurability of the services provided and the extent to which these services are exogenous, with respect to the decision-making autonomy of each local authority.

Based on the combinations of these two output characteristics, three groups of services can be identified, each of which corresponds to a different model for the assessment of the expenditure needs. Table 1 below illustrates this ranking outline. (Barabaschi *et al*., 2014) provide also a clear discussion about the differences between the procedure that uses an estimate of the standard cost and the one that estimates an expenditure function.

Tab. 1 – Summary of general assessment models for standard expenditure needs

		Services are exogenous to the decision-making autonomy of each local authority	
		Yes	***No***
Measurable services	***Yes***	**Pure RCA (cost function)**	**Expenditure function RCA** or **Pure RCA** according to the possibility of testing the endogeneity of output variables
	No	**Expenditure function RCA**	

The first group (north-west quadrant) includes cases for which the quantity of services provided can be measured satisfactorily and the output variables capturing all the essential factors of the implemented activity are exogenous to

the decision-making autonomy of each local authority. In these cases, we can proceed with estimating SEN using a pure RCA approach, effectively obtaining an estimation model of SEN based on the product between exogenous standard (or minimal) service levels and standard average costs.

The second group (north-east quadrant) includes cases for which the quantity of the service provided can be measured, but these services (in terms of quantity and/or quality) reflect the discretional choices of each local authority. In these cases, the estimation of SEN can be performed robustly and consistently using the RCA approach, based on the estimation of a cost function, which easily and effectively overcomes the problem of endogeneity for output variables with respect to actual current expenditure. Otherwise the estimation of expenditure needs will follow the reduced form approach based on the estimation of an expenditure function where output variables are replaced by exogenous demand factors.

The third group (south quadrant) includes those sectors for which it is not possible to measure the quantity of services provided since measurements of available outputs do not allow for a complete picture of the activities of the local authority. In these cases, the estimation of expenditure needs follows the RCA approach based on the estimation of an expenditure function. The majority of functions for municipalities fall in this group.

3.2. The data

The methodology for gathering data is one of the main contributions provided by the Italian experience to the international literature of SEN valuation. The collection of data through questionnaires has allowed SOSE to effectively resolve what is generally deemed to be the primary weak point of estimation mechanisms for SEN: lack of information. Larger volumes of data collected and processed for the determination of SEN ensures higher degree of robustness in the estimation process.

Though the questionnaires, which were prepared in collaboration with the Italian Association of Municipalities and distributed through a dedicated web portal, local authorities were requested to provide information relating to accounting and structural factors in the implementation of services for essential services.

The questionnaires respond to the need to integrate/reclassify and correct what is already available from official sources. In particular, the data contained in the Budget Sheets provided by the Ministry of Interior proved insufficient in determining the actual expenditures of services object of the

standardization analysis. Although the use of Budget Sheets as a starting point has the unquestionable advantage of providing greater stability for gathered information, the extreme heterogeneity of the criteria for recording accounting data and the summary nature of the document prevent Budget Sheets to be credible as the sole source for the determination of actual current expenditures used as dependent variables for the estimation model.

Moreover, other official sources also do not provide enough detailed information to analyze the main features of the services provided by local governments. For example, no official source exists to provide information neither about outputs nor about the main inputs employed in the production process.

The structural data collected through the questionnaire thus represents an extraordinary innovation, allowing elements such as inputs (personnel employed, capital goods, local units used, etc.), outputs (services implemented), and procedures for the implementation of services (unions of municipalities and other forms of joint or direct provision) to be assembled into a unitary framework. On the other hand, accounting information requested in the questionnaires allow for a reclassification and integration of the data contained in the Budget Sheets, thus providing a more accurate representation of actual expenditures.

Therefore, prior to undertaking the valuation of SEN, a unique database was built, including accounting information from the archives of the Budget Sheets, provided by the Ministry of the Interior for the year 2009 and 2010, structural information collected with the questionnaires and information related to socio-economic context derived from official sources. The database provides information about 6702 municipalities and 220 unions[5] of municipalities. In the process of data collection, the methodological contribution provided by ISTAT (National Statistic Institute) proved essential. A detailed analysis of the determinants of municipal standard expenditure needs for the Italian case is reported by Brunello *et al*., 2015.

SOSE also put great effort into controlling the quality of data. For example for the questionnaire FC02U related to municipal police services, direct contacts were established with 486 local authorities via ordinary and certified electronic mail, as well as by telephone. This activity allowed for the correction of 1076 irregularities, corresponding to cases of serious incoherence in the declared data.

In addition, the information acquired through the questionnaires made it possible, for the first time ever, to assess the organizational models used by local authorities for the provision of services, thereby allowing the valuation

[5] Maximum number of unions registered in the provision of local police services.

of their impact on expenditure needs, as stipulated under Article 4 paragraph 3 of Legislative Decree 216/10. In particular, for the first time it has been possible to accurately assess the geography of unions of municipalities and other forms of joint provision of local public services (mountain communities, consortiums and agreements), of which very little was known before.

3.3. The theoretical framework of standard expenditure needs

The theoretical framework followed by SOSE is based on the interaction between the supply and demand of local public services, both expressed in per capita terms with respect to the number of beneficiaries designated here as the client group (see Porcelli *et al*., 2016 and also Barabaschi *et al*., 2014 for more details about the theoretical framework). In the majority of cases the client group corresponds to the total resident population; in the cases of education complementary services and nursery services, however, the client group corresponds to children aged 3-14 and aged 0-2, respectively.

