Società italiana di
economia pubblica

XV
CONFERENZA

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June 2003
Preliminary Draft

Abstract

Oates' decentralization theorem (Oates [23]) grounds on the assumption that the central government is incapable to discriminate public policy on a regional basis. This assumption has sometimes been justified by some informational advantage of local governments about the social and economic features of regions (Oates [24]). Under the Revelation Principle, asymmetric information cannot be proved to be sufficient to explain why the central government does not *replicate* the allocation of local governments, when governments are benevolent. Moreover, empirical analysis seems to prove that central policies are not uniform across countries. On the basis of a stylized model of *public sector governance*, this paper proves that centralization and decentralization are equivalent (Weak Decentralization Theorem), whenever informational spillovers across regions are assumed away. Moreover, the preference for decentralization (or centralization) is shown to crucially depend on the conflict among public sector players for information rent distribution.

1 Introduction

The traditional literature on fiscal federalism (e.g. Tiebout [32], Musgrave [21], Oates [23]) provides specific guidelines to solve the *problem of power assignment* within the public sector: policies involving *inter-jurisdictional spillovers* call for centralization or coordination of decentralized decision-making to enhance efficiency. Broadly speaking, redistribution, stabilization, and national public goods provision should be centralized.

Notwithstanding clear theoretical principles, policy assignment is quite divergent in cross-country as well as in time comparison. One reason is that actual public policies embed a multiplicity of *Musgravian features* (e.g. health and education services). Moreover, in a context characterized by complete and perfect information, unlimited capacity

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of writing laws and contracts, and benevolent public institutions, central policies are at least as efficient as local ones (Poitevin [27]).

In the traditional view, the decentralization of pure allocation functions is based on the assumptions that there are no interregional spillovers and that central policies are constrained to be uniform across the country (Oates [23]). This assumption has sometimes been sustained by the informational advantage of local authorities about the relevant social and economic fundamentals (Klibanoff and Poitevin [12], Oates [24]).

On the theoretical and empirical viewpoints, this argument is quite weak. Recent works by Besley and Coate [3] and Lockwood [15] have pointed out this weakness. These articles address the problem of comparing decentralization and centralization, relaxing the uniformity assumption and assuming a political economics perspective, and focusing on role of *inter-regional distribution* as driving force for the comparison. The following model shares the same approach of this recent literature as regards the critics to uniformity and the intrinsically non-benevolent nature of government, but it nevertheless distinguishes from them because of its focus on *pure allocation*. The objective of this work is to extend Oates' decentralization argument under informational and political constraints, while keeping its very perspective.

In the framework of the Revelation Principle, the central government could design optimal contracts to extract locally available information. Moreover, in Oates' framework, local and central governments are benevolent, hence there is no reason for local governments not to fully and truthfully reveal their information to central government, since there is no conflict between local and central governments' objectives. In other terms, substituting asymmetric information (namely, adverse selection) for uniformity brings to a **Weak Decentralization Theorem**: *under asymmetric information, local governments are always as efficient as central government in providing the efficient allocation of the local public good.*

Asymmetric information *alone* is not sufficient to determine a preference for decentralization on a pure allocation basis. Government *self-interest* has to be considered. Indeed, the power assignment issue has to be addressed in the terms of *public sector governance*. In this paper, two alternative public governance structures are compared. In both cases, the model incorporates the idea that *relevant information is available only at local level*. In the case of centralized governance, the citizens from all regions are the *principals* of a politician ruling the central government and its local agencies. Local agencies implement the central planning (and, thus, reveal the relevant information). Under decentralized governance, the citizens of each region control a local politician that privately obtains the relevant information and directly implements regional fiscal policy.

The paper is organized as follows. In the section 2 public governance models are presented and their complete information features are analyzed. Section 3 explores the role of asymmetric information. Section 4 concludes.

2 The model

The economy is made by J *ex ante* identical regions and two productive sectors: private and public. Households living in the regions are identical up to the productivity of their production factor, w_j^h (with $h \in \mathcal{H}$, the set of households in the region), and the region of residence j (with $j \in \mathcal{J}$, the set of regions). Households provide inelastically one unit of their production factor. The set of region-j's households, $\mathcal{H}$, is made by two subsets: households belonging to $\mathcal{H}_j^x$ competitively provide their productive factor to the private sector, earning a gross income that is equal to their productivity; households belonging to $\mathcal{H}_j^g$ provide their factor to the public sector (working as politician or bureaucrat) and earn an endogenous *net income*, ω_j^h, determined by the model (where $\pi_j = \sum_{k \in \mathcal{H}_j^g} \omega_j^k$ is the expenditure for public wages financed by region-j's public budget).

