DECENTRALISED PROVISION OF MERIT
AND IMPURE PUBLIC GOODS

By

Rosella Levaggi,
Francesco Menoncin

Discussion Paper n. 0909

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comments. Citation and use of such a paper should take account of its provisional character. A revised version may be available directly from the author(s).

Any opinions expressed here are those of the author(s) and not those of the Dipartimento di Scienze Economiche, Università degli Studi di Brescia. Research disseminated by the Department may include views on policy, but the Department itself takes no institutional policy position.
Decentralised provision of merit and impure public goods

Rosella Levaggi and Francesco Menoncin
Dipartimento di Scienze Economiche
Via San Faustino 74b
25100 Brescia
levaggi@eco.unibs.it
menoncin@eco.unibs.it
July 8, 2009

Abstract

In some countries reforms of public service provision have been accompanied by a parallel process of devolution. However, the application of fiscal federalism has not always produced the desired effects. We argue that this result may depend on two factors: a) a lack of coordination causing a non-optimal allocation of resources at aggregate level; b) a lack of incentive to coordination. In our model we assume that goods to be provided at local level are impure public goods. This assumption allows us to consider a more realistic scenario where the production and consumption of the local public good do not necessarily coincide. In an environment with full information and no restriction on the quantities to be provided as the one we propose, fiscal federalism is always suboptimal for the whole community, as it may be expected. However, we show that this does not necessarily mean that in fiscal federalism each local authority is worse off. This implies that coordination is never the outcome of the strategic interaction between the actors and that when the assumption of symmetric information is removed, Central Government will have to expect some local authorities to play strategically against such intervention.

Keywords: Fiscal federalism, decentralisation, impure public goods, mobility

J.E.L. I18, H77
1 Introduction

Policy implementation at national and supranational level usually relies on delegated choices in which either a government agency (acting as an agent) or an autonomous government level is charged with the responsibility of supplying specific services. The aim of these reforms is to improve efficiency and ultimately to increase welfare. However, this process has not always produced the desired effects. The traditional literature on fiscal federalism (see Oates, 1972, and King, 1984, and, for a more detailed review, Oates, 2005) suggests that the allocation of functions to local government should follow efficiency principles. The choice of the quantity to be produced should be left to the tier which is better informed on local preferences, while grants might be used for equity and efficiency reasons. Second generation models (Oates, 2005) suggest that the success of fiscal federalism depends on the information the agents possess about: a) specific parameters (Levaggi and Smith, 1992; Levaggi, 2008; Akai and Mikami, 2006; Snoddon and Wen, 2003); b) the behaviour of other agents (Petretto, 2000) and the effects of their decisions on total welfare (Wildasin, 2004; Crivelli and Staal, 2006). The first issue has been widely studied in the literature and suggests a trade-off between autonomy and control: the local level is better informed than the centre on the relevant parameters that affect welfare and it can strategically use such information. Central Government should then balance the improvement in welfare with the cost deriving from asymmetry of information. The last two issues are related since the need for coordination often arises from the presence of spillovers (Besley and Coate, 2003; Wildasin and Ogawa, 2008). These problems open a very interesting debate on the distribution of welfare gains derived from fiscal federalism even in a context where information is symmetric. In our opinion this problem has not received the due attention in the literature and it may well represent one of the main causes for the observed poor performances of some federal system.

A second and rather important consideration is that, although very sophisticated in its modelling approach, most of the literature models local public good which may produce spillovers on the other local authorities (exceptions are Wildasin, 1997 and Levaggi, 2008). However, most of the services produced at local level are either impure public goods or merit goods. The former are both private goods (increasing utility for the quantity actually bought) and public goods (for the entire amount produced); the latter are private goods whose consumption is financed by the Government for equity/redistribution purposes. For these goods the quantity made available to a specific community should not necessarily be produced and made available where they live. In other words, a certain degree of mobility (either of the service or the service user) may be allowed. The main examples of goods falling into this category are education and health care. This opens interesting policy questions relating to assignment of the quantity to be produced, the transfer price and the level of coordination among policies that is necessary to achieve a first best result.

The aim of our paper is to explore the coordination problem that may arise in a true federal state, without considering the traditional benefits arising from
fiscal federalism that the literature has long pointed out (Oates, 1972; 2005).

We model the production of a merit/impure public good and compare the welfare properties of three settings a) a centralised system; b) fiscal federalism and c) decentralisation assuming that the quantity demanded in a region may be produced elsewhere. We will compare the equilibrium conditions and the results with a more traditional model where mobility is not allowed.

In our context where information is complete and symmetric, fiscal federalism is always sub-optimal for the whole community as one might expect. However, this does not mean that each local authority is worse off. Some regions may in fact be better off, usually because of a reduced tax effort due to a reduction in the equalising grant. If Central Government, as in the present example, has perfect knowledge, a first best can be reached also in a decentralised system through the use of a matching grant. However, this solution will not be reached as a coordination game between the two local authorities because coordination is not welfare improving for both of them.

We think that this aspect related to gainers and losers in pure decentralised decisions may explain why in the actual world, even when we take into account the benefits deriving from a better knowledge of local preference, the gain from fiscal federalism may be limited, if not negative.

The paper is organised as follows: in Section 2 we present the general framework. In Section 3 the first best in the case of a centralized solution is computed. Sections 4 and 5 show the cases of fiscal federalism and decentralization respectively. A discussion and a numerical simulation is left to Section 6. Section 7 concludes.

2 The model

The model presented here examines decentralisation in a context where the commodity produced is an impure local public good with spillovers (Besley and Coate, 2003; Crivelli and Staal, 2006; Wildasin, 1997). We assume that the external effects are anonymous and additive within the same local authority, but the distribution among local authorities matters.

A country, whose population is normalised to one, is divided into two local authorities \(i \in \{a, b\}\) of equal size. Each individual has an exogenous money income, \(M^k\) in the range \([\overline{Y}_i, \overline{Y}_i]\), whose density function is assumed to be uniform. Then, total income in region \(i\) is

\[
Y_i = \frac{1}{2} \int_{\overline{Y}_i}^{\overline{Y}_i} \frac{M^k}{\overline{Y}_i - \overline{Y}_i} dM^k = \frac{\overline{Y}_i + \overline{Y}_i}{4}.
\]

Income is used to buy private commodities and one or zero unit of an impure local public good \(H\) whose price is equal to \(p_i\). Individual’s taste for \(H\) is described by the parameter \(\alpha\) which is assumed to be uniformly distributed in the range \((0, \beta)\), with density function \(\beta^{-1}\).
One unit of $H$ is bought if $\alpha$ is greater than $p_i$. The utility of buying $H$ is given by the difference $\alpha - p_i$ if it is positive, otherwise utility is zero. In other words, the utility coincides with the demanded quantity. This model is suitable if $H$ is an impure public good. Nevertheless, if $H$ is a merit good, then it is fully subsidised and its utility should coincide with $\alpha$. Accordingly, the average utility (i.e. the total demand) for all the agents in region $i$ is given by

$$Q_i = \frac{1}{2} \int_{p_i}^{\alpha} (\alpha - \theta p_i) \frac{1}{\beta} d\alpha = \frac{1}{4} \left( \beta^2 - 2\theta p_i \beta - \frac{p_i^2}{\beta} + 2\theta p_i^2 \right),$$

where $\theta = 1$ if $H$ is an impure public good, while $\theta = 0$ if $H$ is a merit good. In this last case $p_i$ represents the marginal utility of the merit good that the decision maker is willing to finance.$^1$

