XII
CONFERENZA

MASSIMO DI DOMENICO

LOCAL PUBLIC UTILITIES, EXTERNALITIES AND POLITICAL PREFERENCES

Local public utilities, externalities and political preferences

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Abstract

The privatisation and liberalisation processes are important economic issues that have affected the industrial evolution of public utilities. In particular, in a country such as Italy, this important evolution has also concerned local public utilities. These local public utilities, which represent an italian characteristic, have for a long period of time depended mainly from the local political administration supplying to the local community mainly services such as energy, water and waste management, transport.

Starting from an empirical analysis I am currently carrying on with a research group at Bocconi University, I have considered the possibility to rationalise the results obtained by a simple model.

In particular, the local public utility (LPU) sector may be considered under two possible dimensions.

The first is related to: local specific social and cultural characteristics; the particular relationship with the local political institution; the relationship between the citizen/users of services and the LPU.

The second dimension, instead, is related to external factors of the local area such as: the normative structure and its evolution; the privatisation, liberalisation and regulation processes affecting the public utilities having more national relevance; the diversification, strategies and alliances between LPUs of different territories. Indeed, this dimension has contributed to a dynamic evolution of the sector from a static equilibrium, where the LPUs were essentially public firm, to a more dynamic development, where the LPUs behave as private firms in the market.

The present paper, in the attempt to rationalise such a dynamic evolution of the sector, presents a model that explicitly considers two relevant variables.

One of the variable is represented by an exogenous political component in term of political preferences regarding the LPU's behaviour. In particular I consider two states of the world associated to political preferences: the *pro-autonomy* and *pro-co-operation* states. The first case is associated to a political preference that wants the LPU basically related to the original territory. The LPU is constrained by the local political administration to serve principally the citizens of the territory where it is located. This case is opposite to the *pro-co-operative* one where, instead, the LPU seeks externally to the territory possible strategic developments (i.e. seeks alliance with other LPUs, supplies services to other community of citizens and so on).

The second important variable considered is a negative externality which assume a maximum value when associated to political *pro-autonomy* preferences of the local political administration. The negativity of the externality is mainly considered in order to introduce in the model the effect due to the "lost opportunities" for the LPU to develop a strategic behaviour outside the territory as in the *pro-co-operation* case above, in which case the externality vanishes.

Considering only two main variables (externalities and political preferences) has permitted me to consider a simple model where the welfare function maximisation depends on them. The result obtained shows a *second-best* equilibrium modified according to the externality and to the *pro-autonomy* or to the *pro-co-operative* political preferences. In particular, from the model it is possible to infer a critical value for the negative externalities such that: above this critical value it is more social welfare improving for the local community to let the LPU to seek "outside" possible industrial developments; below such critical value, instead, the contrary has been considered and demonstrated.

1.Introduction

The debate concerning privatisation and liberalisation of public utilities has involved in Italy, as in other countries, public services provided at local level. Also for local services it is possible to observe a change from a situation where the State, by its local administration, provided directly good and services, to another where the role of the State is more neutral and where the public firms behave more as the private ones.[1]

In particular the local political authorities (in Italy, for example, the municipalities) have been directly involved for providing public services to citizens belonging to their administrations. Such services go traditionally from water and energy to telecommunication and waste management. The sectors is also characterised by natural monopoly and high investments costs.

The research on the local public utility (LPU) has having, recently, a dramatic increase. Several are the empirical research while less are the theoretical analysis on this topic.

The present paper main goal is to investigate some of the aspects relating to LPUs. In order to do this it introduces two important variables. The first refers to the local characteristics of the territory/district the LPUs are related to. I have individuated three possible elements: the social and cultural aspects; the relationship between the LPU and its corresponding local political authority; the citizens/users and LPU relationship. I call this first variable *internal* because it refers to local characteristics of the territory where the single LPU operates.

A second variable, instead, considers external factors to the territory but having a certain influence over the LPU's behaviour. I refer to this variable as *external*: the evolution of the normative affecting the LPUs and, more generally, the local political administration reform; the privatisation, liberalisation and regulation process of the national public utilities (energy, telecommunication); the diversification strategies, the introduction of innovative processes for the LPUs of different territory/districts and the alliances between them.

1.1 The internal variable

The internal variable refers to characteristics of the district where every single LPU supplies goods and services. Usually this district coincide with the territory administrated by the local political authority but it is possible to find some exceptions[2].

It is important to stress again the relevance of factors that characterises a district for understanding the evolution of the LPUs. These concern complex elements such as the social, cultural and political

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[1] The literature on this argument is, obviously, vast. For more basic and advanced references refer to Berry(1994), Foreman-Peck and Millward (1994), Meyer (1975), Stiglitz (1989), Valotti (1996), Yarrow and Vickers (1988).

