NEED EQUALIZATION TRANSFERS AND PRODUCTIVE EFFICIENCY OF LOCAL GOVERNMENTS

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September 2011

Abstract

The paper deals with Need equalization formula for intergovernmental grants, and analyses, by a simple model, the impact of parameters changes on productive efficiency of a local government. By this kind of efficiency we mean producing and providing, at minimum cost and at high quality, a output level of a public service at least equal to a standard, fixed by the central government for pursuing horizontal equity among jurisdictions. In some German Landers the municipal transfers system is broadly inspired by such a criterion, and the recent reform of Italian equalization grants system moves in this direction.

Keywords: Need Equalization, local public services provision, quality and cost-efficiency

JEL Classification: H70, H72, H77.

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1 Introduction

In many federal countries central government transfers resources to local jurisdictions in order to alleviate the imbalance between expenditures needs and revenues. The aim is to ensure to every citizen the access to reasonably comparable levels of public services within a chosen locality, at a cost in line with what would be paid elsewhere. Therefore, equalization transfers promote horizontal equity by permitting fiscal treatment of identical persons in a federation and by enabling jurisdictions to provide minimum standards of essential packages of public services. Specific notions of equalization are disciplined by many Constitutional acts, as, for instance, in Canada, Australia, Germany (Shah 1996) and recently also in Italy, according to Constitutional act n. 3/2001 and the successive applying bill n. 42/2009 .

Around the world, in industrialised countries and in less developed countries as well, we may find many applications of Fiscal capacity equalization and of Need equalization. The former, on the basis of the so-called Representative Tax System (RTS), tends to equalize the difference between standard revenue and the effective local one (at standardised tax rates), while, the latter tends to cover the difference between a standardised local need expenditure, measured on the basis of the so-called Representative Expenditure System (RES), and some benchmark (Dafflon and Mischler 2008, Shah 2010). Combinations of RTS and RES are often also applied. The quoted bill n.42/2009 in Italy disciplines the two criteria according to the typologies of public functions carried on by regions and municipalities. The Need equalization criterion is applied for some essential regional expenditure items, like health care, social assistance, education and public transit (more or less 80% of total expenditure), while Fiscal capacity equalization criterion is applied for the remaining items. Something similar applies for transfers to municipalities.

Equalization systems, as said, are specifically devoted to guarantee horizontal equity but they have also efficiency implications. In this respect economic literature has developed two specific issues. On one hand, it has analysed the consequences of migration and factor mobility, due to equalization, on productivity of the local firms (Boadway 2006). On the other hand, the economic literature has deeply discussed the efficiency consequences of equalization in terms of the level of tax rates and public expenditure, taking also into account tax competition phenomena. This second body of literature starts from Smart (1998), going ahead, until, at last, Kenders and Koethenbuergher (2010), who provide a theoretical integrated analysis including most of the results of previous literature, and Kotsogiannis (2010),

who provides an analysis of both vertical and horizontal tax competition with revenue equalization. The main results of this literature suggest that fiscal equalization induces higher tax rates than the efficient ones and public services overprovision[1]. However, when there is tax competition, equalization tax distortion may restrain the undesirable "race to the bottom" and then increase overall fiscal efficiency.

In this paper we deal with the efficiency implications of Need equalization by a different perspective, as we look at the consequences of such transfers on productive efficiency in local public services provision. For "local government productive efficiency" in this context we mean that, given the level of a public service output, defined by a minimum standard fixed by the central government, a local government should provide at least this amount, at the maximum level of quality and at the minimum cost.

In order to examine this matter, we build up a simple model where the flow of federal transfers to local governments is given by a revenue sharing of a federal tax and a need equalization grant. The latter is specified along a well known RES rule, now applied in Italy in similarity to those actually applied in other federal countries. According to this, the grant is linked to the gap between a need standardised expenditure index and a standardised local tax revenue index. Further, we assume that local politicians have some preference on cost-inefficiency, as they can acquire political consensus with perks and wasteful expenditures, so they are conflicting with users of public services who want high quality services and low local taxes. As well known, conflicts of this sort originate a specific Principle-Agent relationship (Besley 2007), whose final outcome is conditioned by local politicians accountability. Thus the chance of exploiting cost-inefficiency may depend on the impact of equalization on accountability. In this respect, Kotsogiannis and Schwager (2008) have shown that, with equalized fiscal resources, citizens attach more importance to any remaining variation in public services supply, in terms of quantity as well quality, thus they can more easily punish the rent-taking and incompetent politicians. However, the complexity and the lack of transparency, in defining the exact measure of "potential fiscal capacity and need" to be equalized, may introduce a perverse fiscal incentive that reduces accountability and then efficiency. Indeed, yardstick competition effects are limited and monitoring activities by central governments are not easily implementable .