Good $H$ also produces a public good that depends on the quantity produced in each region, $S$. We assume the local public good $S$ has some spillovers, then welfare in region $i$ can be modelled as Nota: produces produced ma che altro si può mettere?

$$W_i = Y_i (1 - r_i) + Q_i + \phi_i (S_i, S_j),$$

$i, j \in \{a, b\}, i \neq j.$

where $t$ is the central tax rate and $\tau_i$ the local one. The former is set by Central Government to pursue equity and correct for spillovers, according to the different institutional setting (centralisation, fiscal federalism, decentralisation); the latter is set by the local authority.

The nature of the impure local public good is captured by $\phi_i(\cdot)$ which allows to differentiate the utility generated by the public good according to where it is produced. As in Besley and Coate (2003), we introduce fiscal federalism by assuming that preferences for the impure public good are additive within each local authority:

$$\phi_i(\cdot) = f_i (S_i) + g_i (S_j), i \in \{a, b\}.$$

Functions $f(\cdot)$ and $g(\cdot)$ are assumed to be increasing and concave in their argument (decreasing marginal utility at community level), hence the utility of an additional unit depends on where it is produced$^2$. The level of publicness of the good depends on the functional form for $f(\cdot)$ and $g(\cdot)$. In particular:

1. for $f_i = g_i$, the good $H$ is a public good;

2. for $g_i = 0$, the good $H$ is local public good;

3. for $0 < g_i < f_i$, the good $H$ is a local public good with spillovers.

$^1$The coefficient $\frac{1}{2}$ before the integral is due to the assumption that the population in each region is $\frac{1}{2}$ since the total population has been assumed to be 1.

$^2$For a distinction between global public goods and local public goods with spillovers see Levaggi (2009).
In this environment, the decision maker has to internalise the externality caused by the consumption of $H$ via a subsidy that is financed through a linear income tax, partly levied at national level ($t$) and partly at local level at rate $\tau_i$.

Here, we assume:

1. $Y_a > Y_b$, i.e. local authority $a$ is richer than $b$;
2. the marginal cost to produce $H$ is constant and there is no fixed cost;
3. the average cost of production is equal to $v$, and local authority $a$ is more efficient than $b$ in the production process so that $v_a < v_b$.

Given the double nature of private and public good, the benefitter of the two characteristics may not coincide. The quantity demanded by residents in each local authority ($Q_i$) does not necessarily need to coincide with the quantity produced in the same area ($S_i$). This implies that to match supply and demand, lower tiers have to negotiate a transfer price which will not be equal to marginal cost, given the externality produced.

In this context fiscal federalism, i.e. the complete devolution of the production of good $H$ to a lower tier, produces a welfare loss because the positive externality produced by its supply of public good (spillover effect) may not be correctly evaluated. However, although total welfare is decreasing, fiscal federalism may produce a welfare improvement for some local authorities (the richest ones) because it may reduce the pressure for equalisation of resources. This means that a cooperative solution to internalise such externalities may not be feasible and that Central Government’s intervention to correct for spillovers may not be feasible if lower tiers have private information or play strategically.

In this context we concentrate on coordination problems, i.e. we assume that the goods produced at central and local level produce the same level of utility. In a more general context the loss deriving from the problems presented in this paper will have to be balanced with the gains outlined by the traditional theory on fiscal federalism.

### 3 Centralised solution (First Best)

The provision of impure public goods at local level may be granted by Central Government directly or through an agency (centralisation), by an autonomous lower tier (fiscal federalism) or by a lower tier with a specific intervention of a higher tier aimed at reducing the problems arising from lack of coordination (decentralisation). The relative advantages of these solutions have long been discussed in the literature\(^3\). Given that the aim of the paper is to study the coordination problems that may arise in a decentralised system, we will first present the centralised solution which in our context corresponds to First Best. Central Government has to find the optimal mix between the central tax rate

---

\(^3\)See, for example, Levaggi and Smith (2006), Oates (2005), Besley and Coate (2003).
(t), the local one (τ_i) and the user charge (p_i). As in Petretto (2000), the national income tax is used to finance a part of the provision of such good and to redistribute resources:

\[ t = \frac{\rho S a + \rho S b + G a + G b}{Y_a + Y_b}, \]

where \( S \) is a fixed quantity of the service that Central Government wishes to finance and \( 0 \leq \rho \leq 1 \) is the share of the cost the central Government is willing to finance. Both \( S \) and \( \rho \) depend on the preferences of Central Government; we assume they are set outside the model and equal to zero. \( G_i \) represents the equalisation grant which is distributed in a lump-sum form as suggested by Dahlby and Wilson (1994) and Smart (1998):

\[ G_i = \frac{1}{2} \tau^m (Y - Y_i), \]

\[ \tau^m = \frac{\tau_a Y_a + \tau_b Y_b}{Y_a + Y_b}, \]

\[ \overline{Y} = \frac{Y_a + Y_b}{2}, \]

where \( \tau^m \) and \( \overline{Y} \) represent the national average surtax rate and the standardised tax base. Both are invariant to each regional fiscal decision, i.e. local authorities do not perceive the effects that their tax rate has on the equalisation grant.

Impure public good are heterogeneous, varying from impure public goods in its most traditional definition (Musgrave and Musgrave, 1973) to spurious merit goods. In our model, such characteristic of the service is captured by the user charge. For an impure public good, the usual form is a price subsidy, i.e. the consumer is asked to pay a fraction of the price of the service produced. When the impure public good is also a merit good, it is usually supplied for free, but not necessarily to the entire population. The most representative example in this category is health care which is supplied for free or through the payment of a limited fee, but only if the treatment is cost effective.

The impure public good used by residents in one region but produced outside has a price \( q \). For this reason, the local tax rate can be written as:

\[ \tau_i = \frac{v_i S_i - \theta p_i Q_i + q(Q_i - S_i) - G_i}{Y_i}. \]

The problem for Central Government is to find the quantity of \( H \) to be produced, the optimal financial mix, the transfer price and the best output distribution. In actual fact, the maximisation cannot be performed for \( q \), the

---

4 The basic difference between a merit good and an impure public good is that the former is in fact a private good that is used to improve income redistribution or to pivot consumers’ preferences towards the use of goods which the planner thinks they should use. We define as spurious merit good a class of services that have this double characteristic, for example health, education and cultural activities.