[2] For example services supplied by a LPU not only to the City but also to the local metropolitan area .

characteristics. But also relevant variables are the population density, the territory conformation, the climate that could have possible effects on the network expansion, the investments requiring new technologies and so on.

The present paper is more concerned to the political aspect of a district. I think this is a relevant variable that has to be taken into account if we want to better understand the recent evolution of the LPU's both in Italy and other countries (for example, the german *Stadwerke*). Indeed the local political authorities are playing an important role in the LPUs evolution. In some cases, setting binding commitments, but in some others, supporting the strategic evolution of the LPUs giving to them the necessary discretion to strategically evolve. Not only toward a multy –utility asset, for example, but also by creating alliances, consortium and general agreements with LPUs of different districts.

A recent article by Archibugi *et al* (2000) investigates on the nature of the public intervention in the economy and the implementation of privatisation and liberalisation of the market processes. The article considers the relationships occurring between the citizens and the political authority (such as, for example, a municipality), between the political authority and the firm, and between the firm and the citizens/users of the services provided.

The relation between the political authority and the citizen is simply regulated by the electoral outcome. The citizens vote a certain party that, once in power, take the relevant decision concerning how to produce public services and who has to do it. This is an important stage because it affects the structure and the market of such public service sector.

The relationship between political authority and citizens bring us to consideration of *Political Economy* nature. This theory helps us to analyse the way the political authority depends on the support it receives from the voters and the commitments that constrained its activity. The same relationship could also be applied to the model analysed in this paper, investigating how the political support from the citizens introduces commitments concerning the relationship between firm and political authority.

The model I have developed in the next section does not really enter in detailed Political Economy analysis. It considers exogenous the formation of political preferences of the local political decision maker[3]. Those preferences are simply introduced as binding commitments from the local political authority (LPA) allowing, or not, the LPU to find new and relevant economic opportunities outside

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[3] The present model could be integrated with *Political Economy* analysis giving more issues to investigate. For some basic and advanced references concerning the problems treated in this model refer to Becker (83), Caves (1990), Chang (97) Shleifer (98), Laffont (1996), Nannicini (1999), Spiller (1990).

its own district[4]. In particular the LPU seeks for new opportunities outside its district, if it is not more convenient and economical relating only to that district. The openness of the LPU toward more "outside" opportunities is, obviously, possible if its relationship with the LPA is more independent and flexible. For the firm is important, then, to ascertain what is the political attitude toward such an openness. It is possible to have political orientation more *pro-autonomy,* that strictly commit the LPU to be a simple operative division of the LPA's administration. This is the case of LPU that supplies its services over the district according to its public role for those services.

By contrast political attitude *pro-co-operative* allows the LPU to seek also outside its district more economic opportunities. This is the case where to the LPU is associated a more private role. The LPU then, while decreasing its link with the LPA, reinforces its attention to the final customers of its services. In this case the LPU, though, even if more independent from the LPA and orientated to more private goals, still considers important the relationship with the political authorities both inside and outside its district.[5]

1.2 The external variable

For the main purpose of this analysis it is more relevant to investigate the existing relationship between the LPU and the LPA. Traditionally the nature of this relationship were a bilateral monopoly: the LPA is the only demand agent (taking into account the political majority of citizens that support it) and the LPU is the only supplier of services. This relationship has been modified with the recent privatisation and liberalisation of the market. The process has decreased the strong link LPU-LPA, but it has been necessary to introduce a regulation structure in order to avoid that the public utilities take advantage of their position earning possible and inefficient rents. For this reason regulatory agencies have been necessary together to, in some cases, Contract of Services for regulating the activity of public utilities[6].

The idea of a monopoly structure for providing services is usually associated to the important economies (such as scope, scale, integration economies) that it is possible to obtain. The inefficiencies, instead, are usually associated to political and institutional causes (as, for example, the over staffing in the firm, the political appointment of the managers and so on)[7]. Inefficiencies that could be treated either by introducing normative commitments to the political actor, or by reducing the public role in providing services by privatising and liberalising the market. The recent

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[4] Refer to Shleifer and Vishny (94), World Bank (95) for some interesting analysis of this sort.
[5] Cases in Italy, Germany (*Stadtwerke*) confirm such consideration.

[6] See Cella and Termini (99) for more discussions.
[7] Together to, of course, the monopoly power in the market for such utilities.

countries experiences shows us the strong impact that has had the latter on governments' policy, reorganising the market structure for the provision of such services. This also because the orientation toward the privatisation of the markets is ideologically supported by governments.