The demand for local public services (g_e) in the equation (1) depends on: the background variables related to the demand for local public services (**Q**), which capture the demographic and socio-economic aspects influencing the demand; the average income (**R**); and the per capita cost (with respect to the client group) of local public services (y):

$$g_e = d(\boldsymbol{Q}, \boldsymbol{R}, y) \tag{1}$$

The supply for local public services (*y),* expressed in terms of per capita costs, is reported in the equation (2) and depends on the following variables: the level of exogenous load factors (g_s)[6]; the level of endogenous outputs for public services (g_e); input prices ***(p)***; and background variables related to the supply ***(A)***[7]:

$$y = s(g_s, g_e, \boldsymbol{p}, \boldsymbol{A}) \tag{2}$$

[6] These are, for instance, services provided by local authorities for higher-level administrations (such as crime notifications, lawsuits and disputes received or the notification of traffic accidents, in the case of local police functions of municipalities) and, generally, activities not directly attributable to the decisions of local administrators.

[7] These are, for instance, morphological and socio-economic factors that do not affect preferences regarding the level of public services (i.e., those exogenous factors that can favor or hinder the supply of local public goods, such as economies of scale measured through the size of resident population.

The optimal level of local public services and their costs are thus determined simultaneously within a structural model that includes two equations: (1) and (2).

In some cases the estimation of SEN can be performed directly using the cost function reported in the equation (2): that is a model that multiplies the quantities of the service provided by coefficients expressing the standard average cost of individual outputs comprising the services implemented (*pure RCA*). This option can be suitably considered in certain specific cases. The first is when local public services can be measured adequately, and are represented by exogenous load factors (e.g. in the case of complementary education services provided by municipalities). The second is when local public services are represented by endogenous outputs that can be measured with an excellent degree of accuracy and the problem of output endogeneity can be tested through the identification of a set of valid instrumental variables. In the case of nursery services provided by municipalities, for example, the endogeneity of the output variable (the number of children attending full-time and part-time) has been tested using the following instrumental variables: the rate of female employment (age 30-54) registered at municipal level in 2001, and the rate of commuters entering in each municipality in proportion to the resident population.

Alternatively, in order to combine simplicity and robustness of estimates, the valuation of expenditure needs can be implemented using an expenditure function, which represents a reduced form of the structural model for supply and demand for public services. The expenditure function used to estimate SEN is reported in equation (3), which is obtained by substituting equation (1) into equation (2), thus expressing the relationship between the costs for the provision of local services and the local context in which the local government operates.

$$y = f(Q, R, \boldsymbol{p}, \boldsymbol{A}, g_s) \tag{3}$$

The primary advantage of evaluating SEN through the expenditure function is that consistent estimates can be obtained easily and robustly using the *Ordinary Least Squares* (OLS) estimator, since the independent variables are represented only by exogenous variables. This is the main reason why the estimation of expenditure needs based on expenditure functions is the most commonly adopted econometric approach at a global level, while the pure RCA approach is rarely adopted.

3.4. The empirical model of standard expenditure needs

Regardless of the theoretical model selected (cost function or expenditure function), the estimation of SEN is implemented through the calculation of the expected values from an empirical model that identifies the relationship between the current per capita actual expenditures (dependent variable) and a set of independent variables within a multivariate regression model.[8]

Usually the following groups of independent variables have been used:

- *Output variables* (specific to the cost function approach), measuring the quantity and quality of the services provided (e.g. the number of children using nursery services, the number of pupils using meal services etc.);
- *Demand background variables* (specific for the expenditure function approach), measuring the demographic and socio-economic aspects required to capture local preferences/needs regarding the demand for public services (e.g. the percentage of elderly people on total population, the number of people with addictions and mental health problems, the number of single-parent families etc.);
- *Supply background variables,* comprising environmental characteristics that impact the total productivity of input factors (e.g. the numerousness of the resident population, which captures congestion phenomena and/or economies of scale, the morphological characteristics of the territory etc.);
- *Exogenous load factors,* capturing the impact of services provided by local authorities on behalf of higher level administrations, or of activities not directly attributable to the decisions of local administrators (e.g. crime notifications, lawsuits and disputes received, or the notification of traffic accidents in the case of local police services; the front-office activity related to the issue of vital certificates carried out as part of registry office services etc.);
- *Input prices,* represented in the majority of cases by *the average staff expenditures per employee* computed as the ratio between the total labour costs and the total equivalent number of employees reported in the ques-

[8] In the construction of the empirical model of standard expenditure needs, current expenditures are usually considered in per capita terms and, therefore, have been divided by the resident population, which constitutes the client group for the majority of services. Moreover, the use of current per capita expenditures as a dependent variable is preferable, since it allows for a reduction of the heteroscedasticity problem in the data.

tionnaire, and the *average rents per square meter for commercial use* provided by the *Osservatorio del Mercato Immobiliare* (OMI)[9] of the Territorial Agency[10];

– *Managerial choices*, represented by a set of variables used to capture the impact exerted on expenditure by organizational choices such as the joint provision of local public services with other authorities (unions of municipalities, conventions etc.) or the staff/child ratio (in the case of nursery service);
– *Regional fixed effects*, representing a set of dummy variables included in the model in order to capture the impact of regional polices.