The private sector produces a composite good, x (also used as *numeraire*), with a simple fixed-coefficient technology. Namely, the economy's private production, x^s, is equal to the sum of the productivity of households providing their factor to the private sector:

$$x^s = \sum_{i \in \mathcal{J}} \sum_{k \in \mathcal{H}_i^x} w_j^k$$

The composite private good is demanded both as a *consumption good* by each household, x_j^h, and as an *intermediate good* by the government, x_j^g, to produce the local public good in each jurisdiction. The aggregate demand of private good is thus

$$x^d = \sum_{i \in \mathcal{J}} \left(\sum_{k \in \mathcal{H}} x_i^k + x_i^g \right)$$

The public sector produces a pure local public good, g, through a fixed-cost public technology, that is specific for each jurisdiction. The regional public production cost, c_j, may take two values following the *ex ante* probability distribution

$$Prob\{c_j = \underline{c}\} = p \qquad Prob\{c_j = \bar{c}\} = 1 - p$$

that is identically and independently distributed across regions; where $\bar{c} > \underline{c}$. Information about the public production technology can be detected only through a *local agency* or, if it is the case, directly by the local government.

In the region j, the local public good, g_j, is produced through the sum of the intermediate good bought by the government on the private market and the production factors directly provided by public employees

$$g_j = \frac{x_j^g + \sum_{k \in \mathcal{H}_j^g} w_j^k}{c_j} \tag{1}$$

The assumption involved in (1) is that the *factors employed in the public sector are as productive as in the private sector*.

The household's utility function, $u(x_j^h, g_j)$, is strictly monotonic, twice continuously differentiable, and concave. Since any form of inter-individual and inter-regional redistribution is assumed away, the private income taxation is based on the *benefit principle* (Wicksell [33]) to finance the local public good production. By the assumption of inelastic factor supply, the regional tax rate, t_j, does not distort the private choices. Thus, each household spends all its net-of-tax income to buy the private consumption good

$$
x_j^h = \begin{cases} w_j^h \cdot (1 - t_j) & \forall h \in \mathcal{H}_j^x \\ \omega_j^h & \forall h \in \mathcal{H}_j^g \end{cases}
$$

Since inter-regional redistribution is excluded, the regional public budget constraint is always balanced at regional level

$$
t_j \cdot \sum_{k \in \mathcal{H}_j^x} w_j^k \geq \pi_j + x_j^g
$$

local revenues finance the expenditure for public wages, π_j, and for intermediate good, x_j^g.

By the assumption that factors employed in the public sector are productive, it is easy to check that the aggregate production for private and public goods does not depend on the private sector share of factor employment. Given the public output level, when the size of productive factors directly bought by the public sector increases, the public procurement of intermediate good lowers. This feature of the model helps us to focus on the role of governance and information on the public allocation process.

2.1 Public governance: the complete information benchmark

The structure of public sector (i.e. the *public sector governance*) is either centralized or decentralized, while the information about public technology is assumed to be available only at local level.

Both models of (centralized and decentralized) public governance involve a non-benevolent government. Indeed, the policy-makers (politicians and bureaucrats) pursue their own objectives. This idea is here represented by the fact that they maximize the utility of their household, but are *constrained* by the institutional structure of government and by the informational setting.

The model does not incorporate the political and bureaucratic competition and selection processes. The assumed setting of *political common agency shortcuts the working of a complex system of political institutions and relationships.* Each household (as citizen) has a small part of authority on government, hence it has a limited power to bind the government to a given policy. Politicians and bureaucrats are assumed to be appointed through an exogenous random process and are able to resign, in such a case they will work in the private sector. Moreover, the model incorporates the idea that politician or bureaucrat's resignation is costly, since no public activity (public good provision and taxation) can be carried out without policy-makers.

2.1.1 Decentralized public governance

Under *decentralized governance*, each regional government is managed by a common agent (the local *politician*) acting on behalf of the citizens of the region. By the assumption about the information setting, the local politician observes the state of regional public technology and directly implements the political contract. The decentralized governance can be represented in the following game-theoretic terms.

1. A politician in each region, p_j, is randomly appointed out of the regional population, he consumes the public good provided in the region j and privately observes the state of regional public technology, $c_j \in \{\underline{c}, \bar{c}\}$.

2. Each household h from the region j offers a *political contract*, (π_j^h, g_j^h), to the politician, p_j, taking the political contracts offered by the other households as given (*Nash assumption*, e.g. Myles [18]). By the assumption that each household has a (small) power to influence the regional policy, the actual levels of expenditure in public wages and of local public good are obtained aggregating households' political contracts

$$ \pi_j = \sum_{k \in \mathcal{H}_j^x} \pi_j^k \qquad g_j = \sum_{k \in \mathcal{H}_j^x} g_j^k \qquad (2) $$

Then, following the literature on simple mechanisms for free riding solution when the public goods are privately provided (for a survey, see Falkinger *et al.* [6]), the *budgetary mechanism* is assumed to balance overall public expenditure - obtained by (2), through an appropriate tax rate

$$ t_j = \frac{\sum_{k \in \mathcal{H}_j^x} (\pi_j^k + c_j \cdot g_j^k) - w_j^p}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \qquad (3) $$

3. The regional politician p_j observes the contracts offered by all households from the region and chooses to stay in office or to leave, and - if he stays - to publicly communicate the message $\hat{c}_j \in \{\underline{c}, \bar{c}\}$ to households.