The main goal of this paper is more limited with respect to the number of possible analysis associated to the LPUs sector. In particular I am interested to investigate both the link the LPU has with its district in term of political preferences (expressed by the community in that district), that constrained the LPU's activity, and the welfare losses due to "lost opportunities" for the LPU in term of alliances and agreements outside the district. The LPU, in this latter case, looses the possibility to realise better scale, scope, diversification and replication economies, the possibility to ameliorate the quality of services provided and, more generally, increasing the citizens' life conditions being a support for the local economic development.

The recent normative development has really created new opportunities of development for the LPUs, in general. This is demonstrated by the fact that these utilities have found relevant opportunities outside their districts concluding alliances and agreements with other LPUs but also with national and international more general utilities[8]. Following this orientation, the LPUs seek outside their district economic opportunities behaving more with private firm logic than with "public" goals, as was in the past. Anyway, this does not mean that the LPUs loose the link with their district. The LPU remains linked to the district also because this give to it a certain profitability due to the privileged relationship with it, than operating in more competitive and risky market. To this I have to add the fact that the LPAs, at least in Italy but also in other countries such as Germany, do not want to loose completely the control over the own LPU. The LPAs see as important the evolution toward more private goals for the LPU. At the same time, they consider important the duty of the LPU for the local community in term of services provided, together to the possibility for the local administration to have a certain cash flow from the LPU's activities in order to cover its financial needs.

It is interesting to investigate on the nature of the opportunities that the LPUs have outside their districts in term of efficient equilibrium obtainable. In particular the model that follows will compare a welfare equilibrium between a situation where the local districts are more autonomous in their provision of public utilities, according to the "public" classical vision of LPU strictly linked to the LPA and to the local community, and a more co-operative situation where, instead, the LPUs have a more flexible link with the LPAs and seek outside the territories economic opportunities with other firms. The following section really enter in more details describing analytically the

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[8] This is the case, for example, for the energy and telecommunication sectors.

possible trade-off, in term of general welfare for the districts, between a *pro-autonomous* system, that depicts a situation where the political preferences of the district are not for LPUs that seek outside the district more economic opportunities, and a *pro-co-operative* system, where the political preferences are more for LPUs open to external to district opportunities.

2.The model

The model considers an economic system composed of a certain number of local territory/districts having own specific characteristics. As specified above, these characteristics are complex and involve a number of variables that really differentiate each single district from the others. The number of possible variables introduces the necessity of selecting between them in order to build the model. In particular I will refer to the following assumptions:

- I consider a system where every district has its own LPU that receive transfers, for covering costs, from the LPA. The LPU is not completely privatised but linked to its local administration.

- The agents that receive the public utilities are the citizens/users of the district having own political preference expressed by votes at the elections[9].

- Important are the political preferences of the district. I differentiate between districts that have *pro-autonomous* preferences in term of LPU strictly linked to its district, and *pro-co-operative* preferences where, instead, the LPU is allowed to seek also outside its district possible economic opportunities with other LPUs.

- I also consider the presence of negative externalities due to the "lost opportunities" for every LPU not to conclude outside its district possible alliances and agreements. The diseconomies associated to *autonomous* district could depend on different causes such as the limited users field; high investment costs not sustainable by the LPA; local political goals not always coincident with profitable administration of the firms. The presence of such a negative externality brings to a negative impact on the welfare district.

- I do not consider transaction costs knowing that this is a relevant simplification of the model. High transaction costs limit the possible infra-districts integration.

- It is not considered the residential mobility *à la* Tiebout, that could modify the model.

- I also do not consider asymmetric information and the relative costs associated to monitoring the agents in the system and introducing incentives in order to reduce such asymmetries[10].

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[9] As already mentioned, the political preferences process is not further investigated, and such preferences are exogenously introduced in the model.
[10]Information problems associated to *Adverse Selection* and *Moral Hazard* factors.

The model discussed in this section consider the classical Laffont and Tirole[11] structure of a social welfare function, that includes both the citizens/user of the public utilities and a public utilities regulated by the LPA.

Let us consider an economic system composed of $i \in \{1,2,3…n\}$ territory/districts having own distinctive characteristics. Every district *i* is characterised by a normalised to unity political preference. I indicate with *mi* the *pro-autonomous* political preference (as described above) and with *1-mi* the opposing pro-co-operative political preference.

The model includes the negative externalities associated to the lost opportunities for the LPUs not to co-operate outside their own district. Every single district looses, in term of welfare, economic opportunities not pursuing agreements with other districts where the other LPUs operate[12].