As a result the estimation of SEN is conducted using the following empirical model:

$$y_i = \alpha + \boldsymbol{\beta}'\boldsymbol{X}_i + \boldsymbol{\gamma}'\boldsymbol{W}_i + \boldsymbol{\delta}'\boldsymbol{Z}_i + \varepsilon_i \quad (4)$$

where:

– i corresponds to the local authority index;
– $\alpha, \boldsymbol{\beta}, \boldsymbol{\gamma}, \boldsymbol{\delta}$ are the coefficients to be estimated;
– y_i is the dependent variable corresponding to the current per capita expenditures;
– $\mathbf{X}_i$ is the vector of independent variables which are used both in the estimation and in the subsequent stage of calculating SEN. As evident in equation (3), these are demand background variables (Q), supply background variables (A), and variables related to exogenous load factors (g_s).
– $\mathbf{W}_i$ is the vector of independent variables which, while used in the estimation, become *"target" variables* when computing the SEN. These variables should be used as stated by each local authority in estimating the empirical model, so as to avoid distortions in the coefficients; however, in computing the fitted values, this variable can assume a target value (W^*) to be attained by the local authority. The W_i variables include the input prices (p) and endogenous outputs (g_e) when using the cost function approach.
– $\mathbf{Z}_i$ is the vector of independent variables that can explain cost differences related to organizational models, particular managerial choices, regional fixed effects and the average municipal income. These variables are included in the empirical model to avoid the problem of omitted variables, however, in computing SEN the impact of these variables is ignored or

[9] Real Estate Market Centre.

[10] The average rents per square meter for office use is a proxy of the price index of other productive factors different from labour.

"neutralized", in order to attribute to each municipality a standard expenditures need that does not depend on specific organizational choices adopted, form of service management, and the impact of regional policies.

– ε_i represents the idiosyncratic error term, with zero mean, uncorrelated with $\mathbf{X}_i$, $\mathbf{W}_i$ and $\mathbf{Z}_i$, but potentially heterosckedastic.

The specification of the empirical model has been conducted using the "stepwise" method validated by a "general-to-specific" and "specific-to-general" approach. Once the regressors have been selected, the empirical model is estimated using an OLS estimator with robust standard errors in order to control for the heteroscedasticity in the covariance matrix (the only exception is represented by nursery services)[11].

3.5. The computation of standard expenditure needs

Once the coefficients of the empirical model of SEN reported in equation (4) have been estimated, the expected values ($\hat{y}_i$) of the current expenditure of each municipality (also considering those excluded from the regression sample) are obtained as follows:

$$\hat{y}_i = \hat{\alpha} + \hat{\beta}'\boldsymbol{X}_i + \hat{\gamma}'\boldsymbol{W}_i + \hat{\delta}'\boldsymbol{Z}_i \tag{5}$$

Subsequently, the *Theoretical Standard Expenditure Needs* (FS) are computed, neutralizing the impact of variables Z_i and replacing the W_i variables with target values (if available) as reported in equation (6):

$$FS_i = \hat{\alpha} + \hat{\beta}'X_i + \hat{\gamma}W^* + \hat{\delta}'Z^* \tag{6}$$

It follows that the difference Δ_i between the value of actual current expenditure and the theoretical standard expenditure needs is equal to:

$$\Delta_i = y_i - FS_i = \hat{\gamma}(\boldsymbol{W}_i - \boldsymbol{W}^*) + \hat{\delta}'(\boldsymbol{Z}_i - \boldsymbol{Z}^*) + \hat{\varepsilon}_i \tag{7}$$

[11] The following statistical tests have been also used to ensure the robustness of the estimates: Cook's distance (Cook D), commonly used to estimate the impact of a single observation on OLS coefficient estimates; the leverage points analysis, which identifies the observations most distant from the corresponding fitted values; the coherence of "studentized" residuals (Student R); and the analysis of dfbetas, which examine the observations that significantly influence parameter estimates. In the end, observations identified as outliers or extreme values based on the statistical tests have been eliminated by the regression sample.

The difference Δ_i can be decomposed into three additive components, where:

$\Delta_i^1 = \hat{\gamma}(\boldsymbol{W}_i - \boldsymbol{W}^*)$	represents the difference corresponding to the impact exerted by target variables;
$\Delta_i^2 = \widehat{\delta}'(\boldsymbol{Z}_i - \boldsymbol{Z}^*)$	measures the variability connected to particular managerial choices, and regional fixed effects;
$\Delta_i^3 = \hat{\varepsilon}_i$	represents the residual part of the difference between actual expenditures and standard expenditures due to the stochastic component of the model.

After estimating the FS it is possible to calculate an indicator of relative needs for each municipality, corresponding to the allotment coefficient FS_CR_i reported below in equation (8):

$$FS\_CR_i = \frac{N_i \cdot FS_i}{\sum_i N_i \cdot FS_i} \tag{8}$$

where N_i is the size of the client group of each municipality, which corresponds to the total resident population in the majority of services (in the case of education complementary services and nursery services a slightly different procedure has been followed because of the logarithmic specification of the empirical model of the cost function).

The FS_CR_i represents the final result of the procedure, since the valuation of SEN leads to the computation of a set of allotment coefficients for an overall expenditure amount determined externally by the central government. The allotment coefficients computed for each function can then be combined to calculate an overall allotment coefficient for the total amount of essential services' expenditures.

Note that, in the case of unions of municipalities, the estimated SEN were calculated on a "consolidated" base, with reference to the union (with few exceptions such as variables related to the economies of scale) and then distributed to each municipality belonging to the union proportionally to the resident population of each municipality.

Table 2 provides a general overview of the final results reached in the estimation of municipal standard expenditure needs (SEN), reporting the main technical issues for each of the 12 services.

In the majority of cases the actual expenditure adopted as dependent variable refers to 2010 values, only for local police and general administrative services the reference year is 2009. Although it would be preferable to use

the actual expenditure from the same year as dependent variable for all services, it must be highlighted that, since the valuation of SEN seeks to compute an allotment coefficient, the choice of reference year for the actual expenditure exerts a negligible impact on the final results given the stability in the distribution of the current expenditure across sectors.

With regard the client group, it can be noted that the total resident population has been chosen in the majority of cases. The only exceptions are represented by education complementary services and by nursery services, where the client group is represented respectively by children aged 3-14 and aged 0-2.