4. If the politician leaves his office, he will work in the private sector and $t_j = \pi_j = g_j = 0$, hence all households of region j will consume only the private good. If the politician stays in office, all contracts will be implemented.

Under **complete information**, decentralized governance determines a *first best allocation*. Assuming that the state of public technology in each region is common knowledge, the problem of the generic household living in region-j is

$$ \max_{\pi_j^h, g_j^h} u\left(w_j^h - \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot (\pi_j + c_j \cdot g_j - w_j^p), g_j \right) $$

$$ s.t. $$

$$ u(\pi_j, g_j) \geq u(w_j^p, 0) $$

then household's optimization condition is

$$MRS_j^h + \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot MRS_j^p = \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot c_j \tag{4}$$

Condition (4) implies the Samuelson's rule.

2.1.2 Centralized governance

Under *centralized governance*, the government is managed by a common agent (the central *politician*) acting on behalf of the citizens of all regions. By the assumption about the information setting, the politician has to implement the public policy she chooses through local agents. The centralized governance can be represented as follows

1. The central politician, p, and a bureaucrat for each region, b_j, are randomly appointed out of the population of regions. The local bureaucrats consume the public good of the region in which they work and privately observe the state of regional public technology, $c_j \in \{\underline{c}, \bar{c}\}$. The central politician consumes the local public good of the region in which she lives.

2. Each household h from any region offers a *political contract*, (π_j^h, g_j^h), to the central politician, p, taking other households' contracts as given. The public expenditure for wages, the public good provision, and the tax rate of region j are determined as seen under decentralized governance.

3. The central politician p observes the contracts offered by all households from all regions, that determine the overall expenditure allowed by regional budgets to finance public wages

$$\sum_{i \in \mathcal{J}} \pi_i \leq \sum_{i \in \mathcal{J}} \left(t_i \cdot \sum_{k \in \mathcal{H}_i^x} w_i^k - x_i^g \right)$$

and offers a contract ω_j^b to each regional bureaucrat, b_j.

4. Each regional bureaucrat, b_j, observes the contracts offered by all households and the contracts offered by the central politician and chooses to stay in office or to leave, and - if he stays - to privately communicate the message $\hat{c}_j \in \{\underline{c}, \bar{c}\}$ to the central politician, p.

5. If the bureaucrat of a region, b_j, leaves his office, he will work in the private sector and $t_j = \pi_j = g_j = 0$, hence all households in region j will consume only the private good.

6. The central politician observes the vector of messages sent by regional bureaucrats and chooses to stay in office or to leave, and - if she stays - to publicly communicate the message $(\hat{c}_1, ..., \hat{c}_J) \in \{\underline{c}, \bar{c}\} \times ... \times \{\underline{c}, \bar{c}\}$ to households and bureaucrats.

7. If the central politician leaves her office, she will work in the private sector and $t_i = \pi_i = g_i = 0$, $\forall i \in \mathcal{J}$, hence all households from any region will consume only the private good. If the central politician stays in office, all contracts will be implemented.

As in the case of decentralized governance, assuming that the state of public technology in each region is common knowledge and solving by backward induction, the central politician (trivial) problem is

$$
\max_{\{\omega_j^b\}_{j \in \mathcal{J}}} u\left(\sum_{i \in \mathcal{J}} (\pi_i - \omega_i^b), g_z \right)
$$

$$
s.t.
$$

$$
u(\omega_i^b, g_i) \geq u(w_i^b, 0) \quad \forall i \in \mathcal{J}
$$

since the politician's wage is the difference between overall expenditure for public wages and wages paid to regional bureaucrats, bureaucrats' participation constraints are binding, hence

$$
\frac{d\omega_j^b}{dg_j} = -MRS_j^b
$$

where MRS_j^b is the marginal rate of substitution between private and public goods of region-j's bureaucrat. Hence, the household's generic problem is

$$
\max_{\pi_j^h, g_j^h} u\left(w_j^h - \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot \left(\pi_j + c_j \cdot g_j - \sum_{k \in \mathcal{H}_j^g} w_j^k \right), g_j \right)
$$

$$
s.t.
$$

$$
u\left(\sum_{i \in \mathcal{J}} (\pi_i - \omega_i^b(g_i)), g_z \right) \geq u(w_z^p, 0)
$$

where π_j and g_j are determined by equations (2). By the first order conditions, if the household and the central politician live in different regions ($j \neq z$) then household's optimization condition is

$$
MRS_j^h + \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot MRS_j^b = \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot c_j \tag{5}
$$

If the household and the central politician live in the same region ($j = z$) then household's optimization condition is

$$
MRS_z^h + \frac{w_z^h}{\sum_{k \in \mathcal{H}_z^x} w_k^k} \cdot (MRS^p + MRS_z^b) = \frac{w_z^h}{\sum_{k \in \mathcal{H}_z^x} w_z^k} \cdot c_z \tag{6}
$$

As in the case of decentralized governance, both conditions (5) and (6) imply the Samuelson's rule.