Let us indicate with W^i-ii the negative function over the welfare district *i* due to the activity of the remaining districts (when there is not co-operation). I also consider with k the externality in the system.

Referring to the district *i* I introduce the following social welfare function (SWF):

$$(1) \qquad Wi = mi\left\{(1-k)W_{ii} + kW^i_{-ii}\right\} + (1-mi)W_{i(-i)}$$

with

$i \in \{1,2,3…n\}$;

W_{ii} SWF in the *i* district under autonomous condition , without infra-districts agreements;

W^i_{-ii} negative component of the SWF in the *i* district due to the activity of the remaining districts with no co-operation ($W^i_{-ii} < 0$);

k negative externalities due to infra-district non-co-operation. In particular the function Wi decreases with an increase of k. I have normalised this factor to unity, i.e. $k \in [0,1]$;

$W_{i(-i)}$ SWF in the *i* district with co-operation agreements with the other districts (-i).

After having specified the SWF for every district it is necessary to evaluate and compare the general SWF considering two specific cases, according to the Oates (72) analysis[13].

The first case considers an economic system with decentralised political preferences concerning the district economic goals. The planner for every district taking autonomous decisions, have also to

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[11] Laffont and Tirole (1993).
[12] See Ellingsen (98) and Inman (97) for further discussions.
[13] The model also follows the analysis of Besley and Coate (1999). Refer to the article for further references too.

consider the activity of the remaining districts (indeed he is not independent from them). The aggregate SWF for all the districts of the system, in this *decentralised* case, is:

$$(2) \qquad W^d = \sum_{i=1}^{n} \left\{ mi\left[(1-k)W_{ii} + kW_{-ii}^{i}\right] + (1-mi)W_{i(-i)} \right\}$$

with $i \in \{1,2,3\ldots n\}$.

Alternatively it is possible to consider a *centralised* economic model where the decisions of all the districts are taken by a single planner. In this case the SWF internalises the negative externalities in the system:

$$(3) \qquad W^c = (1-\overline{m})\sum_{i=1}^{n} W_{i(-i)} + \overline{m}\sum_{i=1}^{n} W_{ii} \}$$

where
Hypothesis 1:

$$(4) \qquad \overline{m} = \frac{1}{n}\sum_{i=1}^{n} mi \ .$$

The hypothesis just considers that, for the centralised economy, the political preferences is coincident with the median voters theorem applied to the political resultants for every single district.

It is necessary, then, to compare the centralised SWF with the decentralised one in order to verify which is greater.

Let us introduce the following proposition first:

Proposition 1: *the choice between centralisation and decentralisation depends, crucially, on the externalities in the system. It is not always true that centralisation is better for given negative externalities in the economy. There exists a critical value k that defines when, for the hypothesis set for this model, the centralised SWF is greater than the decentralised one. At the same time it defines when it is optimal to leave to the local districts decentralised decisional power.*

Demonstration. The demonstration of the above proposition is conducted by comparing centralised with decentralised SWF. It necessary to consider two particular cases: either mi=m-i or mi ≠ m-i (where m-i is the political component in all the district with exception of the district i).

2.1. Identical district
Hypothesis 2: **mi=m-i**
The hypothesis considers coincident the political component in all the districts. This is a simplification that allows to find important conclusions. It is first necessary to distinguish between a system with or without externalities.

System without externalities k = 0
Comparing (2) with (3) it is possible to find the equilibrium

(5) $W^c = W^d$

The absence of externalities and the identical political preferences in the districts do not create differences between a centralised and decentralised system. Of course this has to be compared with the likely case of externalities in the system.

System with externalities k > 0
The externalities in the system introduce the following:
(6a) $W^c > W^d$

that is

$$(6b) \qquad \sum_{i=1}^{n} Wii > \sum_{i=1}^{n}(1-k)Wii + kW_{-ii}^{i}$$

It is simply to understand that for identical infra-districts political preferences *pro-autonomy* or *pro-co-operation*, the SWF is greater in a centralised than in a decentralised system. The centralisation allows to internalise the externalities in a system with identical political preferences. The result is obtained only considering the externalities and not the political preferences that are important too. It

is necessary to recompose the analysis considering different political preferences for every district and compare the result with those obtained above.

2.2. Differentiated districts

Hypothesis 3: **mi ¹ m-i**

In this case every single district expresses own political preferences. In particular, as it has been said, this differentiation depends on local and specific characteristics that translate into political preferences by citizens (voters). These preferences determine political coalitions that creates systems with a certain political equilibrium. I now proceed to analyse the above results considering such infra-district political preferences.