Tab. 2 – Overview of some technical issues regarding the estimation of municipal standard expenditure needs

Functions and services		*Questionnaire*	*Actual expenditure*	*Client group*	*General approach*	*Model specification*	*Estimator*	*Dependent variable*	*R-sq.*	*Regression sample (n.)*	*Unions of municipalities (n.)*
General Administrative, Management and Control Functions	*Tax office*	FC01A	2009	Total resident population	Expenditure function	Linear	OLS	Current actual per capita expenditure	0.4425	3991	152
	Technical office	FC01B							0.4187	3472	157
	Civil registry	FC01C							0.6029	4761	137
	General services	FC01D							0.7322	3882	178
Local Police		FC02U	2009	Total resident population	Expenditure function	Linear	OLS	Current actual per capita expenditure	0.3726	5061	220
Education (complementary services)		FC03U	2010	Population aged 3-14	Cost function	Logarithmic	OLS	Log of total current actual expenditure	0.9254	3990	183
Public Roads and Transport	*Public roads*	FC04U	2010	Total resident population	Expenditure function	Linear	OLS	Current actual per capita expenditure	0.6484	5333	157
	Local public transportation								0.5829	915	157
Planning and Environmental Functions	*Land management and planning*	FC05U	2010	Total resident population	Expenditure function	Linear	OLS	Current actual per capita expenditure	0.2773	3163	157
	Waste management								0.6462	3989	157
Social Care	*General social services*	FC06U	2010	Total resident population	Expenditure function	Linear	OLS	Current actual per capita expenditure	0.3923	4603	175
	Nursery services			Population aged 0-2	Cost function	Logarithmic	LAD (quantile regression)	Log of total current actual expenditure	0.6783	1133	175

When considering the choice of the general theoretical approach, of the empirical model specification and of the estimator employed in the analysis, it is possible to divide the whole set of twelve services into two groups: one including 10 services related to the general administrative sector, the local police, public road and transport, planning and environment and general social services, for which an expenditure function approach has been followed using a liner specification of the empirical model and OLS estimator; and a second including education complementary services and nursery services, for which a cost function approach (pure RCA) has been followed, estimating a logarithmic cost function through OLS estimator for the former service and LAD estimator for the latter.

It is important to emphasize, in conclusion, that the choice of using a logarithmic specification for the cost functions and a linear specification for the expenditure functions was not determined by the different theoretical model adopted as a reference point for the empirical model. This choice was driven, instead, by the necessity to consider the specification which provided the best fit in order to minimize the distance between historical and standard expenditure as requested explicitly by the association of municipalities. Similarly the choice to used LAD estimator rather than OLS was driven by the necessity to maximize the fit of the model as well as to avoid technical problems in generating the expected values.

4. The case of the social care services

As an example, we discuss in more details the main methodological aspects regarding the estimation of the SEN of the social care sector, which represents one of the main function performed by municipalities and absorbs about 20% of the total actual current expenditure, corresponding to more than 7 billion euros (2010 figures)[12]. A detailed analysis about the model used to estimate SEN for the Register Office, instead, is provided by Barabaschi *et al.*, 2014.

Information derived from official sources has been supplemented with accounting and structural data collected through questionnaire FC06U with reference to the year 2010. The questionnaire, similarly to those imple-

[12] Although most of the data are publicly available through *www.opencivitas.it*, the reproducibility of the estimates is not immediate because, for privacy reasons, some variables can be obtained only after a specific request addressed to the Ministry of Finance.

mented for other functions, consists of twelve tables, each with different objectives and content. The top six tables contain mainly structural data about managerial choices, staff structure, other inputs employed in the production, and the quality and quantity of services. The remaining six tables are mainly used to collect accounting information aimed at supplementing the information derived from the Budget Sheets in order to evaluate the level of actual expenditures used as dependent variable in the empirical model. In particular, they provide information about the structure of staff cost, the outsourcing, and revenues from the provision of services. Regarding nursery services, for example, questionnaire FC06U provides a wide range of new information about staff structure, the number of children attending part-time and full-time, the number of voucher recipients, opening days and opening hours, the percentage of children using the meal service etc.

In sum, 6,667 municipalities (99.5% of the total) returned the questionnaire within the established deadline; subsequently, SOSE put great effort into controlling the quality of data by establishing direct contacts with 3,982 local authorities via ordinary and certified electronic mail, as well as by telephone. This activity allowed for the correction of 8,107 irregularities, corresponding to cases of serious incoherence in the declared data.

Based on the data collected, the services provided in the social care sector have been divided into 11 macro-services (or macro-output):

– nine are potentially endogenous with respect to the choices of local administrators: nursery services; early childhood (e.g. other educational and recreational services for early childhood); social emergency (e.g. meals provided by the social canteen); social inclusion (e.g. transport of people with disabilities, literacy courses); income support (e.g. rent allowances); home care (e.g. home care meal service, tele-assistance, remote monitoring); day care centers (e.g. recreational social and cultural activities); residential care (e.g. children in foster care, assistance and social rehabilitation); back office activity;
– two can be classified as exogenous load factors: front office services; cemetery, cremation and mortuary services.

Each macro-output (excluding nursery services) is, in turn, divided into several basic services for a total of 36 elementary output variables.

In consideration of the specific nature of each macro-service, the estimation of SEN has been carried out by separately analyzing the nursery services, which have children aged 0-2 as client group, and by grouping the rest of the social services which have the entire resident population as client group within a single category called general social services.