5 In this case, \( \alpha \) may represent the effectiveness of the treatment for that specific patient.
transfer price. In a centralised system, $q$ is used as an instrument to redistribute income between the two local authorities; in our model, given the assumption of linear utility as regards disposable income, distribution does not matter. For this reason, such parameter will have to be determined by Central Government using other criteria.\(^6\) The problem for Central Government can be written as:

$$\max_{p_a, p_b, S_a, S_b} \sum_{i \neq j = a, b} \left( Y_i (1 - t - \tau_i) + \frac{1}{4} \beta^2 \gamma \beta - \beta x^2 + 2\beta y^2 \right) + f_i \left( S_i \right) + g_i \left( S_j \right)$$

s.t.

$$\tau_i = \left( v_i - q \right) S_i \left( \beta p_i - \gamma \right) Q_i - G_i,$$

$$t = \frac{Q_a + Q_b}{Y_a + Y_b} = 0,$$

$$S_a + S_b = Q_a + Q_b = Q.\quad (1)$$

The FOC are derived in Appendix A and can be written as:

$$\frac{\partial f_a \left( S_a \right)}{\partial S_a} + p = v_a,$$

$$\frac{\partial f_b \left( S_b \right)}{\partial S_b} + p = v_b,$$

$$p_a = p_b = p,$$

$$p = \frac{q + \lambda}{\beta^2},$$

$$v = \left( 1 - S^D_a - S^D_b \right).\quad (2)$$

The first two conditions can be written as

$$v_a - \frac{\partial f_a \left( S_a \right)}{\partial S_a} = v_b - \frac{\partial f_b \left( S_b \right)}{\partial S_b},$$

which can be interpreted in the following way: the allocation of production between the two local authorities should follow an efficiency principle by balancing the need to reduce the cost of public provision with the utility both communities derive from the location of the production of that specific good.

The quantity of the impure public good in the two local authorities will be the same in equilibrium. According to the value of $\theta$, $p$ can be interpreted in terms of a price or a demanded quantity. In both cases $p$ is chosen to equalize the marginal rate of substitution between income and the impure public good with the price ratio. Although the effect of $q$ in aggregate cancels out, its value affects $\lambda$, the Lagrange multiplier. This parameter is equal to zero when the transfer price $q$ is chosen to make supply and demand match. In a centralised context where Central Government may choose the level of supply and demand in the two regions, $q$ may be arbitrarily set. However, if such price does not clear the market, $\lambda$ will be positive, indicating the presence of an equilibrium with rationing.

The further discretion that Central Government has in this case may be used to improve equalisation and the level of welfare in the two regions, but at the cost of severe controls to avoid overspending.

---

\(^6\) An alternative may be to use the average cost: $\frac{v_a + v_b}{\beta}$ or the minimum production cost, $v_a$ in our case.
The optimal solution in terms of $p^*$, $S^*_a$, $S^*_b$, $Q^*_a$, and $Q^*_b$ can be substituted in the welfare function:

$$W^* = \frac{1}{2} \beta^2 - 2\theta p^* \beta - p^{*2} + 2\theta p^{*2}$$

$$+ \sum_{i \neq j=a,b} (Y_i (1 - t - \tau^*_i(q)) + f_i(S^*_i) + g_i(S^*_j),$$

$$\frac{S^*_i (v_i - q) - Q^*_i (\theta p^* - q)}{Y_i}$$

$$= \frac{(V - Y_i)}{(Y_a + Y_b)} \sum_{i=a,b} (S^*_i (v_i - q) - Q^*_i (\theta p^* - q)) .$$

The value of $\tau^*_i(q)$, the optimal local tax rate, depends on the net cost to produce the optimal quantity $S^*_i$ and on the equalisation grant. In aggregate they do not have any effect on welfare because they simply determine the allocation of income between the two jurisdictions.

However, the welfare of each single jurisdiction depends on $q$. The lower the $q$ the better-off the less efficient local authority where residents get the impure public good at a very convenient price. In aggregate the two effects cancel out and do not affect the equalisation grant that is defined on an average tax rate. However, as pointed out before, if $q$ is not chosen to equalise supply and demand, the Government will have to implement rationing on the demand for the part of services bought outside each jurisdiction.

### 3.1 Special cases

The more traditional case studied by the literature on fiscal federalism where the quantity demanded at local level is produced in the same jurisdiction (i.e. mobility is not allowed) is a special case of our model. In this case the last constraint in (1) becomes:

$$S_a = Q_a,$$

$$S_b = Q_b.$$

The FOC presented in Appendix A can be written as:

$$\frac{1}{2\gamma} \left( \frac{\partial f_a(Q_a)}{\partial Q_a} + \frac{\partial p_a(Q_a)}{\partial Q_a} \right) + \frac{p_a}{2\gamma} = \frac{v_a}{2\gamma},$$

$$\frac{1}{2\gamma} \left( \frac{\partial f_b(Q_b)}{\partial Q_b} + \frac{\partial p_b(Q_b)}{\partial Q_b} \right) + \frac{p_b}{2\gamma} = \frac{v_b}{2\gamma} .$$

The interpretation is straightforward: the quantity to be produced in each local authority is equal to the sum of the private marginal utility ($p$) and the public marginal utility, taking the externalities into due account. It is interesting to note that if the marginal cost in the two local authorities differs, even in the presence of a public good the quantity supplied in the two tiers will be different. This represents an important and interesting difference from the model in which
mobility is allowed, a result somehow similar to the literature on benefits arising from international trade.

Also in this case, the optimal values $\tilde{p}_i^*, \tilde{Q}_a^*$ and $\tilde{Q}_b^*$ can be substituted in the welfare function:

$$W_i^* = \sum_{i=a,b} \left( Y_i (1 - t - \tilde{\tau}_i^*) + \frac{1}{4} \beta^2 - \frac{2\theta \tilde{p}_i^*}{\beta} - \tilde{p}_i^* + 2\theta \tilde{p}_i^* \right)$$

$$+ \sum_{i \neq j = a,b} \left( f_i \tilde{Q}_i^* + g_i \tilde{Q}_j^* \right),$$

$$\tilde{\tau}_i^* = \frac{\tilde{Q}_i^* (v_i - \theta \tilde{p}_i^*)}{Y_i} - \frac{(Y - Y_i)}{(Y_a + Y_b)Y_i} \sum_{i=a,b} \tilde{Q}_i^* (v_i - \theta \tilde{p}_i^*).$$

Welfare is certainly lower than in the previous example, unless mobility is zero in equilibrium in (3). As per welfare distribution, Central Government may simply use the equalisation grant, i.e. the margins for redistribution are more limited.

"Global" public goods Another interesting case that may be considered is represented by the assumption that the public good is produced through demand, not supply. In other words, the welfare function should be written as

$$W = \sum_{i=a,b} \left( Y_i (1 - t - \tilde{\tau}_i) + \frac{1}{4} \beta^2 - \frac{2\theta \tilde{p}_i}{\beta} - \tilde{p}_i^* + 2\theta \tilde{p}_i^* \right)$$

$$+ f_a (Q_a) + g_a (Q_b) + f_b (Q_a) + g_b (Q_b).$$

In this case, the good should be produced in the most efficient local authority. Although the functional form is rather different, the coordination problems arising in this context are those studied by the literature on global public goods.7

4 Fiscal federalism

In this framework, each local authority sets its own level of taxation and service production according to its preferences and resources. It takes $t$ and $G$ as given, and perceives its budget constraint as hard. Central Government’s role is merely confined to equalising resources through the lump-sum grant; this actor is the last one to move, i.e. it sets the grant after local authorities have set their own level of expenditure and taxation. Local authorities have the maximum degree of autonomy and we denote it by fiscal federalism.