The main results of the paper are the following ones. An increase of the revenue sharing rate tends to reduce the quality of the public service, while it

[1] This has also consequences on the extent of the so called flypaper effect (Dahlby 2011).

tends to induce the politicians and the public officials to contain production costs. On the contrary, an increase of the rate of the equalization and of the standard tax rate have opposite effects. An increase of the minimum standard of the public service provision has a beneficial effect on cost-efficiency, while the impact on quality is not determined, depending on the structure of technology and costs. However, we find that, if quality and quantity are substitute both in preference and costs, then the local government reduces the quality. Finally, it is confirmed, also in this setting, that organising the equalization system with adequate transparency and simplicity can improve, through a higher accountability, cost-efficiency.

We have also shown that by this funding mechanism the inefficiencies, in terms of low quality and high costs, can be, in some cases, paid by the need equalization grant and revenue sharing, and then create perverse and contradictory effects on regional financial responsibility.

The paper runs as follows. Section 2 shows the stylized model we are going to elaborate. Section 3 analyses of the impact of need equalization on regional financial responsibility and quality and cost-efficiency levels. Section 4 concludes.

2 The set-up model

We consider a federation with a pre-committed central government and several local governments, not fiscally interconnected each other (Koethenbuergher 2008). Hence we may simply model a local government that, facing a representative consumer-tax payer, provides a local public service, considered as a essential (merit) good by the national legislation. It finances the production costs of quantity q and quality m, the latter measured by a real number in a closed interval, with a surtax at rate t on a tax base B, which is also taxed, at rate τ, by the central government. This remains on the shadow, in the sense it has already chosen own tax rate and fiscal arrangements of the equalization transfers, which are then exogenously given. We want, as said, to ascertain the local government response to changes of these fiscal parameters, in terms of productive efficiency of public services provision.

2.1 Consumer preferences

These are represented by the following separable function

$$V = \upsilon(t + \tau, I) + \varphi(q, m). \tag{1}$$

$\upsilon(t+\tau, I)$ is an indirect sub-utility function of aggregate tax rate and initial endowment of resources (untaxable income). By duality, this derives by maximizing a quasi-concave direct utility function which depends on a untaxed commodity, the numeraire, and a taxed one, whose value at producer price turns out to be the tax base, B. From now on, B is disposable labour income and then the untaxed commodity is leisure. Accordingly, by Roy identity[2] , $\upsilon_{t+\tau} = -\upsilon_I B < 0$. Moreover, from consumer equilibrium, it can be derived the consumer reaction function to fiscal choices, $B(t+\tau), B_{t+\tau} < 0$.

$\varphi(q, m)$ is a quasi-concave sub-utility function of quantity and quality of the public service, with $\varphi_q > 0, \varphi_{qq} < 0; \varphi_m > 0, \varphi_{mm} < 0$. Quantity and quality can be complements ($\varphi_{mq} > 0$) as well substitutes ($\varphi_{mq} < 0$); thus the marginal willingness to pay for quality can increase or decrease with the consumption of the service, according to the type[3]. With $\zeta_{mq} \stackrel{\circ}{=} \frac{\varphi_{mq} q}{\varphi_m} \gtreqless 0$ we denote the demand-elasticity of substitution between quality and quantity.

2.2 Local government revenues

The local government obtains funds from three sources. First, the local taxation, tB. Secondly, a revenue sharing over the federal tax yield, $\alpha\tau B$, where $0 < \alpha < 1$ is the fraction decided by federal government. In this case the revenue sharing goes from central to local governments, like for regional TVA and income tax in Italy, but it can run also in the opposite direction, for yield acquired at locale level, like for business tax in Germany. In the latter case, the local jurisdiction yields tB and transfers αtB to the central government so the model must be accordingly changed (Kenders and Koethenbuergher 2010). Thirdly, the local government gets funds from a equalization grant, if entitled. Indeed, we consider a gross, vertical, equalization process, by which only "poor" regions receive a grant, and the total of grants are funded by federal taxation. Consequently the transfer is given by

$$G = Max[\beta(N - t^s B), 0]. \tag{2}$$

$0 < \beta \leq 1$ is the equalization rate, N the need lump sum component of the grant, to be explained in the successive sub-section, and t^s is the standardised surtax rate, a fiscal policy arrangement.