Efficiency of both governance models rests on two features. As first, under complete information all agency relations do not involve efficiency losses - *efficiency of agency*. This result is grounded also on the assumption that factors employed in the public sector are actually productive. Policy-makers (i.e. central and regional politicians, and regional bureaucrats) are rewarded at a wage that is implied by their reservation utilities and this mechanism does not distort the efficiency of allocation. The second feature is related to the fiscal structure of the model - *allocation efficiency*: on the *expenditure side* both types of public outlet (public good provision and public wages) involve *easy riding* incentives for households that are perfectly compensated, on the *tax side*, by the assumed *rule* for tax rate determination - expression (3). In other terms, both benefits and costs of public sector activity are *socialized*.

3   Decentralization theorem and asymmetric information

In the considered setting, governments are intrinsically non-benevolent. But, unless further constraints are introduced, under complete information both *forms of government* are efficient and, hence, equivalent on the *pure allocation* viewpoint. The argument of Oates' decentralization theorem, in the weaker sense of equivalence between centralization and decentralization, still holds.

Self-interested bureaucrats and politicians are not sufficient to determine Pareto-inefficient allocations. As observed by Mueller [20], asymmetric information provides the scope for self-interest unfolding. In this section, adverse selection is considered by assuming that the information about public technology is privately observed by the local agency or government located in each region.

When information about technology is privately observed, *first best* efficiency may be unreachable because of incentive problems. Namely, the policy-makers could exploit their informational advantage by declaring (and implementing behaviors corresponding to) a *false* state of regional public technology.

3.1   Asymmetric information and the Leviathan

In this section, the incentives problems of complete information contracts are analyzed for the local policy-makers, namely the local politician - in decentralized setting, and the local bureaucrat - under centralized governance. The incentives of the central politician will be analyzed in the next section.

As first let us observe that, for any state of technology - $c_j \in \{\underline{c}, \bar{c}\}$, the corresponding complete information optimal policies, $(t_j(c_j), \pi_j(c_j), g_j(c_j))$, are such that the public budget is balanced in each region:

$$t_j(\underline{c}) \cdot \sum_{h \in \mathcal{H}_j^x} w_j^h - \pi_j(\underline{c}) - x_j^g(\underline{c}) = 0 \tag{7}$$

$$t_j(\bar{c}) \cdot \sum_{h \in \mathcal{H}_j^x} w_j^h - \pi_j(\bar{c}) - x_j^g(\bar{c}) = 0 \tag{8}$$

By conditions (7) and (8), declaring a false state of public technology or alternatively implementing policies conceived for a different state of technology, determines a hidden *unbalance* of regional budget. Namely, declaring high cost while it is low implies a surplus

$$t_j(\bar{c}) \cdot \sum_{h \in \mathcal{H}_j^x} w_j^h - \pi_j(\bar{c}) - \hat{x}_j^g(\underline{c}) = (\bar{c} - \underline{c}) \cdot g_j(\bar{c}) > 0$$

whereas, declaring low cost while it is high determines a loss

$$t_j(\underline{c}) \cdot \sum_{h \in \mathcal{H}_j^x} w_j^h - \pi_j(\underline{c}) - \hat{x}_j^g(\bar{c}) = -(\bar{c} - \underline{c}) \cdot g_j(\underline{c}) < 0$$

where $\hat{x}_j^g(.)$ is the public procurement of intermediate good of the mimicking local policy-maker.

In this section, we abstract from possible interregional *informational externalities*, that in the next section will be shown to affect the incentive-compatibility of the contracts between the central politician and the local bureaucrats. The local policy-makers (i.e. regional bureaucrats and politicians) collect tax revenues and implement public expenditure programs in the region either on the basis of higher level planning (centralized governance) or on the basis of regional political contract. Therefore, they are able to appropriate the fiscal unbalance, arising from *cheating*. The utility of the local policy-maker that cheats can be represented as follows

$$u(\omega_j^h(\hat{c}_j) + (\hat{c}_j - c_j) \cdot g_j(\hat{c}_j), g_j(\hat{c}_j)) \qquad \forall h \in \mathcal{H}_j^g \tag{9}$$

where: $\hat{c}_j$ is the declared state of local public technology; c_j is the actual state, and ω_j^h is equal to ω_j^b - the local bureaucrat's wage - under centralized governance, and it is equal to $\omega_j^p = \pi_j$ - the wage of the regional politician - under decentralized governance. Of course, all variables (ω_j^h and g_j) are *functions* of the declared state of the public technology.