The first best solution outlined in Section 3 may not be the outcome of a process of fiscal federalism, even in a setting where there is symmetric information between Central Government and local authorities. This usually happens because the local authority does not fully take into account the consequences

---

7See Levaggi (2009) for a review of these issues.
of its actions on welfare (Petretto, 2000). This behaviour usually leads to a sub-optimal solution; in this section we show the classical problem arising from lack of coordination: each local authority maximises its own utility function whereas in the centralized model the total welfare is maximized. The problem faced by each local authority can be written as

$$\text{max}_{p_i, S_i} \quad W_i = Y_i (1 - t - \tau_i) + \frac{1}{4} \beta^2 - \frac{2 \theta p_i \beta - p_i^2 + 2 \theta p_i^2}{\beta} + f_i (S_i) + g_i (S_j)$$

s.t. $\tau_i = \frac{(v_i - q) S_i - (\theta p_i - q) Q_i - G_i}{Y_i}$

The FOC for the problem are derived in Appendix B and can be written as

$$-v_i + q + \frac{\partial f_i (S_i)}{\partial S_i} = 0.$$  

Each local authority does not take into account the spillover effect that its production creates on the neighbour jurisdiction. Furthermore, in their maximisation process they take $q$ as a given parameter, but in equilibrium only a value will clear the market. To reconcile decentralisation with market clearing conditions, it is necessary to find the $q$ that satisfies the optimal conditions (7) and the market clearing constraint. The problem can be solved using a Nash game:

$$S_i = f_i^{-1} (v_i - q),$$

$$S_a + S_b = Q_a + Q_b = 1 - \frac{q}{\beta}.$$  

After finding the $\bar{q}$ that clears the market, it will be possible to obtain $\bar{p}, \bar{S}_a$ and $\bar{S}_b$.

The total quantity produced is lower than in first best because the local authorities do not take the positive externality into account. Total welfare can be written as

$$W = \frac{1}{2} \frac{\beta^2 - 2 \theta \beta - \bar{p}^2 + 2 \theta \bar{p}^2}{\beta} + \sum_{i=a,b} Y_i (1 - t - \tau_i)$$

$$\tau_i = \frac{S_i (v_i - \bar{q}) - \bar{Q}_i (\theta \bar{p} - \bar{q})}{Y_i}$$

$$\tau_i = \frac{S_i (v_i - \bar{q}) - \bar{Q}_i (\theta \bar{p} - \bar{q})}{Y_i}.$$

Total welfare will be lower than in the first best equilibrium, but this does not necessarily mean that both local authorities are worse off. To explain this, let’s compare (3) with (9). The quantity produced is lower than in the first best
equilibrium. This means that the average local tax rate $\tau$ is lower. In general, the first effect offsets the second, but in this case the average tax rate is also used to set the equalising grant $G_i$. This implies that less resources are flowing from $A$ to $B$ in equilibrium and this income effect may, for the richer local authority, more than offset the initial loss due to underproduction. The second element that determines $\tau_i$ is $q_i$, the price set for mobility. In First Best it may be set to any level, provided that Central Government is prepared to impose rationing. In this model it is the market that sets $q_i$, but the effect on the distribution of welfare in this case is ambiguous: it depends on the initial level of $q_i$. In general, it is not however possible to conclude that both local authorities are losers.

4.1 No mobility

As for centralisation, we can examine the optimal conditions for the case where mobility is not allowed. In this case it is possible to find a solution without a coordination effort between the two local authorities. In fact, each of them maximises its own utility function and assumes that the quantity produced by the other local authority is set. The F.O.C for the problem can be written as:

$$\frac{1}{2}$$ \left( \frac{\partial f(a(Q_a))}{\partial Q_a} \right) + \frac{p_a}{2} = \frac{v_a}{2},$$  

$$\frac{1}{2}$$ \left( \frac{\partial f(b(Q_b))}{\partial Q_b} \right) + \frac{p_b}{2} = \frac{v_b}{2}.$$  

(10)

The quantity produced and demanded will clearly be lower than in the First Best equilibrium as in the case with mobility. Total welfare in this case can be written as

$$\tilde{W} = \frac{1}{2} \left( \beta^2 - \tilde{p}_i^2 - 2\theta \tilde{p}_i \beta + 2\theta \tilde{p}_i^2 \right) + \sum_{i=a,b} Y_i (1 - t - \tilde{\tau}_i)$$  

$$+ \sum_{i \neq j = a,b} f_i (\tilde{Q}_i) + g_i (\tilde{Q}_j),$$  

$$\tilde{\tau}_i = \frac{\tilde{Q}_i (v_i - \theta \tilde{p}_i)}{Y_i} = \frac{(\tilde{Y} - \tilde{Y}_i)}{(Y_a + Y_b) Y_i} \sum_{i = a,b} \tilde{Q}_i (v_i - \theta \tilde{p}_i).$$

(11)

Also in this case total welfare is lower than in first best, but this does not necessarily mean that both local authorities are worse off. In this case, the richest local authority is certainly paying less in terms of equalising grant and this effect may offset the loss in utility caused by the reduction in the quantity of impure public goods produced.

To explain how this happens, let's examine Figure 1 where the different effects are depicted.

The first best optimal allocation is represented by the combination $(\tilde{Q}_a^*, \tilde{Q}_b^*)$. Given a specific level of expenditure, Central Government sets the lump sum grant $G_i$ so that the net income of each local authority is $(\tilde{Y}_a^*, \tilde{Y}_b^*)$ and total welfare is $\tilde{W}_a^* + \tilde{W}_b^*$. In the fiscal federalism case, each local authority does not
perceive the positive externality its production creates and the optimal quantity of impure public good is reduced to $(\tilde{Q}_a, \tilde{Q}_b)$. Expenditure and the average tax rate decreases, there is less need for equalisation grant. This is the reason why the budget constraint shifts from $aa$ to $a_0a_0$ and from $bb$ to $b_0b_0$ respectively. $B$ certainly suffers a welfare loss, but $A$ may be better off: the quantity of impure public good produced is lower than the optimal amount, but the income effect brought about by the reduction in the equalisation grant may compensate such reduction. We can then conclude that while

$$\tilde{W}_a^* + \tilde{W}_b^* > \tilde{W}_a + \tilde{W}_b,$$

for $A$ we have

$$\tilde{W}_a^* \geq \tilde{W}_a.$$

This is the reason why, although a bargaining solution where the two local authorities coordinate their effort and pay for the reciprocal externalities should be envisaged, such outcome may not be reached. If Central Government wishes to reach an optimal allocation, a form of reduced autonomy has to be used.