[2] With X_y we mean, as usual, $\partial X/\partial y$.

[3] As far as health services are concerned, we may find treatments where a high quality of care can favour as well discourage an increase of quantity demanded (e.g. length of stay in hospital)

RES rule (2) is now applied in Italy, for the funding of regional expenditures on health care, social assistance and education, with this specificity:

$$\beta = 1, t^s = t_0 + \alpha\tau = \frac{N}{B_{\max}}$$

In other words, for only a region, the richest one ($B = MaxB), G = 0$ as the revenue sharing rate is established for exactly allowing its budget equilibrium, without any grant: $\alpha^{\max} = \frac{N - t_0 B_{\max}}{\tau B_{\max}}$. All other regions receive a grant exactly equal to the difference between the need term N, a standardised public expenditure as we'll see later on, and the revenues from local taxation, obtained applying a basic uniform surtax rate, t_0, and revenue sharing[4]: $G = N - t_0 B - \alpha\tau B$.

Rule (2) is also applied for financing public services provided by municipalities within Landers in Germany (Otter, 2008, Egger et al. 2010). In the case of RTS rule, as for the provinces in Canada and as for the remaining regional expenditures in Italy, the lump sum component in (2) is given by $N \doteq t^s B^s$, where B^s is the standardised (average) tax base (Smart 2007, Kotsogiannis 2010). Thus

$$G = Max[\beta t^s (B^s - B), 0]. \tag{3}$$

Notice that, in both RES and RTS, G, as in (2) and in (3), is a matching grant, linearly and negatively related to local tax base, and we'll see that this is what mainly matters as far as the incentive to efficiency is concerned.

Summing up we get the following revenues function for a "poor" region:

$$R = \beta N + \widehat{t} B \tag{4}$$

where $\widehat{t} = t + \alpha\tau - \beta t^s$ is the "effective local tax rate", i.e. the perceived local rate to which the fiscal distortion at local level is linked (Grazzini and Petretto 2006). In the Italian case, it would be $\widehat{t} = t - t_0$, and (4) simply $R = N + (t - t_0)B$, while in the case of revenue sharing from local to central government, as in Germany, it would be $\widehat{t} = (1 - \alpha)t - \beta t^s$. For both special cases the following analysis should be easily adapted.

[4] Actually, the revenue sharing is on TVA, but in this stylized model we may refer in simpler way to income tax as well.

2.3 Needs and costs

We adopt the RES interpretation according to which the "Needs" are measured by the product of a standardised unitary cost c^s with a minimum (essential) standard of output provision, q_E

$$N \doteq c^s q_E \tag{5}$$

Index q_E can be thought as a synthetic representation of the wide and articulated notion of *Essential levels of health care*, explicitly mentioned by Italian legislation for NHS funding. The parameter c^s is specific to the considered jurisdiction, and it may be estimated or computed by one of the several RES techniques, e.g. the regression analysis (Dafflon and Mischler 2008).

As far as the production costs of the jurisdiction are concerned, we assume this factorised, quasi-linear, function:

$$C(q, m, e; A) = c(q, m; A)eq \tag{6}$$

A is a vector of demographic and environmental variables influencing production costs. $e \geq 1$ is a variable of cost-inefficiency, an index measuring the impact of perks and wasteful expenditures made by the local politicians and bureaucrats seeking for political consensus and power. Therefore, it is also an index of the incumbent politicians ability or competence in that jurisdiction.

The shape of the cost function is given by the following set of expressions

$$\begin{aligned}
C_q &= [c_q q + c(q, m; A)]\, e > 0, C_m = c_m eq > 0, C_e = c(q, m; A)q > 0 \\
C_{qq} &= [c_{qq} q + 2c_q]e \gtreqless 0, C_{mm} = c_{mm} eq > 0, C_{ee} = 0 \\
C_{eq} &= C_q / e > 0 \\
C_{mq} &= (c_{mq} q + c_m)e \gtreqless 0 \Longleftrightarrow \xi_{mq} + 1 \gtreqless 0, \xi_{mq} \doteq \frac{c_{mq} q}{c_m}
\end{aligned}$$

The marginal costs of quantity, quality and inefficiency index are positive, as all employ scarce resources. The first one may be increasing as well decreasing with quantity as neither c_q or c_{qq} are signed. The second one is increasing with quality as we may reasonably assume $c_{mm} > 0$.The third one is constant with respect to inefficiency index. The positive sign of C_{eq} implies that, given (6), quantity and inefficiency are cost-substitutes, which seems

conceivable. Cmq is not instead signed, depending on the sign of c_{mq}. If ξ_{mq} is higher (lower) than -1, quality and quantity are cost-substitutes (complements). In the latter case, the technology exhibits *economies of scope* in producing output with high quality. Actually an innovation increasing the standard of quality may save as well require more resources for producing the service (e.g. physicians hours of labor in a hospital department).