4.1. The nursery services[13]

With regard to nursery services, the output produced can be easily measured through the number of served children. Preliminary tests conducted to verify output endogeneity did not reject the null hypothesis according to which the amount of children served can be considered exogenous with respect to municipal expenditure. Consequently it was decided to evaluate the SEN through the estimation of a cost function using a log-log specification of the empirical model, as reported in the following equation (9):

$$\begin{aligned} log(Y_i) = \alpha_0 + \gamma\, log(M_i) + \theta_1\, log(P_{1i}) + \theta_2\, log(P_{2i}) + \\ + \boldsymbol{\delta}_2^{'}\boldsymbol{F_i} + \boldsymbol{\delta}_3^{'}\boldsymbol{L_i} + \\ + \eta_1 e_i + \boldsymbol{\delta}_{1e}^{\prime}\boldsymbol{S_i} e_i + \boldsymbol{\delta}_{1(1-e)}^{\prime}\boldsymbol{S_i}(1-e_i) + \varphi_1 D_i + \varphi_2 D_i log(V_i) + \varepsilon_i \end{aligned} \tag{9}$$

where: i is the municipal index, α_0 is the constant term, Y corresponds to the actual current expenditure, M is the output variable measured in terms of served children; P_1 is the variable capturing the price of labour (computed as the weighted average between internal and external labour costs), P_2 is the variable capturing the cost of capital (proxied by average rents per square meter for commercial use), $\boldsymbol{F}$ is the vector of cost-shift variables related to fixed cost components and/or the service quality (total area in square meters and staff/child ratio), $\boldsymbol{L}$ is the vector of binary variables related to the forms of joint provision and regional fixed effects; $\boldsymbol{S}$ is a vector of cost-shift variables that measure the intensity of service[14]; e represents the share of children which attend nursery not run directly by the municipality because externalized to private entities; D is a binary variable that takes value 1 if the municipality provides only vouchers; V corresponds to the number of voucher recipients, ε is the idiosyncratic error term of zero mean, uncorrelated with the other independent variables and potentially heteroscedastic.

The analysis of managerial choices provides the following segmentation of local authorities: 1,783 municipalities directly provide nursery services; 552 municipalities provide the service jointly with other authorities (unions of municipalities, mountain communities, conventions etc.); 4,367 municipalities do not provide nursery service.

[13] This section is based on official documents produced by the Italian Ministry of Finance (MEF 2014b).

[14] This set of variables includes: the share of part-time children, the share of children who use meal services, the share of infants, the dummy that identifies opening hours of fewer than seven hours, the dummy that identifies opening days of fewer than 213 days and the variables related to the presence of kitchens.

The sample used for the estimation of the cost function has been defined after an detailed analysis of the data reported only by those municipalities that provide nursery services. In this way we have constructed a sample of 1,133 local authorities (including 12 unions, 4 mountain communities, 6 consortia, and 33 conventions). After the removal of outliers, the regression sample shrinks to 970 observations.

Despite the elimination of outliers from the regression sample, OLS estimates showed a poor fit, as the value of the *root mean squared error* was very high making the transformation of the expected values of the logarithmic function into monetary values - a necessary transformation for the correct valuation of the SEN - impossible. To solve this problem, it was decided to compute the coefficient point estimates of the parameters of equation (9) using the *Least Absolute Deviations* (LAD) estimator[15], which corresponds to a quantile regression analysis performed in relation to median values. The estimates of the coefficients of the independent variables in all other percentiles have also been taken into consideration, however, in order to verify the robustness of the point estimates obtained at the median, thus showing a good stability of the coefficients' point estimates of all independent variables.

The coefficients' point estimates of the cost function are reported in Table 3a in relation to different groups of variables: $\boldsymbol{X}$, $\boldsymbol{W}$, and $\boldsymbol{Z}$. Tables 3b and 3c paper the values considered for the computation of SEN regarding the variables included in group $\boldsymbol{W}$ and group $\boldsymbol{Z}$. Final estimates show a pseudo R-squared value equal to 0.6783 providing evidence of a good fit for the empirical model. It is possible to note, in particular, the presence of slight increasing economies of scale, since the coefficient of output is below one. It should also be noted, moreover, that the null hypothesis of price elasticity equal to one cannot be rejected.

The logarithmic specification of the final model allows us to interpret the coefficient estimates in terms of elasticity; however it makes an immediate valuation of the theoretical SEN (*FS*) impossible. In this case we need to use the following formula to evaluate the *FS* for each municipality *i:*

$$FS_i = \frac{\exp(\hat{\alpha}+\hat{\boldsymbol{\beta}}'\boldsymbol{X}_i+\hat{\boldsymbol{\gamma}}'\boldsymbol{W}_i^*+\hat{\boldsymbol{\delta}}'\boldsymbol{Z}_i^*)}{N_i} \qquad (10)$$

where exp(.) is the exponential function. As a results, individual components of the *FS* cannot be considered independently from the others since, in this case, the *FS* does not have an additively structure.

[15] For more details about the LAD estimator see Cameron and Trivedi (2010).

The absence of basic levels of services established by law according to which a minimum percentage of children aged 0-2 must be served by nursery services, prevents SOSE from listing the output variables in the set of target variables $\boldsymbol{W}$. This implies that the *FS* of each local authority can be computed considering only the actual number of children served by nursery services, papering zero SEN for those municipalities without nursery services[16]. The valuation of a positive standard expenditure also for those municipalities without nursery service is subordinate to the identification of the some mandatory "essential level of services" by the policymakers.