When the local policy-maker declares the actual state of the public technology ($\hat{c}_j = c_j$), the function (9) is equal to the complete information one. Under complete information, the local policy-maker gets his reservation utility level, whatever the state of public technology

$$u(\omega_j^h(\underline{c}), g_j(\underline{c})) = u(w_j^h, 0) \qquad \forall h \in \mathcal{H}_j^g$$
$$u(\omega_j^h(\bar{c}), g_j(\bar{c})) = u(w_j^h, 0) \qquad \forall h \in \mathcal{H}_j^g$$

therefore, it is easy to check that if the complete information contract is implemented under adverse selection, *the policy-maker is willing to cheat if and only if the actual public cost of production is low*, by declaring that it is high. Conversely, the policy-maker is never interested in cheating when the public cost is high.

The same argument can be sustained observing that if the private and public goods are complementary or at least not too substitutable[1] the *single crossing condition* for the

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[1]Technically, if $\partial_{xg} u_j^h$ is negative, it must be above a given threshold

$$\partial_{xg} \hat{u}_j^h > M\hat{R}S_j^h \cdot \partial_{xx} \hat{u}_j^h - \frac{\partial_x \hat{u}_j^h}{g_j(\hat{c}_j)}$$

local policy-makers on the space (ω_j^h, g_j) holds[2]

$$\partial_c \left(\left. \frac{d\omega_j^h}{dg_j} \right|_{c_j} \right) = 1 + \partial_x M\hat{R}S_j^h \cdot g_j(\hat{c}_j) > 0 \tag{10}$$

3.2 Incentive-compatibility and rent sharing under centralization

Under centralized governance, the central politician is self-interested and has a private information (i.e. the messages sent by local bureaucrats) about the public cost of production in each region. The analysis of incentives of the central politician is more intricate than the local policy-makers' one.

3.2.1 Single region case

To extricate this issue, let us firstly consider the case with *only one region* (i.e. $J = 1$). If the central politician decides to cheat about the level of public cost in the region (e.g. to declare $\hat{c}$ instead of c), she has to design a contract with the concerned local bureaucrat that incorporates this choice. Indeed, the level of public cost that is publicly communicated by the central politician, $\hat{c}$, *commands* a certain level of expenditure for public wages, $\pi(\hat{c})$, of public good provision, $g(\hat{c})$, and of taxation, $t(\hat{c})$. The local public good provision enters the utility function of the local bureaucrat, and this affects the incentive-compatibility of the contract between him and the central politician.

In other terms, the central politician has to design two kinds of contracts, consistently with her choice between the two alternatives (a) to reveal or (b) not to reveal the information received by the local bureaucrat.

a. As observed, the local bureaucrat has an incentive to declare a false state of public cost only when it is low, hence - in such a case - the contract for the local bureaucrat has to fulfil the following incentive-compatibility constraint

$$u(\omega_1^b(\underline{c}), g_1(\underline{c})) \geq u(\omega_1^b(\bar{c}) + (\bar{c} - \underline{c}) \cdot g_j(\bar{c}), g_j(\bar{c})) \tag{11}$$

b. In this situation, whatever the message sent by the local bureaucrat to the central politician, the public good provision will not change:

- in the case of low cost, the contract for the local bureaucrat has to satisfy the following incentive-compatibility constraint

$$u(\tilde{\omega}_1^b(\underline{c}), g_1(\bar{c})) \geq u(\omega_1^b(\bar{c}) + (\bar{c} - \underline{c}) \cdot g_j(\bar{c}), g_j(\bar{c})) \tag{12}$$

which is equivalent to

$$\tilde{\omega}_1^b(\underline{c}) \geq \omega_1^b(\bar{c}) + (\bar{c} - \underline{c}) \cdot g_j(\bar{c}) \tag{13}$$

---

[2]Where

$$\partial_x MRS_j^h = \frac{\partial_{xg} u_j^h}{\partial_x u_j^h} - MRS_j^h \cdot \frac{\partial_{xx} u_j^h}{\partial_x u_j^h}$$

10

– let now consider the case of high cost: assuming that local bureaucrat truthfully declares the state of technology and that the central politician is *unwilling* to truthfully reveal this message, the local bureaucrat's behavior (to declare the true state) is incentive-compatible since, by (11)

$$u(\omega_1^b(\underline{c}), g_1(\underline{c})) \geq u(\omega_1^b(\bar{c}), g_j(\bar{c})) \tag{14}$$

Proposition 3.1 *The complete information political contracts (between the households and the central politician) are incentive compatible, whatever the public cost in the region.*

Proof. Let us assume the political contract to be incentive-incompatible, hence the central politician is willing to cheat. If the public cost is high, she could cheat by paying the low-cost complete information wage to the local bureaucrat - by condition (14). But, then she has to fund the hidden fiscal deficit. That implies an utility lower than the reservation level assured by the complete information political contract. If the public cost is low, the central politician has to pay a wage that completely drains the hidden public budget surplus, by (13),

$$u(\omega_1(\bar{c}) - \tilde{\omega}_i^b(\underline{c}) + (\bar{c} - \underline{c}) \cdot g_1(\bar{c}), g_1(\bar{c})) = u(\omega_1(\bar{c}) - \omega_i^b(\bar{c}), g_1(\bar{c}))$$

warranting the reservation utility level, that is nevertheless attained with the complete information political contract. ∥

It is worth to remark that in the *rent-sharing conflict* between the central politician and the local bureaucrat, the latter is able to completely appropriate the informational rent. This, in turn, eliminates the incentive problem of the central politician that is unable to profit from cheating.