### 5 Decentralisation

Central Government may follow different strategies in a federal context. Its primary objective is to find an optimal trade-off between autonomy and control.
For this reason, it may leave local authorities free to set their expenditure and taxation strategies or it may try to induce them to choose a welfare improving equilibrium. Central Government may use several instruments to reach this objective. In our analysis we will use a matching grant since it is the instrument suggested by the literature to correct for spillover. Given the assumption of perfect information, Central Government may find the optimal level of the matching grant by finding the subsidy that allows the externality to be internalised. Tresh (1995) suggests using a unit subsidy equal to the marginal rate of substitution between the public good produced in local authority i and income in local authority j, i.e. the spillover created by each local authority:

\[
\text{In our case (see Appendix C), the optimal rate of the matching grant will be equal to:}
\]

\[
r_i^* = \frac{\partial g_j(S_i)}{\partial S_i} \frac{1}{v_i},
\]

and the F.O.C for each single local authority becomes:

\[
-p_i = q, \quad -v_i (1 - r_i^*) + q + \frac{\partial f_i(S_i)}{\partial S_i} = 0.
\]

The externality created by the supply of the impure public good is internalised through a matching grant to the jurisdiction that produces the good. However, given that for an impure public good only the quantity actually sold produces benefits to the community, supply has to match demand. In this model, given the assumption of mobility between the two regions, the marginal price for demand is \( q \). As in the previous section \( q \) will have to be set to clear the market:

\[
S_i = f_i^{-1}(v_i (1 - r_i) - q),
\]

\[
S_a + S_b = 1 - \frac{q}{\beta}.
\]

In this case, given that \( q \) is chosen to clear the market, \( \lambda \) will be equal to zero.

The cost of the matching grant will be financed through the national tax \( t \).

Through decentralisation, Central Government may replicate the first best optimal solution and reach the same level of total welfare, but the distribution will be determined by the market. For a decentralised system, in fact, welfare will be written as:
\[ W^D = \frac{1}{2} \beta^2 - \rho^2 - 2\theta p^* \beta + 2\theta \rho^2 + \sum_{i=a,b} Y_i \left( 1 - t^d - \tau_i^d \right) \]  
\[ \tau_i^d = \frac{S_i^* \left( v_i (1 - r_i^*) - q^d \right) - Q_i^* \left( \theta p^* - q^d \right)}{Y_i} \]  
\[ t^d = \frac{\sum_{i=a} v_i r_i^* S_i^*}{Y_a + Y_b}. \]

In this case, total welfare is certainly equal to first best, given that the quantity produced is the same in both cases. The distribution of welfare between the two local authorities depends on the initial value of \( q \), the transfer price in First Best and on the relative importance of the spillover effect the two local authorities produce. Given that the quantity produced in both cases is the same, the difference in welfare may arise from a different distribution of the fiscal burden. In other words, for each local authority the welfare gain (loss) from first best to decentralisation depends on the sign of the following expression:

\[ \tau_i^* - \tau_i^d - t^d. \]  

If it is positive, the local authority is the net gainer in the decentralisation process, if it is negative it will lose. To show how spillovers and transfer price interact, we can observe that 14 can be written as:

\[ \tau_i^* - \tau_i^d - t^d = \frac{1}{Y_i} \left( S_i^* v_i - (q^d - q) (S_i^* - Q_i^* - Q_i \theta p^*) \right) + \frac{S_i^* v_i r_i^* - S_i^* v_j r_j^*}{2Y_i}. \]

The first part of the expression depends on the value of \( q \). In particular if Central Government chooses in equilibrium a transfer price to clear the market \( (q^d) \), the two expressions are equal. The second part depends on the spillover effect. As shown in Appendix D, if the utility function derived from the public characteristic is logarithmic, the last part is zero if the spillover effect is reciprocal.

5.1 No mobility

For the no mobility case Central Government has to find a grant that internalises the positive externality. Using the procedure described in Appendix B, the

\[^* \text{See appendix....} \]
matching grant will be written as:

$$\hat{r}_i = \frac{2\beta g_j(Q_i)}{v_i \partial Q_i}.$$ 

In this case demand has to be incentivated in order to increase production and to internalise the externality. This is the basic reason why the matching grant is written in terms of marginal rate of substitution from the consumer’s point of view.

Total welfare in this case can be written as:

$$\bar{W}_a^* = \frac{1}{2} \beta \left( \frac{p_i^2 - \beta p_i^2 - 2 \theta p_i^2 \beta + 2 \theta p_i^2}{\beta} \right) + \sum_{i=a,b} Y_i (1 - \hat{r}^d - \hat{r}_i)$$

$$+ \sum_{i 
eq j=a,b} f_i \left( \hat{Q}_i \right) + g_i \left( \hat{Q}_j \right)$$

$$\hat{r}_i = \frac{\hat{Q}_i^* v_i (1 - \hat{r}_i) - \theta p_i^*}{Y_i}$$

$$- (\bar{Y} - Y_i) \sum_{i=a}^b \hat{Q}_i^* \left( v_i (1 - \hat{r}_i) - \theta p_i^* \right),$$

$$\hat{r}^d = \frac{\sum_{i=a}^b v_i \hat{r}_i \hat{Q}_i^*}{Y_a + Y_b}.$$ 

Total welfare is equal to first best, but the distribution depends on the relative size of the spillover effect the two local authorities produce as shown in Appendix D.

6 Discussion

The model presented in this paper shows that even in a context where fiscal federalism is second best, some local authorities may be better off. This is due the sum of two countervailing effects: a decrease in welfare brought about by the lack of coordination which means that the total quantity of public good produced is not optimal; a reduction in the equalisation grant. Richer regions may well be better off as a result, while poor regions will certainly be worse off. In this environment, some forms of decentralisation may be more efficient, although they require an amount of information that in the real world CG may not possess. We model a class of public goods that we think may represent more closely the actual supply by local authorities since we concentrate on impure public and merit goods. We show that in this environment the coordination problems characterizing fiscal federalism are important and that it is usually not possible to reach a first best allocation without the intervention of a supranational authority. Cooperative solutions would be welfare improving for the whole community, but they may not be implemented because they may not be beneficial for all the actors. This result is caused by the equalisation of resources that usually characterizes federal systems. The reduction of expenditure due to misperception of the spillovers reduces the grant that richer regions have...
to pay to poorer ones. This effect may well offset the initial welfare loss due to underprovision of the impure public good.

In the presence of an impure public good, allowing mobility increases welfare, although it creates more problems as regards coordination. Furthermore, decentralisation in this case may allow the same level of welfare to be reached as in first best, but CG loses a redistributive tool. In the centralised solution CG may use the equalisation grant and \( q \), the transfer price to redistribute income. In the decentralised solution \( q \) is set by the market.