System without externalities k = 0

It is necessary to verify if:

(7) $W^c \geq W^d$

Substituting the (2) and the (3) into (7):

(8) $\sum_{i=1}^{n} (mi - \overline{m}) \left[W_{i(-i)} - W_{ii} \right] \geq 0$

The (8) shows that the validity of the equation both depends on the difference between the autonomous SWFs for every district, and the co-operative ones, and the difference between the average political preference $\overline{m}$ with the political preferences distribution around that average.

The result obtained do not permits to consider, in a unique way, the superiority, in term of welfare, of the centralised system over the decentralised one. It is possible to argue, though, that the more the political preferences distribution is concentrated around the average, the more the system is indifferent between centralisation and decentralisation. By contrast, for distribution not nearly distributed around the average, more uncertain will be the comparison between centralised and decentralised systems.

It is possible to affirm that the differences between districts, expressed in term of political preferences, are important variable in order to define an optimal SWF. Let us consider, again, the problem by introducing externalities in the system.

System with externalities k > 0

As in the previous case, I consider

(9) $W^c \geq W^d$

considering the variable k as the crucial variable to compare the centralised welfare with the decentralised one:

(10) $k \leq \dfrac{\sum\limits_{i=1}^{n} (mi - \overline{m}) \left[W_{i(-i)} - W_{ii} \right]}{\sum\limits_{i=1}^{n} mi (W_{-ii}^{i} - W_{ii})}$

Again the result depends on the ratio between:

- as for the (8), the difference between the centralised and the single district political preferences, associated to the difference between the co-operative compared to the autonomous welfare in every single district i;
- the difference between the single district' welfare without co-operation.

There exists a critical value for k that defines when the SWF is superior in a centralisation case compared with a decentralised one.

According to proposition 1, I have found a critical value for k (K*) that introduce a trade-off between the necessary centralisation, in order to internalise the externalities in the system, and the decentralisation policy, in order to respect the infra-district specific differences.

The formalised analysis conducted in this section has introduced the important consideration treated by the public sector territory structure and different level of government theories. This represents the analytical starting point for an application to a system with different districts, characterised by LPUs that provide services to local communities.

3. Local public utilities regulation and district centralisation and decentralisation

In the previous section I have considered a system composed of different districts in term of political preferences. The simple differentiation between political support pro-autonomy or pro-co-operation and the externalities has introduced elements that have permitted a comparison between a more decentralised system and a centralised one. This has stressed the existence of a trade-off that involves local needs with a desire to internalise the externalities.

In this section I enter in more details considering an economic system characterised by LPUs that supply services to the local citizen/users. Those LPUs are linked to the LPAs through regulation and receive transfers from them.

3.1.The agents in the model and the classic SWF

The intention in this section is to integrate the general conclusions delineated in the previous section with the basic Laffont and Tirole (L-T) model on regulation[14].

I introduce such a model considering political preferences and specifying the functions for all the agents of the model.

The firm

The regulated firm, which I consider a natural monopoly, produces the good q at cost:

(11) $\qquad C = (\boldsymbol{b} - e)\,q$

where e is the managers' effort, while $\boldsymbol{b}$ represents the efficiency or technological factor. The latter can assume two values: either high or inefficient ($\overline{\boldsymbol{b}}$) with probability (1-v), or low or efficient ($\underline{\boldsymbol{b}}$) with probability v.

The local political authority receive the income R(q) from the firm net of the transfer t to the same firm. The firm's utility function, then, is:

(12) $\qquad U = t - \Psi(e)$

($\Psi'(e)>0$ and $\Psi''>0$) where t is the transfer and $\psi(e)$ is the managers' effort expressed in monetary term. The firm's individual rationality (IR) is then $t-\psi(e)\geq 0$.

The regulation agency

The L-T model consider as important the agency control over the firm's activity. In this specific model such a control is internalised by the LPAs. I do not consider a specific regulation agency and for this reason the regulation agency's utility is:

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[14] *Ibiden* Laffont and Tirole (1993).

(13) $\qquad V(s) = s = 0$

The consumers

For the consumer/users I introduce the gross surplus $S(q)$ derived from consuming the firm's good q. The net consumers function is then:

(14) $\qquad V_c = (S(q)-P(q)q)-(1+\lambda)[T- P(q)q] \geq 0$

where T represents the taxation over the citizen and equal to $T=s+t \equiv t$ with λ the shadow cost of public funds.

The benevolent dictator

The model considers a benevolent dictator with political preferences either pro-co-operation or pro-autonomy[15].

Without political preferences the benevolent dictator maximises, in each single district, the following SWF:

(15) $\qquad W = [S(q) - P(q)q\ ] - (1+\lambda)[\,t + (\beta - e)\,q] + U$

with individual rationality constraints

$U \geq 0$ for the firm; $V_c = [S(q)-P(q)q]-T \geq 0$ for the consumer.