3.2.2   Extending the single-region outcomes: *interregional independence*

Enlarging the analysis to consider $J > 1$, we observe that the results of the single-region case are relevant whenever the political contract between citizens and the central politician determines the *interregional independence of fiscal policies*. Let the *Interregional Independence* (II) be defined as the case in which the political contract of region j depends only on the realization of the cost parameter in j

$$\pi_j(c_1, ..., c_J) = \pi_j(c_j)$$
$$g_j(c_1, ..., c_J) = g_j(c_j)$$

As we will see in the next section, the way the state of public technology of one region influences the fiscal policy of another region is related to the problem of common agency financing. Therefore, the II assumption is warranted when cross-effects of regional fiscal policies are excluded. Generally speaking this may happen in two cases:

1. if the politician utility function is quasi-linear in her private consumption

2. or if the regions are assumed to be very small and hence the number of regions, J is quite large (in the limit, the budget of the concerned region has measure zero with respect to the aggregate budget of regions)

The II assumption is an extension, in informational terms, of the *no-spillover* assumption that we find in Oates' traditional analysis (Oates [23]).

3.2.3   The general case

Relaxing the II assumption, the relationships between the politician and the regional bureaucrats become rather intricate. Generally speaking, the contract of each region will depend on the complete description of the state of the world declared by the central politician, $(\hat{c}_1, ..., \hat{c}_J)$. This implies that the analysis of incentives of the local bureaucrat has to include all the parameters describing the state of the world. In other terms, the local bureaucrat has to decide his behavior on the basis of the *interim expected value of his utility*. Thus, the condition (11) becomes

$$\sum_{\mathbf{c}_{-j} \in \{\underline{c}, \bar{c}\}^{J-1}} u(\omega_j^b(\underline{c}_j, \mathbf{c}_{-j}), g_j(\underline{c}_j, \mathbf{c}_{-j})) \geq$$

$$\geq \sum_{\mathbf{c}_{-j} \in \{\underline{c}, \bar{c}\}^{J-1}} u(\omega_1^b(\bar{c}_j, \mathbf{c}_{-j}) + (\bar{c}_j - \underline{c}_j) \cdot g_j(\bar{c}_j, \mathbf{c}_{-j}), g_j(\bar{c}_j, \mathbf{c}_{-j}))$$

and the condition (12) becomes

$$\sum_{\mathbf{c}_{-j} \in \{\underline{c}, \bar{c}\}^{J-1}} u(\tilde{\omega}_j^b(\underline{c}_j, \mathbf{c}_{-j}), g_j(\bar{c}_j, \mathbf{c}_{-j})) \geq$$

$$\geq \sum_{\mathbf{c}_{-j} \in \{\underline{c}, \bar{c}\}^{J-1}} u(\omega_1^b(\bar{c}_j, \mathbf{c}_{-j}) + (\bar{c}_j - \underline{c}_j) \cdot g_j(\bar{c}_j, \mathbf{c}_{-j}), g_j(\bar{c}_j, \mathbf{c}_{-j}))$$

Under interregional *inter-dependence*, the utility of the central politician declaring a generic vector of messages, given the actual state of the world $\mathbf{c} = (c_1, ..., c_J)$, is

$$u\left(\sum_{i \in \mathcal{J}} (\pi_i(\hat{\mathbf{c}}) - \tilde{\omega}_i^b(\hat{\mathbf{c}}) + (\hat{c}_i - c_i) \cdot g_i(\hat{\mathbf{c}})), g_z(\hat{\mathbf{c}})\right) \tag{15}$$

where

$$\tilde{\omega}_j^b(\hat{\mathbf{c}}) = \omega_j^b(c_j, \hat{\mathbf{c}}_{-j})$$

the wage paid by the central politician to the region-j's bureaucrat is equal to the complete information one, when the state of public technology declared by the politician for region j corresponds to the actual one.

By (15), it follows that the rent-sharing problem has, in general, a non-trivial solution. Under complete information, whatever the state of the world (the vector of actual public costs in all regions)

$$u\left(\sum_{i \in \mathcal{J}} (\omega_i(\mathbf{c}) - \omega_i^b(\mathbf{c}), g_z(\mathbf{c}))\right) = u(w_z^p, 0)$$

hence, the political contracts of high-cost regions are incentive-compatible (given also that the high-cost contract between the politician and the bureaucrat is incentive-compatible, whatever the politician's behavior).

Conversely, the political contracts of low-cost regions are likely not to be incentive-compatible. If the politician would not face incentive constraints with the local bureaucrats, the argument showing the incentive-incompatibility of complete information (low-cost) political contracts would follow as in the section 3.1.