### 6.1 Example

In this section we present a numerical example to highlight the results of our paper. As in Besley and Coate (2003) we assume a linear/log utility for each local authority:

\[
W_i = Y_i (1 - t - \tau_i) + \frac{1}{4} \beta^2 \frac{2\theta p_i \beta - p_i^2 + 2\theta p_i^2}{\beta} \\
+ u_i \ln S_i + (1 - w_i) \ln S_j,
\]

and we assume that the good produced is a merit good \((\theta = 0)\). We have evaluated the different solutions for the following initial parameters

<table>
<thead>
<tr>
<th>( Y_a )</th>
<th>( Y_b )</th>
<th>( w_a )</th>
<th>( w_b )</th>
<th>( S )</th>
<th>( v_a )</th>
<th>( v_b )</th>
<th>( \theta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>8</td>
<td>0.6</td>
<td>0.6</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The results are presented in Table 1.

Welfare reaches its maximum in a system where mobility is allowed, as might be expected. In this case production is concentrated in region \( a \), but the quantity demanded is the same in both local authorities. The tax rate and the grant depends on \( q \), the price for mobility as much as the welfare of the two local authorities. The fiscal federalism solution for the most general model is characterized by a relatively high price for mobility, which creates an increase in the quantity of good \( H \) produced in \( A \), but a total reduction in demand \((Q_a + Q_b)\). The increase in \( S_a \) and the contextual reduction in \( \tau \) and \( G \) may make local authority \( A \) better off in this environment, much depends on the price for mobility \( CG \) wishes to fix in a centralised system. The gain in welfare for \( A \) is, on the other hand, unquestionable for the model without mobility. In the latter case, a bargaining solution allowing to reach first best would be feasible in theory, but \( A \) would never accept it because it implies a lower utility. Finally, through \( CG \) intervention using a matching grant, it is possible to reach first best in this context. In this case, the price for mobility is lower than in fiscal federalism, but the quantity offered is higher because of the matching grant. It is also interesting to note that for \( q = 3.039 \) in the first best equations such solution is perfectly replicated in terms of welfare distribution and the local tax rate is equal. It is however important to note that this result depends on the type of
utility function used and the assumption of symmetric spillovers as shown in the previous section.

7 Conclusions

The traditional literature on fiscal federalism suggests that the allocation of functions to local governments should follow efficiency principles. The choice of the quantity to be produced should be left to the tier which knows local preferences best. However, in order to finance the local provision, grants might be used for equity and efficiency reasons. Indeed, the presence of grants balancing for uneven distribution in both resources and needs is one of the main arguments in favour of the application of strict budget balance rules. This means that any expenditure in excess of that financed by Central Government should be paid by local taxes. The traditional literature on fiscal federalism is centred on the production of goods and services that have mainly the characteristic of local public goods. In the recent past the process of fiscal federalism has extended the category of goods and services to be provided at local level to include also services that are both impure public goods and merit goods, i.e. they are rival in consumption and can be supplied to local residents also by providers located outside the boundaries of the local authority.

The use of fiscal federalism in this case is problematic for the regulator which
is left with very few options for making local government replicate the first best solution. This is a well-known result; what our model adds to the previous literature is the effect on coordination of impure public goods provision. In this context, we have shown that when mobility may be allowed, such solution improves welfare, but it creates more problems as regards coordination.

In a context of full information such as the one we have presented in this paper, local authorities do not play any strategic game and through decentralisation total welfare may be maximised. However, in a more realistic context where preferences may be private information and rules concerning the settlement of payment for services produced to outside users may be difficult to enforce, the coordination problems and the lack of incentives to move from a suboptimal solution may be the cause of the problems observed in federal states.
References


[4] Davenport


A Solution to the Central Government problem

The more general problem can be written as:

\[
\max_{p_a, p_b, S_a, S_b} \sum_{i \neq j = a, b} \left( Y_i (1 - t - \tau_i) + \frac{1}{4} \beta^2 - 2\theta p_i \beta - p_i^2 + 2p_i^2 + f_i (S_i) + g_i (S_j) \right) \\
\text{s.t.} \quad \tau_i \leq (v_i - q) S_i - (\theta p_i - q) Q_i, \quad i = 1, 2, \\
(1 - a) S_a + a S_b = (1 - a) Q_a + a Q_b, \\
(1 - b) S_a + b S_b = (1 - b) Q_a + b Q_b.
\]

For \( a = b = \frac{1}{2} \) mobility is allowed, for \( a = 1 \) and \( b = 0 \) mobility is not allowed. The first two constraints can be substituted in the maximisation problem. The Lagrangean is

\[
\mathcal{L} = Y_a \left( 1 - \frac{(v_a - q) S_a - (\theta p_a - q) \frac{1}{2\beta} (\beta - p_a) - G_a}{Y_a} \right) \\
+ \frac{1}{4} \beta^2 - p_a^2 - 2\theta p_a \beta + 2\theta p_a^2 + f_a (S_a) + g_a (S_b) \\
Y_b \left( 1 - \frac{(v_b - q) S_b - (\theta p_b - q) \frac{1}{2\beta} (\beta - p_b) - G_b}{Y_b} \right) \\
+ \frac{1}{4} \beta^2 - p_b^2 - 2\theta p_b \beta + 2\theta p_b^2 + f_b (S_b) + g_b (S_a) \\
+ \lambda_1 \left( (1 - a) S_a + a S_b - (1 - a) \frac{1}{2\beta} (\beta - p_a) - a \frac{1}{2\beta} (\beta - p_b) \right) \\
+ \lambda_2 \left( (1 - b) S_a + b S_b - (1 - b) \frac{1}{2\beta} (\beta - p_a) - b \frac{1}{2\beta} (\beta - p_b) \right),
\]

on which the first order conditions are

\[
\frac{\partial \mathcal{L}}{\partial p_a} : \frac{1}{2} q - p_a + \lambda_1 (1 - a) + \lambda_2 (1 - b) = 0, \\
\frac{\partial \mathcal{L}}{\partial p_b} : \frac{1}{2} q - p_b + \lambda_1 a + \lambda_2 b = 0, \\
\frac{\partial \mathcal{L}}{\partial S_a} : -v_a + q + \frac{\partial f_a (S_a)}{\partial S_a} + \frac{\partial g_a (S_a)}{\partial S_a} + \lambda_1 (1 - a) + \lambda_2 (1 - b) = 0, \\
\frac{\partial \mathcal{L}}{\partial S_b} : -v_b + q + \frac{\partial f_b (S_b)}{\partial S_b} + \lambda_1 a + \lambda_2 b = 0,
\]

which can be rearranged to give the conditions presented in the text.
Solution to the fiscal federalism problem

In this case, the problem has to be written for each authority:

$$\max_{p_i, S_i} Y_i (1 - t - \tau_i) + \frac{1}{4} \beta^2 - 2q \beta - p_i^4 + 2q^2 p_i^2 + f_i (S_i) + g_i (S_j)$$

s.t.

$$\tau_i = \frac{(v_i - q) S_i - (\theta p_i - q) Q_i - G_i}{Y_i},$$

$$t = 0,$$

$$S_i = Q_i.$$

The last constraint is relevant only in the problem without mobility. The first two constraints can be substituted in the maximisation problem. The Lagrangean is

$$\mathcal{L} = Y_i \left( 1 - \frac{(v_i - q) S_i - (\theta p_i - q) \frac{1}{Y_i} \beta}{\frac{1}{Y_i} \beta} \right)$$

$$+ \frac{1}{4} \beta^2 - 2q \beta - 2 \theta p_i \beta + 2q^2 p_i^2 + f_i (S_i) + g_i (S_i) +$$

$$+ \lambda \left( S_i - \frac{1}{2} \beta (\beta - p_i) \right),$$

on which the first order conditions are

$$\frac{\partial \mathcal{L}}{\partial p_i} : \frac{1}{2} q + \frac{p_i - \lambda}{\beta} = 0,$$

$$\frac{\partial \mathcal{L}}{\partial S_i} : -v_i + q + \frac{\partial f_i (S_i)}{\partial S_i} - \lambda = 0.$$

Mobility allowed In this case, $\lambda = 0$ and the conditions are the same as those presented in the text. Both local authorities will have to agree at a later stage on $q$ in order to clear the market.