Given (6), we may interpret the standardised unitary cost c^s in this way. Let us assume that central government knows the local cost function $C(.)$, but does not observe the quality locally realised, being able only to estimate the mean value $\overline{m}$ from a probability distribution of quality indexes $\mathcal{F}(m)$. Environmental features A are observed and employed in econometric analyses for estimating the standardised cost. The variable effort e is not observed and then not acknowledged in the "contract" defined by the equalization rule. Therefore, the standard unitary cost may be as follows:

$$c^s = c(q_{E,}\overline{m}; A) \tag{7}$$

which might be lower or higher than the effective unitary cost $c(q, m; A)e$, depending on the level of output (returns to scale), the actually realised level of quality and the inefficiency index. However, the former is the most likely (normal) case.

2.4 Local politicians preferences

We suppose they have, as pay-off function, the sum of utility function of the representative consumer (1) and the following benefit function of extra-costs for perks and wasteful expenditures:

$$a\psi(e), \psi' > 0, \psi'' < 0. \tag{8}$$

where $\psi(e)$ reflects the preference for cost-inefficiency and $a \geq 0$ shows the degree of non-benevolence or rent-taking by local politicians. If $a = 0$, they are perfectly benevolent as rightly accountable. If $a > 0$ they are in some extent rent-takers. As underlined by Kotsogiannis and Schwager (2008), accountability depends on institutional rules, in particular on the transparency and simplicity of the techniques applied for assessing the Need index and implementing the chosen equalization.

Let us now define with

$$E(q_E, m, e) \doteq [c(q_E, m; A)e - c^s]\, q_E \tag{9}$$

the discrepancy, positive or negative, between actual costs for producing the minimum standard and the Need index N, which coincides with the estimated cost to implement the minimum standard. Let, for instance, consider the case where $c^s = c(q_E, \overline{m}; A) < c(q_E, m; A)$. The extra cost, over the RES level, made by non-benevolent local politicians is represented by the area ABCD in Fig. 1[5].

The local politicians choose their strategies knowing the federal government fiscal choices and the consumer reaction function, i.e. the shape of the tax base function. In the following section, we are going to ascertain, first, how the fiscal autonomy is used for financing extra-costs, and, second, how local politicians, once in equilibrium, would change their strategies on m and e, in response to changes on fiscal arrangements α, β, t^s, on the minimum standard q_E and also on parameter a[6].

Figure 1 here

3 The impact of equalization on financial responsibility and service quality and cost efficiency

3.1 Equilibrium

The equilibrium of local government is obtained by solving the following maximization process w.r.t q, m, t, and e:

$$Max \;\; W = \upsilon(t + \tau, I) + \varphi(q, m) + a\psi(e) \tag{10}$$

$$s.t.$$

$$\beta N + \widehat{t}B = c(q, m; A)eq \qquad (\lambda) \tag{11}$$

[5] This overspending, not fundable ad infinitum by local taxation, can become the source for a debt increase due to soft budget constraint syndrome (Vigneault 2007, Weingast 2009, Breuillé and Vigneault 2010).

[6] These changes have, of course, also effects on local tax ratee t, but here we may disregard them as we are concentrating on productive efficiency.

$$q \geqslant q_E \qquad (\mu), \mu(q - q_E) = 0 \tag{12}$$

The corresponding Lagrangean is the following function:

$$L = W + \lambda[\beta N + \widehat{t}B - c(q, m; A)eq] + \mu(q - q_E) \tag{13}$$

The multiplier λ reflects, as usual, the marginal cost of taxation, while the multiplier μ reflects the benefit of the service as a merit good and also the cost of strengthening the binding minimum standard constraint. By applying the envelope theorem to the maximum function $W^*(\alpha, \beta, t^s, q_E, a)$, we get:

$$\begin{aligned} \frac{\partial W^*}{\partial \alpha} &= \lambda \tau B > 0, \frac{\partial W^*}{\partial \beta} = \lambda(N - t^s B) > 0, \frac{\partial W^*}{\partial t^s} = -\lambda \beta B < 0, \\ \frac{\partial W^*}{\partial q_E} &= \lambda \beta (c^s + \frac{\partial c^s}{\partial q_E} q_E) - \mu, \frac{\partial W^*}{\partial a} = \psi(e) > 0. \end{aligned}$$