The model also introduce the cost component $(1+\lambda)[\cdot]$, associated to the distortion created by the taxation in order to cover the firm's cost and directly charged over the citizens/consumers. It is possible to simplify the (15) in the following way:

(16 a) $\qquad W = [S(q)+\lambda\,P(q)q] - (1+\lambda)[(\Psi(e)+(\beta - e)q)] - \lambda U$

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[15]The benevolent dictator theory and the absence in the system of agents' political preferences, represents a strong critics by the Political Economy main literature. I have treated such problem in my PhD thesis: Political and economic analysis of regulation: theory and application. Southampton University.

The (16 a) shows an inefficient rent for the firm that it is necessary to eliminate. The system is characterised by not knowing all the characteristics agents' variables. The only known variables are the cost C, the output q (or equivalently the price p = P(q)) for the firm. The incentive scheme s(C,q,r) –equal to zero, in our model- and t(C, q, r) are introduced in order to maximise the expected value for the (15), for different states of the nature[16].

The maximisation of (16 a) leads to:

(i)

$$(16\,b) \qquad \frac{p-(\boldsymbol{b}-e)}{p} = \frac{1}{1+\boldsymbol{l}}\frac{1}{\boldsymbol{h}}$$

i.e $\qquad L_R = R_m$

(ii) $\Psi'(e)=q \Leftrightarrow e=e^*$; (iii) U=0; (iv) $V_C \geq 0$;

(v) The project is realised if $[S(q)+\lambda P(q)q]-(1+\lambda)[\Psi(e^*)+(\beta-e^*)q]\geq 0$;

The (i) shows the equality between the Lerner index and the Ramsey coefficient. The (ii) shows an optimal effort for the firm and the (iii) an utility equal to zero for the firm because of is costly to leave a rent to it. The (iv) stresses the individual rationality constraint for the consumer/users while the (v) specifies the condition for realising the project.

3.2. The novelties in the model

The novelties of the model w.r.t the L-T one is represented by SWFs that take into consideration the centralisation and the decentralisation processes for the districts, the political pro-autonomy and pro-co-operation policies, and the negative externalities.

For simplicity I apply the SWF derived from equations (2) and (3) to a model composed of two districts. Every district is characterised by having its own public utility that receives a transfer from the LPA, and by negative externalities due to non-co-operative or autonomous activity of the two districts.

3.2.1 Decentralised system

For a system with i∈{1,2} it is possible to obtain:

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[16]In this model such a definition is not really relevant for the purposes of the paper. This because I do not treat the asymmetric information problem.

(17) $\quad W_1^d = (1 - m1_1)(W_{12} + W_{21}) + m1\{W_{11}(1-k) + k W_{22}^1 + k W_{11}^2 + W_{22}(1-k)\}$

(analogously for i = 2).

where

W_{11} and W_{22} are the autonomous SWFs for districts 1 and 2, as derived from the (16);

W_{12} and W_{21} are the co-operative SWFs between the two districts;

W^1_{22} and W^2_{11} represent the negative functions on the SWFs due to the interdependence between districts;

m1 is the pro-autonomous political component for district 1.

Maximising the (17):

(18) $\quad \max_{q1} W_1^d = (1-m1)(\frac{\partial W_{12}}{\partial q_1} + \frac{\partial W_{21}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1}) + m1\left\{(1-k)(\frac{\partial W_{11}}{\partial q_1} + \frac{\partial W_{22}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1}) + k(\frac{\partial W^1_{22}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1} + \frac{\partial W^2_{11}}{\partial q_1})\right\}$

with derivatives:

i) $\quad \dfrac{\partial W_{12}}{\partial q_1} > 0; \dfrac{\partial \partial W_{12}}{\partial \partial q_1} < 0$

ii) $\quad \dfrac{\partial W_{21}}{\partial q_2} > 0; \dfrac{\partial \partial W_{21}}{\partial \partial q_2} < 0$

iii) $\quad \dfrac{\partial W_{11}}{\partial q_1} > 0; \dfrac{\partial \partial W_{11}}{\partial q_1} < 0$

iv) $\quad \dfrac{\partial W_{22}}{\partial q_2} > 0; \quad \dfrac{\partial \partial W_{22}}{\partial \partial q_2} < 0$

v) $\quad \dfrac{\partial W_{11}^2}{\partial q_1} > 0; \dfrac{\partial \partial W^2_{11}}{\partial \partial q_1} < 0$

the negative function W^2_{11} in the second district depends from q_1 (analogously in the first district for variations of q_2);

vi) $\quad \dfrac{\partial W_{22}^1}{\partial q_2} > 0; \quad \dfrac{\partial \partial W_{22}^1}{\partial \partial q_2} < 0$

and considering the following equalities:

vii) $\quad \dfrac{\partial W_{22}}{\partial q_2 *} \dfrac{\partial q_2 *}{\partial q_1} = 0$