Mobility not allowed In this case $\lambda$ can be substituted back from the first equation into the second one to give the optimal conditions presented in the text.
C Optimal matching grant

In general, the optimal conditions for the supply of an impure public good with spillovers in a community made of \( n_i \) individuals can be written as:

\[
\sum_{i=1}^{n_i} MRS_{Y_i^j, H_i} + \sum_{j=1}^{n_j} MRS_{Y_j^i, H_j} + MRS_{Y_i, H_i} = MRT_{Y, H}.
\]

In the fiscal federalism case, each jurisdiction underestimates the marginal rate of substitution because it does not take account of the positive externality and the FOC can be written as:

\[
\sum_{i=1}^{n} MRS_{Y_i^j, H_i} + MRS_{Y_j, H_i} = MRT_{Y, H}.
\]

To internalise the externality it is sufficient to use a per unit subsidy equal to the aggregate gain of citizens in the other local authority:

\[
s_i = \sum_{j=1}^{n_j} MRS_{Y_j^i, H_j},
\]

in the form of a conditional matching grant at rate \( r_i = \frac{s_i}{n_i} \).

**Mobility**  In this case, the subsidy is supplied to the producer. From (2) we can write

\[
s_i = \sum_{j=1}^{n_j} MRS_{Y_j^i, H_j} = \frac{\partial f_j (S_i)}{\partial S_i}.
\]

**No mobility**  In this case the subsidy has to be given in terms of demand price reduction hence the marginal rate of substitution takes account of the marginal cost of taxation. The subsidy in this case will be equal to:

\[
s_i = \sum_{j=1}^{n_j} MRS_{Y_j^i, H_j} = 2\beta \frac{\partial f_j (Q_i)}{\partial Q_i}.
\]
## D Welfare comparison

**Mobility** In order to understand how welfare is distributed, it is necessary to determine the sign of the following expression:

\[ \tau^*_i - \tau^d_i = t^d, \]

which can be written as:

\[ \frac{S^*_i (v_i - q) - Q^*_i (\theta p^* - q)}{Y_i} - \frac{\bar{Y} - Y_i}{(Y_a + Y_b) Y_i} \sum_{i=a,b} (S^*_i (v_i - q) - Q^*_i (\theta p^* - q)) \]

\[ - \frac{1}{Y_a + Y_b} \sum_{i=a,b} v_i r^*_i S^*_i (v_i (1-r^*_i) - q^d) - Q^*_i (\theta p^* - q^d) \]

\[ \frac{\bar{Y} - Y_i}{(Y_a + Y_b) Y_i} \sum_{i=a,b} (S^*_i (v_i (1-r^*_i) - q^d) - Q^*_i (\theta p^* - q^d)). \]

Let’s first examine \( \tau^*_i \). In equilibrium, \( S^*_a + S^*_b = Q^*_a + Q^*_b \). It is then possible to write

\[ \tau^*_i = \frac{1}{Y_i} (S^*_i v_i - q (S^*_i - Q^*_i) - Q_i \theta p^*) + \frac{Y_a - Y_b}{2 (Y_a + Y_b) Y_i} \sum_{i=a,b} (S^*_i v_i - Q^*_i \theta p^*). \]

The second expression can be written as

\[ \frac{1}{Y_a + Y_b} \sum_{i=a,b} v_i S^*_i r^*_i + \frac{1}{Y_i} (q^d Q^*_i + S^*_i (v_i (1-r^*_i) - q^d)) \]

\[ - \frac{\bar{Y} - Y_i}{Y_i (Y_a + Y_b)} \sum_{i=a,b} (q^d Q^*_i + S^*_i (v_i (1-r^*_i) - q^d)), \]

or

\[ \frac{1}{Y_i} (S^*_i v_i - q^d (S^*_i - Q^*_i) - Q_i \theta p^*) \]

\[ + \frac{Y_a - Y_b}{2 (Y_a + Y_b) Y_i} \sum_{i=a,b} (S^*_i v_i - Q^*_i \theta p^*) - \frac{S^*_i r^*_i v_i - S^*_i r^*_i v_j}{2Y_i}, \]

and, finally,

\[ \tau^*_i - \tau^d_i = t^d = \frac{1}{Y_i} (S^*_i v_i - (q^d - q) (S^*_i - Q^*_i) - Q_i \theta p^*) \]

\[ + \frac{S^*_i r^*_i v_i - S^*_i r^*_i v_j}{2Y_i}. \]

For a lin-log utility function of the form:

\[ W_i = Y_i (1 - t - \tau_i) + \frac{1}{4} \beta^2 - 2 \theta p_i \beta - p_i^2 + 2 \theta p_i^2 \]

\[ + w_i \ln S_i + (1 - w_i) \ln S_j, \]

\[ + w_i \ln S_i + (1 - w_i) \ln S_j, \]

\[ + w_i \ln S_i + (1 - w_i) \ln S_j, \]

\[ + w_i \ln S_i + (1 - w_i) \ln S_j, \]

\[ + w_i \ln S_i + (1 - w_i) \ln S_j, \]
we have
\[
\tau^* - \tau^d - t^d = \frac{1}{Y_i} \left( S^*_i v_i - (q^d - q) (S^*_i - Q^*_i) - Q_i \theta p^* \right) \\
+ \frac{(1 - w_i) - (1 - w_j)}{2Y_i}.
\]

If the spillover is reciprocal, the last term is equal to zero and the distribution of welfare between First Best and decentralisation depends on \( q \). In particular, if \( q = q^d \) decentralisation exactly replicates first best.