Therefore, given the marginal cost of taxation, the maximum local government objective function is increasing with the revenue sharing rate and the equalization rate, and decreasing with the standard tax rate. The sign of the objective function change w.r.t. the minimum standard q_E depends on the comparison between the benefit of alleviating the budget constraint with a higher grant [7], $\lambda \beta \frac{\triangle N}{\triangle q_E}$, and the opportunity cost of allocating resources on production instead to other tasks (e.g. quality as well perks), μ. Finally, of course, the local politicians pay-off function in equilibrium is increasing with the degree of rent-taking opportunity a.

Clearly, in the RES Italian case, only these effects are meaningful:

$$\frac{\partial W^*}{\partial t_0} = -\lambda B < 0, \frac{\partial W^*}{\partial q_E} = \lambda(c^s + \frac{\partial c^s}{\partial q_E} q_E) - \mu, \frac{\partial W^*}{\partial a} = \psi(e) > 0.$$

Now the objective function is decreasing with the uniform tax rate. Notice that, in this case, the politician is indifferent on the level of revenue sharing rate, as all changes of it are compensated by the need equalization grant.

The F.O.C.s of maximizing (10) are as follows:

$$(q^*) : (\varphi_q + \mu) - \lambda C_q = 0, q^* = q_E \tag{14}$$

[7] However, notice that economies of scale, $c_q < 0$, could even reduce the standardised cost and then the grant.

$$(m^*) : \varphi_m - \lambda C_m = 0 \tag{15}$$

$$(t^*) : \lambda = \upsilon_I \eta(\alpha, \beta, t^s) \tag{16}$$

where $\eta(\alpha, \beta, t^s) = \frac{1}{1-\frac{\widehat{t}\varepsilon}{1-t-\tau}} > 0$ is the Marginal Cost of Public Funds (MCF), positive as long as the subnational government is always on the upward-sloping section of its Laffer curve, with $\varepsilon \doteq -B_{t+\tau}\frac{t+\tau}{B} > 0$, the elasticity of tax base;

$$(e^*) : a\psi'(e) - \lambda C_e = 0. \tag{17}$$

Let us now elaborate these conditions for discussing the main issues of this paper.

3.2 Overspending in equilibrium and the role of regional fiscal autonomy for financial responsibility

Taking into account (9), the expression

$$E(q^* = q_E, m^*, e^*) \doteq [c(q_E, m^*; A)e^* - c^s]q_E$$

is the overspending in equilibrium. Consequently, using (4), (5) and (**??**), we obtain as follows

$$E(q_E, m^*, e^*) \doteq (t^* - \beta t^s + \alpha\tau)B(t^* + \tau) - (1-\beta)c^s q_E$$

Now, we may define $(t^* - t^s)$, the wedge between the chosen surtax rate and the standardized one, as the *autonomous fiscal effort* (AFE) of the region receiving the transfer. Consequently this is given by

$$AFE \triangleq (t^* - t^s) = \frac{E(q_E, m^*, e^*)}{B(t^* + \tau)} - [(1-\beta)t^s + \alpha\tau] + \frac{(1-\beta)N}{B(t^* + \tau)} \tag{18}$$

which can be positive as well negative.

For regions where $G = 0$, by substituting (5) in (18), the AFE is

$$(t^* - t^s) \leq \frac{E(q_E, m^*, e^*)}{B(t^* + \tau)} - \alpha\tau.$$

Clearly if $E(.) = 0, (t^* - t^s) \leq -\alpha\tau < 0$. Thus, an efficient rich region, with no cost-inefficiency and a quality level equal to the mean value and

without any grant, applies a surtax rate lower than the standardised one, as long as there is a revenue sharing.

Let us now consider the Italian RES rule and two specific cases of inefficient regions with their respective fiscal efforts to underline a possible inconsistency of the analysed equalization system.

In the first one, the region has an actual public expenditure higher than the standardised one because it is cost-inefficient and provides a quality at least equal to the mean value, i.e.

$$E(q_E, m^*, e^*) > 0, \text{for } m^* \geq \overline{m}, e^* > 1.$$

In this case, by (18), the AFE is

$$(t^* - t^s) > -\alpha\tau.$$

It can be positive as well negative. If it is positive, the region bears the burden of its inefficiency, but, if the revenue sharing rate or/and the federal tax rate are high, it could be also negative and the burden of the inefficiency is partially shifted to others. However, in any case, $t^* - t_0 > 0$.