But, since the politician *do* face an incentive constraint while designing local bureaucrat's contracts (which is the essence of the rent-sharing conflict), this affects the incentive-compatibility of political contracts in low-cost regions. Possibly, as showed by Proposition 3.1, it could *solve* such a problem. Nevertheless, in the case of interregional *inter-dependence* of local fiscal policies, the politician has a private information that neither the local bureaucrats nor the households observe (i.e. the whole messages sent to the central government).

This informational advantage of the central politician is likely to translate in a rent sharing advantage. Indeed, the local bureaucrats should not be able to completely drain the fiscal surplus that false messages from the central politician would create.

3.3 Generalization of the Weak Decentralization Theorem

In this section, centralized and decentralized governance models will be compared under the *II* assumption. As already argued, the *II* assumption concerns the working of the central governance and it determines the incentive-compatibility of complete information contract between the households and the central politician.

3.3.1 Decentralized governance under asymmetric information

Since the state of public cost is observed only by the local politician, the problem of the generic household living in region j has to take into account the incentive-compatibility constraint and it is

$$
\max_{\{\pi_j^h(c), g_j^h(c)\}_{c \in \{\underline{c}, \bar{c}\}}} p \cdot u\left(w_j^h - \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot (\pi_j(\underline{c}) + \underline{c} \cdot g_j(\underline{c}) - w_j^p), g_j(\underline{c})\right) +
$$
$$
+ (1-p) \cdot u\left(w_j^h - \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot (\pi_j(\bar{c}) + \bar{c} \cdot g_j(\bar{c}) - w_j^p), g_j(\bar{c})\right)
$$
$$
s.t.
$$
$$
u(\pi_j(\bar{c}), g_j(\bar{c})) \geq u(w_j^p, 0)
$$
$$
u(\pi_j(\underline{c}), g_j(\underline{c})) \geq u(\pi_j(\bar{c}) + (\bar{c} - \underline{c}) \cdot g_j(\bar{c}), g_j(\bar{c}))
$$

by first order conditions, household's optimization condition is obtained

$$MRS_j^h(\underline{c}) + \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot MRS_j^p(\underline{c}) = \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot \underline{c} \tag{16}$$

$$MRS_j^h(\bar{c}) + \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot MRS_j^p(\bar{c}) = \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot \tag{17}$$

$$\cdot \left[\bar{c} + \frac{p}{1-p} \cdot \frac{\partial_x u_j^h(\underline{c})}{\partial_x u_j^h(\bar{c})} \cdot \frac{\partial_x \hat{u}_j^p(\underline{c})}{\partial_x u_j^p(\underline{c})} \cdot \left(M\hat{R}S_j^p(\underline{c}) - MRS_j^p(\bar{c}) + \bar{c} - \underline{c} \right) \right]$$

Proposition 3.2 *Under asymmetric information, the decentralized governance determines a constrained optimal policy such that*

1. *the provision of the public good is efficient (satisfies the Samuelson's rule)*

2. *under the single crossing condition for the regional politician, the provision of the public good in regions with high public cost is lower than the efficient one.*

Proof. The first part of the proof follows by aggregating condition (16) over h. The Samuelson's rule is thus obtained. To prove 2, let us first observe that if the single crossing condition is satisfied (the condition (10) has a constant positive sign), integrating the condition (10) for the regional politician between $\underline{c}$ and $\bar{c}$, it follows

$$\int_{\underline{c}}^{\bar{c}} \partial_c \left(\frac{d\omega_j^p}{dg_j} \bigg|_c \right) dc = \int_{\underline{c}}^{\bar{c}} dc + \int_{\underline{c}}^{\bar{c}} \partial_x M\hat{R}S_j^p(c) \cdot g_j(\bar{c}) \cdot dc =$$

$$= \int_{\underline{c}}^{\bar{c}} dc - \int_{\underline{c}}^{\bar{c}} \partial_c M\hat{R}S_j^p(c) = M\hat{R}S_j^p(\underline{c}) - MRS_j^p(\bar{c}) + \bar{c} - \underline{c} > 0$$

Hence, aggregating over h the condition (17), it follows that

$$\sum_{h \in \mathcal{H}_j^x} MRS_j^h + MRS_j^p > \bar{c} \tag{18}$$

which implies the second part of the proposition. $\parallel$

3.3.2 Centralized governance under asymmetric information

Under centralized governance, the central politician needs a local agency to implement the political contracts with citizens. By Proposition 3.1, assuming the **interregional independence** of regional policies, the complete information political contracts (between households and the central politician) is incentive-compatible, because of the effect of the rent-sharing conflict between the politician and the local bureaucrat. On the contrary, the

program of the central politician has to fulfil the incentive-compatibility constraint for the local bureaucrat:

$$\max_{\omega_j^b} p \cdot u(\pi_j(\underline{c}) - \omega_j^b(\underline{c})), g_j(\underline{c})) + (1 - p) \cdot u(\pi_j(\bar{c}) - \omega_j^b(\bar{c})), g_j(\bar{c}))$$