**No mobility** In this case, given that \( Q_i = S_i \) the difference in utility can be written as
\[
\tilde{\tau}^* - \tilde{\tau}^d - \tilde{t}^d = \frac{\tilde{Q}^*_i v_i r^*_i - \tilde{Q}^*_j v_j r^*_j}{2Y_i},
\]
and for a lin-log utility we get
\[
\tilde{\tau}^* - \tilde{\tau}^d - \tilde{t}^d = \frac{(1 - w_i) - (1 - w_j)}{2Y_i}.
\]
Anno 2006
0601 – Francesco MENONCIN “The role of longevity bonds in optimal portfolios” (gennaio)
0603 – Roberto CASARIN, Carmine TRECROCI “Business Cycle and Stock Market Volatility: A Particle Filter Approach” (febbraio)
0604 – Chiara DALLE NOGARE, Matilde VASSALLI “A Pressure-Augmented Taylor Rule for Italy” (marzo)
0605 – Alessandro BUCCIOL, Raffaele MINIACI “Optimal Asset Allocation Based on Utility Maximization in the Presence of Market Frictions” (marzo)
0606 – Paolo M. PANTEGHINI “The Capital Structure of Multinational Companies under Tax Competition” (marzo)
0607 – Enrico MINELLI, Salvatore MODICA “Credit Market Failures and Policy” (gennaio)
0609 – Françoise FORGES, Enrico MINELLI “Afriat’s Theorem for General Budget Sets” (marzo)
0610 – Aviad HEIFETZ, Enrico MINELLI “Aspiration Traps” (marzo)
0611 – Michele MORETTO, Paolo M. PANTEGHINI, Carlo SCARPA “Profit Sharing and Investment by Regulated Utilities: a Welfare Analysis” (aprile)
0612 – Giulio PALERMO “Il potere come relazione sociale. Il caso dell’università baronale italiana” (giugno)
0613 – Sergio VERGALLI “Dynamics in Immigration Community” (luglio)
0614 – Franco SPINELLI, Carmine TRECROCI “Maastricht: New and Old Rules” (luglio)
0615 – Giulio PALERMO “La valutazione dei titoli scientifici dei docenti del Dipartimento di Scienze Economiche dell’Università di Brescia” (settembre)
0616 – Rosella LEVAGGI “Tax evasion and the cost of public sector activities” (settembre)
0617 – Federico BOFFA, Carlo SCARPA “Exporting Collusion under Capacity Constraints: an Anti-Competitive Effect of Market Integration” (ottobre)
0618 – Monica BILLIO, Roberto CASARIN “Stochastic Optimisation for Allocation Problems with Shortfall Risk Constraints” (ottobre)

Anno 2007
0701 – Sergio VERGALLI “Entry and Exit Strategies in Migration Dynamics” (gennaio)
0702 – Rosella LEVAGGI, Francesco MENONCIN “A note on optimal tax evasion in the presence of merit goods” (marzo)
0703 – Roberto CASARIN, Jean-Michel MARIN “Online data processing: comparison of Bayesian regularized particle filters” (aprile)
0704 – Gianni AMISANO, Oreste TRISTANI “Euro area inflation persistence in an estimated nonlinear DSGE model” (maggio)
0705 – John GEWEKE, Gianni AMISANO “Hierarchical Markov Normal Mixture Models with Applications to Financial Asset Returns” (luglio)
0706 – Gianni AMISANO, Roberto SAVONA “Imperfect Predictability and Mutual Fund Dynamics: How Managers Use Predictors in Changing Systematic Risk” (settembre)
0707 – Laura LEVAGGI, Rosella LEVAGGI “Regulation strategies for public service provision” (ottobre)
Anno 2008
0801 – Amedeo FOSSATI, Rosella LEVAGGI “Delay is not the answer: waiting time in health care & income redistribution” (gennaio)
0802 - Mauro GHINAMO, Paolo PANTEGHINI, Federico REVELLI "FDI determination and corporate tax competition in a volatile world" (aprile)
0803 – Vesa KANNIAINEN, Paolo PANTEGHINI “Tax neutrality: Illusion or reality? The case of Entrepreneurship” (maggio)
0804 – Paolo PANTEGHINI “Corporate Debt, Hybrid Securities and the Effective Tax Rate” (luglio)
0805 – Michele MORETTO, Sergio VERGALLI “Managing Migration Through Quotas: an Option-Theory perspective” (luglio)
0806 – Francesco MENONCIN, Paolo PANTEGHINI “The Johansson-Samuelson Theorem in General Equilibrium: A Rebuttal” (luglio)
0807 – Raffaele MINIACI – Sergio PASTORELLO “Mean-variance econometric analysis of household portfolios” (luglio)
0808 – Alessandro BUCCIOL – Raffaele MINIACI “Household portfolios and implicit risk aversion” (luglio)
0809 – Laura PODDI, Sergio VERGALLI “Does corporate social responsibility affect firms performance?” (luglio)
0810 – Stefano CAPRI, Rosella LEVAGGI “Drug pricing and risk sarin agreements” (luglio)
0811 – Ola ANDERSSON, Matteo M. GALIZZI, Tim HOPPE, Sebastian KRANZ, Karen VAN DER WIEL, Erik WENGSTROM “Persuasion in Experimental Ultimatum Games” (luglio)
0812 – Rosella LEVAGGI “Decentralisation vs fiscal federalism in the presence of impure public goods” (agosto)
0813 – Federico BIAGI, Maria Laura PARISI, Lucia VERGANO “Organizational Innovations and Labor Productivity in a Panel of Italian Manufacturing Firms” (agosto)
0814 – Gianni AMISANO, Roberto CASARIN “Particle Filters for Markov-Switching Stochastic-Correlation Models” (agosto)
0815 – Monica BILLIO, Roberto CASARIN “Identifying Business Cycle Turning Points with Sequential Monte Carlo Methods” (agosto)
0816 – Roberto CASARIN, Domenico SARTORE “Matrix-State Particle Filter for Wishart Stochastic Volatility Processes” (agosto)
0817 – Roberto CASARIN, Loriana PELIZZON, Andrea PIVA “Italian Equity Funds: Efficiency and Performance Persistence” (settembre)
0818 – Chiara DALLE NOGARE, Matteo GALIZZI “The political economy of cultural spending: evidence from italian cities” (ottobre)

Anno 2009
0901 – Alessandra DEL BOCA, Michele FRATIANNI, Franco SPINELLI, Carmine TRECROCI “Wage Bargaining Coordination and the Phillips curve in Italy” (gennaio)
0902 – Laura LEVAGGI, Rosella LEVAGGI “Welfare properties of restrictions to health care services based on cost effectiveness” (marzo)
0903 – Rosella LEVAGGI “From Local to global public goods: how should externalities be represented?” (marzo)
0904 – Paolo PANTEGHINI “On the Equivalence between Labor and Consumption Taxation” (aprile)
0905 – Sandye GLORIA-PALERMO “Les conséquences idéologiques de la crise des subprimes” (aprile)
0906 – Matteo M. GALIZZI "Bargaining and Networks in a Gas Bilateral Oligopoly" (aprile)
0907 – Chiara D’ALPAOS, Michele FRATIANNI, Paola VALBONESI, Sergio VERGALLI “It is never too late”: optimal penalty for investment delay in public procurement contracts (maggio)

0908 – Alessandra DEL BOCA, Michele FRATIANNI, Franco SPINELLI, Carmine TRECROCI “The Phillips Curve and the Italian Lira, 1861-1998” (giugno)