16

W_{22} of the second district is not dependent from variation of q_1 in the first district;

$$viii) \quad \frac{\partial W^1_{22}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1} = 0$$

W^1_{22} is independent from q_1 (for giving value of q_2*[17]);
and with

$$ix) \quad \frac{\partial q_2}{\partial q_1} \underset{<}{\overset{>}{=}} 0$$

Considering the SWF W_{11} in the (16) and deriving w.r.t. q_1, it is possible to obtain:

$$(19) \quad \frac{\partial W_{11}}{\partial q_1} = p_1 + \boldsymbol{l} \ p_1' q_1 + \boldsymbol{l} \ p_1 - (1 + \boldsymbol{l})(\boldsymbol{b} - e)$$

where $S'(q) = p$.

From (18) and considering the (19) it is possible to obtain the price-marginal cost function (PMC):

$$(20) \quad \frac{p_1 - (\boldsymbol{b} - e)}{p_1} = \frac{\boldsymbol{l}}{1 + \boldsymbol{l}} \frac{1}{\boldsymbol{h}_{p1}} + \frac{\boldsymbol{x}}{p_1}$$

where

$$(21) \quad \boldsymbol{x} = -\frac{[(1 - m1)(\frac{\partial W_{12}}{\partial q_1} + \frac{\partial W_{21}}{\partial q_2} \frac{\partial q_2}{\partial q_1}) + m1 k \frac{\partial W^2_{11}}{\partial q_1})}{m1(1 - k)}$$

or also

$$(22) \quad \boldsymbol{x} = \frac{(\frac{\partial W_{12}}{\partial q_1} + \frac{\partial W_{21}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1}) - \frac{\frac{\partial W_{12}}{\partial q_1} + \frac{\partial W_{21}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1}}{m1} - k \frac{\partial W^2_{11}}{\partial q_1}}{(1 - k)}$$

For simplicity I introduce the factor *a*

$$a = \frac{\partial W_{12}}{\partial q_1} + \frac{\partial W_{21}}{\partial q_2 *} \frac{\partial q_2 *}{\partial q_1} > 0$$

i.e. the marginal variation of q_1 over the co-operative SWF W_{12} is greater w.r.t the inverse marginal variation of SWF W_{21} in the second district[18]. It is possible to obtain:

$$(23) \qquad x = \frac{a - \frac{a}{m1} - k \frac{\partial W^1_{22}}{\partial q_1}}{(1 - k)}$$

It is necessary to verify, then, if $\xi \geq 0$ or $\xi < 0$ w.r.t the following cases:

a) $k = 0$

b) $k > 0$.

The a) and b) cases are important in order to understand if, in a decentralised context, the presence of externalities is a critical factor that accounts for the optimal second best prices *à la Ramsey*.

Hypothesis a)

$k = 0 \implies \xi < 0$

From equation (23) is simple to draw $\xi < 0$.

Hypothesis a) stresses that the absence of externalities in the system represents a better optimal equilibrium for prices, in this regulated system with decentralisation.

Hypothesis b)

$k > 0 \implies$ either $\xi < 0$ or $\xi \geq 0$

Under this situation it is more difficult to ascertain if the externality limits the Ramsey optimal price equilibrium. The Proposition 1 fully applies here.

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[17] I do not consider intertemporal interdependence.

[18] In particular it is assumed that, for whatever sign of the function $\frac{\partial q_2}{\partial q_1} \gtrless 0$, the impact of q_1 (q_2) over the co-operative SWF in the same district W_{12} (W_{21}) is greater than the impact on the SWF W_{21} (W_{12}) in the opposite district.

The critical value for k, such that the second best optimality is reduced, is obtained as it follows:

$\xi > 0$ for

$$k < \frac{1}{\dfrac{\partial W^2{}_{11}}{\partial q_1}} \, a \, (1 - \frac{1}{m1}) = K *$$

It is simple to note that the critical value for k, in the first district, depends on either the pro-autonomy or pro-co-operative political consent and on the second district welfare variation.

For k<K*, then, the second best optimality is negatively modified by the externality in the system.

For k>K*, instead, $\xi < 0$ obtaining a greater approximation to the second best optimal equilibrium (for some simulations over the value for ξ see the appendix).