Tab. 3a – Nursery services, LAD coefficients' point estimates (coefficients can be interpreted as elasticities, dependent variable = log(actual current expenditure))

CONSTANT		1.7834	
	X variables		
OUTPUT	Number of children attending full-time and part-time (log)	0.9412	***
INTENSITY OF SERVICE	Share of infants (part-time and full-time)	0.2783	**
	Share of children using meal services	0.2305	**
	Share of children attending part-time sessions	-0.2449	**
MANAGEMENT CHOICES	Share of children in kindergartens not directly managed by the local government	-0.5397	***
	Presence of kitchens (dummy, 1 = yes) X share of children under direct management	0.1461	**
	Presence of kitchens (dummy, 1 = yes) X share of children not under direct management	0.3350	***
	Days open fewer than 213 days (dummy, 1 = yes)	-0.0858	**
	Hours open fewer than 7 hours (dummy, 1 = yes)	-0.1856	**
QUALITY OF SERVICE	Staff/child ratio	1,8647	***
	Total area in square meters (log)	0.0918	***
VOUCHERS	Vouches recipients (dummy, 1 = only vouchers)	-0.6238	**
	Number of voucher recipients (log) X Voucher recipients dummy	0.7246	***
	W variables		
INPUT PRICES	Average staff expenditures per employee (weighted average between internal and external labour costs) (log)	0.5564	***
	Average rent per square meter for commercial use (log)	0.3449	***
	Z variables		
ASSOCIATED MANAGEMENT	Unions of municipalities (dummy, 1 = yes)	0.2008	
	Conventions of municipalities (dummy, 1 = yes)	0.2607	**
REGIONAL FIXED EFFECTS			

Bootstrap standard errors (200 repetitions), *** P-value < 0.001, ** P-value < 0.05, * P-value < 0.1

[16] The presence of nursery services is identified by the positive number of served children (i.e., the number of children attending full time or part time, including the number of voucher recipients).

Tab. 3b – Nursery services, $\boldsymbol{W}^*$ variables used in the valuation of standard expenditure needs

Average staff expenditures per employee (average between internal and external labour costs)	Internal component, as reported in the questionnaire. External component, replaced with the median value computed by the region and by population brackets.
Average rents per square meter for commercial use	Median value by the region and the population brackets

Tab. 3c – Nursery services, $\boldsymbol{Z}^*$ variables used in the valuation of standard expenditure needs

Unions of municipalities	0
Conventions	0
Regional fixed effects	0

4.2. The remaining general social services[17]

With regard to the remaining general social services, the output presents a more complex structure. Furthermore, the difficulties encountered in testing the endogeneity of the output variables with respect to municipal expenditure, and the multi-output structure of the cost function, made the estimation of a cost function unfeasible at least at this stage. Consequently, the valuation of the SEN has been obtained using the expenditure function approach, specifying a linear empirical model using as a dependent variable the current expenditure in per capita terms with respect to the total resident population.

The analysis of managerial choices provides the following segmentation of local authorities: 6,124 municipalities directly provide general social services; 531 municipalities provide these services jointly with other authorities constituting a union; instead, only 12 municipalities do not provide any of the general social services.

The sample used for the estimation of the expenditure function has been defined after a detailed analysis of only those data reported by municipalities that provide at least one of the general social services. In this way we have constructed a sample of 4,603 local authorities including 37 unions of municipalities. After the removal of outliers, the regression sample shrinks to 4,400 observations.

[17] This section is based on official documents produced by the Italian Ministry of Finance (MEF 2014a).

The coefficient point estimates of the expenditure function have been obtained using robust OLS estimator, and final results are reported in Table 4a in relation to different groups of variables: ***X***, ***W***, and ***Z***. Tables 4b and 4c paper the values considered for the computation of SEN regarding the variables included in group ***W*** and group ***Z***. Final estimates show a R-squared value equal to 0.3726 providing evidence of a good fit.

The linear specification of the expenditure function and the dependent variable expressed in terms of per capita actual expenditure allows us to interpret the coefficient point estimates in euros that multiplied by the related variables generate the additive components of the theoretical standard expenditure needs (*FS*).

Let us consider, for example, a hypothetical municipality of 25,000 inhabitants with all background variables and input prices equal to the sample mean. Considering that in the empirical model all background variables and input prices are expressed in deviation from the sample mean[18], the FS of this hypothetical municipality can be computed as follows:

FS =	*57.2419*	*+ (constant term)*
	*0.00096*25000*	*+ (impact of resident population)*
	4.66401	*+ (whether support services are provided)*
	6.04295	*+ (whether home health care services are provided)*
	2.89174	*+ (whether social integration and prevention services are provided)*
	7.08344	*+ (whether residential care services are provided)*

[18] Note that this choice affects only the estimate of the constant term coefficient, since the other coefficient's point estimates are invariant to linear combinations of the regressors.

Tab. 4a – General social services, OLS coefficients' point estimates (all coefficients are expressed in euros, dependent variable = actual current expenditure/total resident population)

CONSTANT		57.2419	***
	X variables		
BACKGROUND VARIABLES ***(all variables entered in deviation from the sample mean)***	Female employment rate (*per capita)*	144.152	***
	Foreign resident population (%)	0.32541	**
	Elderly resident population (% over 65)	0.58844	**
	Mortality rate (average 2008-2010)	0.37831	*
	Pupils with disabilities (pre-school, primary and secondary; per capita)	1016.44	**
	People with addictions and mental health problems (per capita)	587.912	***
	Number of crimes at provincial level (per capita)	119.157	**
	Percentage of households with severe material deprivation (%)	1.14076	**
	Number of single-parent families (per capita)	217.269	**
	Number of survivor pensions (per capita)	133.698	**
	Disability allowances (per capita)	315.613	**
	Life expectancy without disabilities at age 65 (years)	-2.68469	**
MANAGEMENT CHOICES	Support services (dummy, 1 = yes)	4.66401	**
	Home health care (dummy, 1 = yes)	6.04295	**
	Social integration and prevention services (dummy, 1 = yes)	2.89174	**
	Residential care (dummy, 1 = yes)	7.08344	***
CONGESTION AND DISECONOMIES OF SCALE	Population spline (3.000 - 10.000 inhabitants)	0.00229	***
	Population spline (10.000 - 50.000 inhabitants)	0.00096	***
	Population spline (100.000 - 110.000 inhabitants)	0.00349	***
	W variables		
INPUT PRICES (***% deviation from the sample mean)***	Average rent per square meter for commercial use	0.05490	**
	Average staff expenditures per employee (weighted average between internal and external labour costs)	0.06993	**
	Z variables		
INCOME (***% deviation from the sample mean)***	Income reported as a tax base for the national personal income tax	0.1532	**
MANAGEMENT CHOICES	Reception for appointment (dummy, 1 = yes)	4.8058	***
ASSOCIATED MANAGEMENT	Unions of municipalities (dummy, 1 = yes)	5.5299	
REGIONAL FIXED EFFECTS			