$$s.t.$$
$$u(\omega_j^b(\bar{c}), g_j(\bar{c})) \geq u(w_j^b, 0)$$
$$u(\omega_j^b(\underline{c}), g_j(\underline{c})) \geq u(\omega_j^b(\bar{c}) + (\bar{c} - \underline{c}) \cdot g_j(\bar{c}), g_j(\bar{c}))$$

it is easy to check that both the individual rationality and the incentive-compatibility constraints are binding, hence, the local bureaucrat's wage functions are such that

$$\frac{d\omega_j^b(\underline{c})}{dg_j(\underline{c})} = -MRS_j^b(\underline{c})$$

$$\frac{d\omega_j^b(\underline{c})}{dg_j(\bar{c})} = \frac{\partial_x \hat{u}_j(\underline{c})}{\partial_x u_j(\bar{c})} \cdot (M\hat{R}S_j^b(\underline{c}) - MRS_j^b(\bar{c}) + \bar{c} - \underline{c})$$

$$\frac{d\omega_j^b(\bar{c})}{dg_j(\bar{c})} = -MRS_j^b(\bar{c})$$

We can now solve the generic household problem

$$\max_{\{\pi_j^h(c), g_j^h(c)\}_{c \in \{\underline{c}, \bar{c}\}}} p \cdot u\left(w_j^h - \frac{w_j^h}{\sum_{h \in \mathcal{H}_j^x} w_j^h} \cdot (\pi_j(\underline{c}) + \underline{c} \cdot g_j(\underline{c}) - \sum_{h \in \mathcal{H}_j^g} w_j^h), g_j(\underline{c})\right) +$$

$$+ (1 - p) \cdot u\left(w_j^h - \frac{w_j^h}{\sum_{h \in \mathcal{H}_j^x} w_j^h} \cdot (\pi_j(\bar{c}) + \bar{c} \cdot g_j(\bar{c}) - \sum_{h \in \mathcal{H}_j^g} w_j^h), g_j(\bar{c})\right)$$

$$s.t.$$
$$u(\pi_j(\underline{c}) - \omega_j^b(g_j(\underline{c}), g_j(\bar{c}))), g_j(\underline{c})) \geq u(w_j^p, 0)$$
$$u(\pi_j(\bar{c}) - \omega_j^b(g_j(\bar{c})), g_j(\bar{c})) \geq u(w_j^p, 0)$$

By the first order conditions, the following optimization conditions are determined

$$MRS_j^h(\underline{c}) + \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot (MRS_j^p(\underline{c}) + MRS_j^b(\underline{c})) = \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot \underline{c} \tag{19}$$

$$MRS_j^h(\bar{c}) + \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot (MRS_j^p(\bar{c}) + MRS_j^b(\bar{c})) = \frac{w_j^h}{\sum_{k \in \mathcal{H}_j^x} w_j^k} \cdot \tag{20}$$

$$\cdot \left[\bar{c} + \frac{p}{1 - p} \cdot \frac{\partial_x u_j^h(\underline{c})}{\partial_x u_j^h(\bar{c})} \cdot \frac{\partial_x \hat{u}_j^b(\underline{c})}{\partial_x u_j^b(\underline{c})} \cdot \left(M\hat{R}S_j^b(\underline{c}) - MRS_j^b(\bar{c}) + \bar{c} - \underline{c}\right)\right]$$

Also in the case of centralized governance the Proposition 3.2 holds. Thence, the following proposition can be stated

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Proposition 3.3 (Weak Decentralization Theorem) *Under asymmetric information, self-interested government and II assumptions, the decentralized governance is ex ante as efficient as the centralized governance for the allocation of the local public good.*

Proof. As first we observe that, when the cost of public production is low, both governance models determine the Pareto-efficient allocation. Moreover, if the cost is high, the *size* of the optimal distortion introduced by the decentralized and centralized governance cannot be *ex ante* ranked. ‖

4   Conclusions

The Proposition 3.3 proves that when inter-regional spillovers (even in the form of the informational spillovers) are assumed away, the prediction of Oates' decentralization theorem (in the weak sense of institutional neutrality) is a rather strong result even in a public governance model, allowing central and local policy-makers to appropriate informational rents. In absence of monitoring technologies or informational advantages of *central* authorities, the final outcome of the informational rent conflict delivers the whole rent to the agent directly observing the relevant parameter. In other terms, in the considered model, *information is power.*

In the information economics perspective, the central governance could (and, in general, *does*) entail informational externalities among regions. Such spillovers are determined by the *commonness* of the central government, with respect to individual households as well as regions. Public-wages expenditure under central governance is, unless special assumptions are introduced, a *national public good*. This, on the one side, implies that the political contracts of different regions are correlated and, on the other, confers to the central politician an informational advantage with respect to local bureaucrats, that observe only a part of relevant information. Acting as an informed principal, the central politician may be able to reduce the share in informational rent of the local bureaucrats.

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