In the second case, the region has an actual public expenditure lower than the standardised one because provides a much lower level of quality than the average one, but it is still cost-inefficient, i.e.

$$E(q_E, m^*, e^*) < 0, m^* < \overline{m}, e^* > 1.$$

The AFE is

$$(t^* - t^s) < -\alpha\tau.$$

which is always negative, and also $t^* - t_0 < 0$.

In this case, the politician of this twice inefficient region (with low quality and high costs) can surely shift the burden of its inefficiency to all other regions and central government. In conclusion, it may happen that the inefficiencies are paid by the need equalization grant and revenue sharing, and then the system can create perverse and contradictory effects on regional financial responsibility.

3.3 The impact of equalization parameters on quality and efficiency

The equilibrium conditions for quality and cost-efficiency, are obtained, by comparing the marginal benefits with the marginal costs of funds devoted

to these local government strategies. Thus, using (15), (16) and (17), we have as follows:

$$MBm \triangleq \frac{\varphi_m}{\upsilon_I} = C_m\eta \triangleq MCm \tag{19}$$

$$MBe \triangleq \frac{a\psi'}{\upsilon_I} = C_e\eta \triangleq MCe \tag{20}$$

In order to ascertain the effects of changes on α, β and t^s on m^* and e^*, we follow a heuristic partial equilibrium approach [8]. Given the properties of utility and cost functions, in (19) MBm is decreasing and MCm is increasing on m, given q, t and e, and in (20) MBe is decreasing and MCe constant on e, given q, t and m. Equilibrium values m^* and e^* are where the two curves are crossing (Fig.2 and Fig.3).

Let consider the chosen level of quality. An increase of the revenue sharing $\triangle\alpha$, tends to increase the marginal cost of m as

$$\frac{\partial\eta(\widehat{t})}{\partial\alpha} = \tau\frac{\partial\eta}{\partial\widehat{t}} > 0$$

where[9]

$$\frac{\partial\eta}{\partial\widehat{t}} = \frac{\varepsilon}{1-t-\tau}\left[1-\widehat{t}\frac{\varepsilon}{1-t-\tau}\right]^{-2} > 0$$

and then it provoques a shift to the right to the marginal cost curve in Fig.2. This implies an increase of the equilibrium level of quality.

Figure 2 here

An increase of the degree of equalization $\triangle\beta$ tends, instead, to decrease the marginal cost of m as

[8] This implies: (i) to assume approximately constant the marginal utility of income and (ii) to consider the effect of a parameter change on each endogenous variable (specifcally on m and e) given the others. The results are less general than in a general equilibrium static comparitive framework (see e.g. Dahlby 2011), but clearer and economically meaningful.

[9] This is an application to our model of the general proposition by which, under very plausible hypotheses, MCF is always increasing with the tax rate (see at least Dahlby 2011).

$$\frac{\partial \eta(\widehat{t})}{\partial \beta} = -t^s \frac{\partial \eta}{\partial \widehat{t}} < 0$$

and then it provoques a shift to the left to the marginal cost curve and a decrease of the equilibrium level of quality.

The same result obtains with an increase of the standardised surtax rate $\triangle t^s$ as

$$\frac{\partial \eta(\widehat{t})}{\partial t^s} = -\beta \frac{\partial \eta}{\partial \widehat{t}} < 0$$

Let us consider the level of productive inefficiency. An increase of the revenue sharing $\triangle \alpha$, tends to increase the marginal cost of e with a parallel shift to above of the cost curve MCe in Fig.3 and this implies a decrease of e. Opposite is the effect of an increase of β and t^s. Notice that an increase of accountability $- \triangle a$ gives a shift to the left of the MBe curve and a decrease of e.

Figure 3 here

An increase of the revenue sharing rate tends to reduce the quality of the public service, while it tends to induce the politicians, and public officials, to improve the internal efficiency of the productive process[10]. The opposite effect is reached by increasing the rate of the equalization and the standardised tax rate.

Notice that these effects are working throughout the level of the effective local tax rate, $\widehat{t} = t + \alpha\tau - \beta t^s$, while remaining unchanged the aggregate rate influencing the tax base, $\tau + t$. Changes of the grants parameters α, β and t^s have, by the way of $\eta(\alpha, \beta, t^s)$, a different impact on the marginal cost of public funds devoted to increase quality, given by (19), and rent-taking activities, given by (20). This explains why α, which increases the effectively perceived local tax rate $\widehat{t}$, has an opposite effect w.r.t. β and t^s, which instead decrease it. It is also straightforward that any reform increasing the transparency of the equalization system, and then the accountability of the local political set-up, represented by $-\triangle a$, implies a reduction of cost-inefficiency, without influencing the level of quality.