Robust standard errors, *** P-value < 0.001, ** P-value < 0.05, * P-value < 0.10

Tab. 4b – General social services, $\boldsymbol{W}^*$ variables used in the valuation of standard expenditure needs

Average staff expenditures per employee (average between internal and external labour costs)	Internal component, as reported in the questionnaire External component, median value by the region and the population brackets
Average rents per square meter for commercial use	Median value by the region and the population brackets

Tab. 4c – General social services, $\boldsymbol{Z}^*$ variables used in the valuation of standard expenditure needs

Unions of municipalities	0
Reception for appointment	0
Income reported as tax base for the national personal income tax	National average = 20.240,36 (euro, year 2010)
Regional fixed effects	0

Therefore, if all services listed in the set of managerial choices variables were provided, the *FS* would be equal to 101.92 euros. As a result, the *FS* of an identical municipality with a percentage of households with severe material deprivation 10% above the sample mean would be equal to euro 113.33 = 101.92 +1.14076*10, instead the *FS* of an identical municipality with a percentage of households with severe material deprivation 10% below the sample mean would be equal to euro 90.51 = 101.92 - 1.14076 * 10. Other examples can be provided along the same lines.

In conclusion, it is important to point out that although the *FS* can be computed for each local authority independently from the others, the SEN of each municipality, corresponding to the allotment coefficient FS_CR_i, are strictly dependent on the *FSs* of all other local authorities as reported in equation (8).

5. The model of standard levels of services

In addition to standard expenditure needs, the Italian law (Legislative Decree 216/10) prescribes also the evaluation of the level of services (output) provided by each local authority. The fact that the law requests that the expenditure needs of local government be measured, along with the quantity of services that should be offered, must be greeted favorably, since the latter is an extremely important exercise, both in rendering public expenditures efficient and in determining essential levels for services that local authorities

should provide in relation to their expenditure needs. This is a necessity which has been much debated politically and academically, but never clearly satisfied from a methodological standpoint.

However, unlike the evaluation of SEN, the measurement of the level of services is a quite new exercise and very few references can be found in the literature. Regarding the measurement of the historical level of output the English experience is, at the moment, the most interesting one since over the last twenty years the outputs of English local authorities have been measured systematically by the Audit Commission (see Audit Commission, 2009) through a range of indicators (over 200 active in 2009) known as BVPI[19] and then used as one of the building blocks of the Comprehensive Performance Assessment (CPA) a system based on a balanced scorecard methodology which led to the annual publication of a ranking of local authorities, for eight years from 2002 to 2009, assigning to each authority a number of stars ranging from four for performance excellence, to zero for a highly negative judgment (see Lockwood and Porcelli, 2013 for more details about CPA).

The literature, instead, provides no help about the evaluation of the standard level of service (SLS) that should be used as a reference point to judge the level of output provided by each municipality. The methodology developed by SOSE suggests to interpret the SLS as the level of services (in terms of quantity and quality) compatible with the demand for services expressed by the resident population of a specific territory (for more details about the evaluation of SLS see Porcelli *et al.*, 2016). Therefore, starting from the same theoretical framework used for the evaluation of expenditure needs, the assessment of the standard level of services provided by each local authority is based on estimating the reduced form of the demand for local services reported in the equation (11), that is obtained by replacing the equation (2) in the equation (1).

$$g_e = h(Q, R, \boldsymbol{p}, \boldsymbol{A}, g_s) \tag{11}$$

When technically possible, the multi-output structure of services must be taken into account, and to correctly valorize any existing interdependencies between outputs it is important to estimate a structural model. In this context, the SLS of each municipality corresponds to the expected level of output $\widehat{g_e}$.

[19] For example, among the output indicators for social care services are the number of elderly who require assistance at home in every 1000 inhabitants over 65 years of age (BPVI54); indicators related to environmental services include the percentage of recycled domestic waste (BPVI82a); and, lastly, indicators measuring the performance of general administrative services include the percentage of invoices paid within 30 days of receipt or within the agreed payment terms (BVPI8).

The joint analysis of the expenditure gap between historical expenditures and SEN, and the output gap between historical outputs (g_e) and SLS ($\widehat{g_e}$) can be used to evaluate the performance of each local government mapping municipalities into the four quadrants as shown if figure 1. The rationale behind the positioning of local authorities in the four quadrants is based on the consideration that SLS provide a measure of the potential demand corresponding to standard expenditures.

Therefore, a red light comes on for the local authorities in quadrants III and II of figure 1: local authorities positioned in quadrant III are designated "under standard" since they present actual expenditures that are lower than the standard expenditures and should satisfy a potential demand that is higher than the current supply capacity; local authorities positioned in quadrant II are designated "non-efficient" since in addition to facing a potential demand that is higher than the current supply capacity, they present actual expenditures that are higher than standard expenditures. Both these groups of local authorities should be placed under observation: the "under standard" authorities in order to ascertain that by obtaining more financial resources they effectively provide also more services in terms of quantity and/or quality, the "non-efficient" authorities to verify the likely presence of serious inefficiencies in the provision of local services.