Interesting enough is also to verify the effects on quality and inefficiency of changes of the essential level (minimum standard). An increase of q_E, if $\mu > 0$, implies an increase of q. Consequently, the effect on quality of

[10] The sign of the effects is of course reversed if the revenue sharing goes from local to central level.

an increase of the minimum standard of the public service provision is not determined, as the shift of marginal benefit and cost curves depends on the relative shape of marginal utility and marginal cost of quality. Indeed, the sign of φ_{mq} and C_{mq} is not given a priori. If, for instance, $\zeta_{mq} < 0$ (demand-substitutes) and $\xi_{mq} + 1 > 0$ (cost-substitutes, no *economies of scope*), as it is well conceivable, in Fig. 2 both MBm and MCm curves shift to the left and m tends to decrease with q_E. However, with quality and quantity as complements and/or with *economies of scope*, m might increase too. The cost-inefficiency tends instead to certainly decrease with an increase of the minimum standard, because of the cost-substitutability between inefficiency index and quantity, $C_{eq} > 0$, which increases the opportunity cost of wasteful expenditures. In Fig. 3 the MCe curve shifts to above and equilibrium level of e decreases.

We summarize the results and implications of previous arguments in Table 1.

Table 1 here

4 Concluding remarks

Need equalization is a worldwide used criterion of intergovernmental transfers. Many developed and also underdeveloped countries are applying variants of it. For instance, the constitutional reform recently implemented in Italy foresees an ambitious and sophisticated application of it. The main objective refers to equity concerns, as it tends to reduce the differences in terms of resources for assuring to all citizen the access to a adequate level of essential public services. However, as shown by a wide recent literature, any equalization system, defining a grant inversely correlated to local tax base, has efficiency consequences on the of level of local tax rates and public expenditure.

In this paper we have extended the analysis of these consequences to productive efficiency of local government in providing local public services. With this notion we mean to provide, at the maximum conceivable level of quality and at the minimum cost, a level of the output of the service at least equal to a standard fixed by the central government.

First, we have shown that with this funding RES mechanism, in particular that one applied in Italy, the inefficiencies, in terms of low quality and high costs, can be, in some cases, paid by the need equalization grant and

the revenue sharing, and then create, with a low fiscal effort, a perverse and contradictory effects on regional financial responsibility.

Second, we have proved that, for the general RES rule, an increase of the revenue sharing rate tends to reduce the quality of the public service, while it tends to induce the politicians and the public officials to extend the effort for improving the efficiency of the productive process. The opposite effect is given by an increase of the rate of the equalization and of the standard tax rate, given the opposite effect on the marginal cost of public funds. The effect on quality of an increase of the minimum standard of the public service provision is, instead, not determined, as it depends on the structure of costs and technology. However, it this respect, we have obtained a quite readable condition for signing the effect: If quality and quantity are substitute in preferences and costs then the local government reacts reducing quality. Given cost-substitutability between inefficiency index and quantity, an increase of the minimum standard increases for sure the politician effort toward cost-efficiency. Finally, of course, an increase of degree of accountability and benevolence has beneficial effects on local government cost-efficiency.

In conclusion, the central government, in designing the structure of grant parameters, faces a trade-off between quality and cost-efficiency of local public services provision, at fixed essential output levels, that should be appropriately managed. Higher quality means a more actually equitable public provision, while higher cost-efficiency means harder budget constraint, less potential deficit and a minor risk of bail-out. Should the central government attaches a higher weight to quality (cost-efficiency), it should reduces (increase) the revenue sharing rate in favour an increase (reduction) of equalization parameters. In any case, all political reforms improving politicians accountability increase, as expected, cost-efficiency and reduces overspending phenomena, without reducing the level quality, then with no trade-off at all.

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Fig.1. Overspending due to productive inefficiency

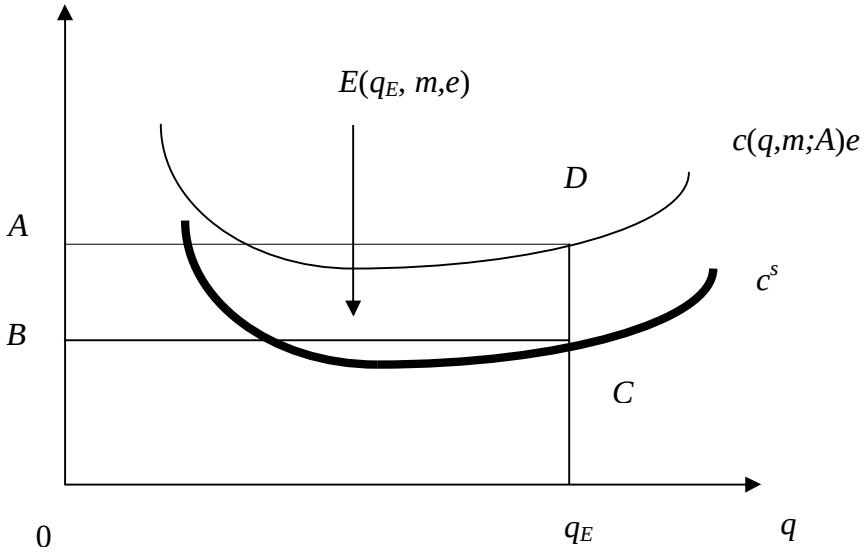

Fig. 2. Equilibrium values of *m*

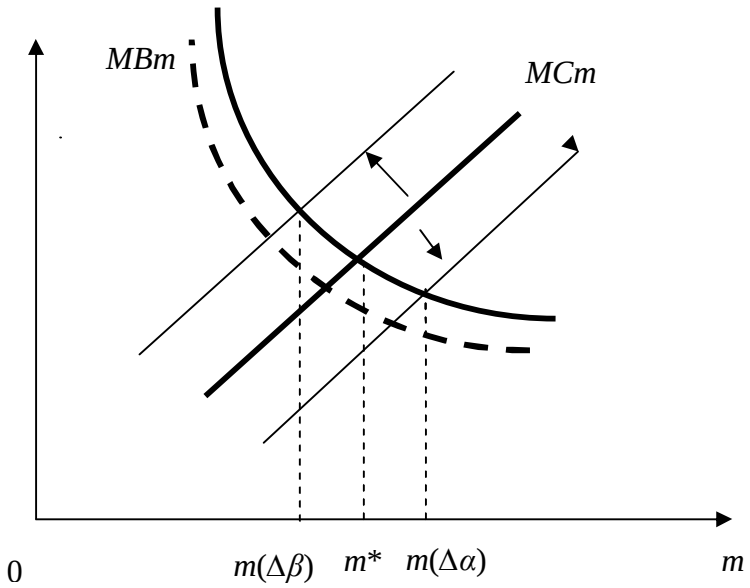

Fig.3. Equilibrium values of *e*

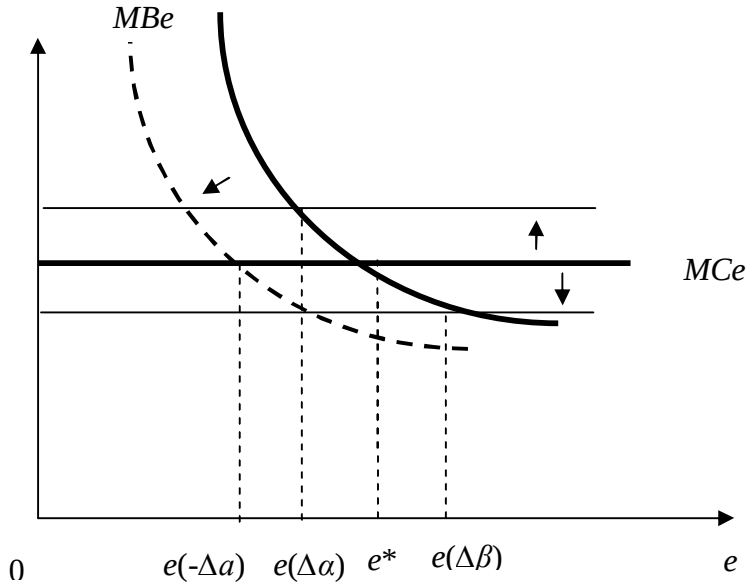

Table1: *Impacts of equalization parameters on productive efficiency*

Fiscal arrangements		**Output quality**	**Cost Inefficiency**
Revenue sharing rate	$\Delta\alpha$	-	-
Equalization rate	$\Delta\beta$	+	+
Standard tax rate	Δt^s	+	+
Accountability	$-\Delta a$	None	-
Essential level	Δq_E	?	-