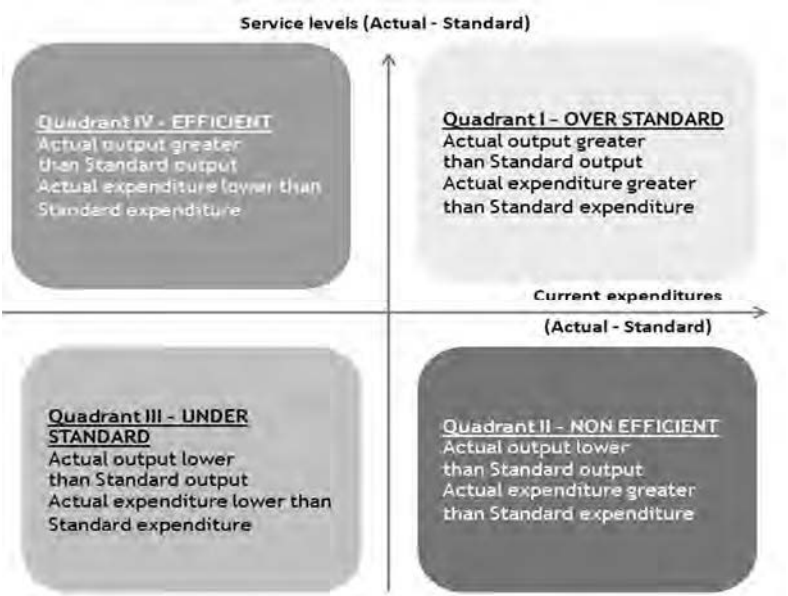
On the other hand, a green light comes on for the local authorities situated in the two upper quadrants of figure 1. Those in quadrant IV, defined as "efficient", present a potential demand that is lower than the one effectively satisfied, and standard expenditures that are greater than their actual expenditures. These local authorities should be used as benchmarks for identifying best practices. Lastly, local authorities positioned in quadrant I, defined as "over-standard" are those with actual expenditures that are higher than the standard expenditures, but that prove an actual quantity of output that is also higher than the potential demand. These local authorities should be capable of autonomously financing effective service levels that are higher than potential demand, or of reduce their service levels to bring them in line with their standard expenditures.

The joint analysis of expenditure and output in terms of gaps from the respective standard values is a new methodology, still at an experimental stage, that in the future can become a simple tool to identify local authorities target of specific policies aimed at improving efficiency in the provision of public services, as well as a simple way to identify the best practices adopted by benchmark local authorities.

SOSE aims to compute the SLS of all municipal essential services using proxies to measure the historical level of services when the outputs are not

easily or unambiguously measurable as, for example, in the case of local police where the quantity of services was measured considering the number of fines.

Fig. 1 – Positioning map in relation to the gap between actual expenditure and standard expenditures (horizontal axis) and between actual outputs and standard levels of services (vertical axis)



6. Conclusions

The Italian experience in measuring standard expenditure needs (SEN) of municipalities, although follows the main consolidated methodologies proposed by the international literature (such as the Regression Based Approach) and adopted also by other industrialized countries, shows some interesting innovations.

As a first innovation, the Italian government decided to integrate the information provided by official sources (Budget Sheets, National Institute of Statistics, Ministry of Education, Land Registry Office, etc.) with new data by sending all authorities a specific questionnaire for each service.

As a complementary exercise, besides the evaluation of SEN, the data collected through the questionnaires have been used to produce a system of

performance indicators, providing basic information on how each municipality uses its resources for the provision of the essential services. The main indicator is the gap between the standard and actual expenditure for each service, other indicators are, for example, the labour cost for employee or the share of labour costs on total expenditure or the level of services per capita. This system of indicators are integrated with a *Business Intelligence* model named *Opencivitas* (available at *www.opencivitas.it*), with the purpose of providing local authorities with an innovative online tool for information-management. *Opencivitas* is primarily a benchmarking tool designed to allow each local authority to display its data and compare them with the data of other authorities with similar characteristics. The aim is to make available specific *online* management tools that allow local authorities and citizens to monitor the level of services provided and render them more efficient.

A further innovation proposed by the Italian methodology is based on the estimation of theoretical standard expenditure needs (FS) which differs from the expected values of the empirical model in that, when calculating FS, a set of *target variables* assume a target long term value which differs from their actual value. For instance, instead of completely recognizing the expenditure needs in relation to a local authority's labour cost, only the labour cost corresponding to the national average would be recognized. In this way, local authorities that present an effective labour cost that is lower than the national average are rewarded, and vice-versa, those whose effective labour cost is higher than the national average are penalized. When the estimation of expenditure needs is based on the cost function approach, this procedure of substituting target values for the actual values of some variables, named as *neutralization process*, is very important, since it would respond to the necessity of substituting actual output values with those deemed to be "optimal" or "essential" when calculating SEN, in order not to reproduce the path of actual expenditures in the valuation of SEN. It is important to underscore that the choice of the variables subjected to neutralization introduces an element of flexibility in the procedure for determining SEN, since the choice of the variables to be neutralized is an issue that, in some cases, can be left to policymakers' decision.

A final innovation, in conclusion, is the idea to combine the evaluation of SEN with the level of services provided by each local authority so to construct a tool which can be used to measure local governments' performance just using a simple four quadrants model which ranks local authorities according to two dimensions: first the difference between the actual expenditures and the standard expenditures (expenditure gap); second the difference between the actual level of services and the standard level of services (output gap).

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