3.2.2 Centralised system

In a centralised system it is necessary to refer to the following SWF:

(24) $W^C = (1 - \overline{m}) \, (W_{12} + W_{21}) + \overline{m} \, (W_{11} + W_{22})$

with $\overline{m} = \dfrac{m1 + m2}{2}$ the average of the two district political preferences.

Maximising the (24):

(25) $\max\limits_q W^C = (1 - \overline{m}) \left(\dfrac{\partial W_{12}}{\partial q} + \dfrac{\partial W_{21}}{\partial q} \right) + \overline{m} \left(\dfrac{\partial W_{11}}{\partial q} + \dfrac{\partial W_{22}}{\partial q} \right)$

it is possible to obtain, after easy calculus, the PMC function:

(26) $\dfrac{p * - [(\boldsymbol{b}_1 - e_1) + (\boldsymbol{b}_2 - e_2)]/2}{p *} = \dfrac{\boldsymbol{l}}{2(1 + \boldsymbol{l})} \left(\dfrac{p_1}{p *} \dfrac{1}{\boldsymbol{h}_1(p_1)} + \dfrac{p_2}{p *} \dfrac{1}{\boldsymbol{h}_2(p_2)} \right) + \dfrac{\boldsymbol{x}}{p *}$

with

$\boldsymbol{x} = \left(1 - \dfrac{1}{\overline{m}} \right) \left(\dfrac{\partial W_{12}}{\partial q} + \dfrac{\partial W_{21}}{\partial q} \right);$

19

$$\frac{\partial W_{12}}{\partial q} \geq 0; \ \frac{\partial \partial W_{12}}{\partial \partial q} < 0; \ \frac{\partial W_{21}}{\partial q} \geq 0; \ \frac{\partial \partial W_{21}}{\partial \partial q} < 0.$$

considering, for simplicity, $p* = \dfrac{p_1 + p_2}{2}$ (average of the prices in the two districts).

The Ramsey formula in the (26) depends on the number of districts considered in the model. Generalising it is possible to obtain:

(27)
$$\frac{p* - [\sum_n (\boldsymbol{b}_i - e_i)/n]}{p*} = \frac{\boldsymbol{l}}{n(1+\boldsymbol{l})} \left(\sum_n \frac{p_i}{p*} \frac{1}{\boldsymbol{h}_i(p_i)} \right) + \frac{\boldsymbol{x}}{p*}$$

with $\xi < 0$ for the hypothesis considered, obtaining a similar situation as hypothesis a) in the decentralised system.

3.2.3 Centralised and decentralised systems: a comparison

In order to compare the decentralised with the centralised system, it is necessary to consider:

Case 1 - Hypothesis a)
Identical districts, no externality
mi = m-i
k = 0

Decentralised system

In this context the PMC function for every district *i* is:

(28)
$$\frac{p_i - (\boldsymbol{b} - e)}{p_i} = \frac{\boldsymbol{l}}{1+\boldsymbol{l}} \frac{1}{\boldsymbol{h}_{pi}} + \frac{\boldsymbol{x}}{p_i}$$

where, for the a) hypothesis $\xi < 0$.

Centralised system

For the centralised system it is possible to obtain:

$$(29) \qquad \frac{p*-(\boldsymbol{b}-e)}{p*}=\frac{\boldsymbol{l}}{1+\boldsymbol{l}}\frac{1}{\boldsymbol{h}_{p*}}+\frac{\boldsymbol{x}}{p*}$$

Having considered identical districts such that p* = pi, it is possible to obtain a PMC function identical for every district, with no difference between centralised and decentralised systems.

Case 2 – Hypothesis b)
Identical districts, externality in the system
mi = m-i
k > 0

Decentralised system
According to the hypothesis the negative externalities brings, for critical value of k, an increase of the ξ factor, decreasing the second best equilibrium as obtained in the (28).

Centralised system
The centralised system does not present differences w.r.t the case where there is not externality, for critical value of k in the decentralised system. In this case the factor ξ is independent from the externality and the centralised system represents an optimal equilibrium w.r.t the decentralised case.

Case 3 – Hypothesis a)
Different districts, no externality
mi ¹ m-i
k = 0

Decentralised system
In this case the second best equilibrium depends crucially on the political component *mi* pro-autonomy.

$$(30) \qquad \boldsymbol{x}=a-\frac{a}{mi}$$

The factor ξ is a function correlated to *mi*. In particular, ξ increases with *mi*. This means that the political component pro-autonomy isolate the district not allowing for externality internalisation. This introduces distortions in the system moving from the second best equilibrium.

Centralised system

The centralised case depends on the component *mi* characterising each single district. In particular, the more are differentiated the *mi* w.r.t. the centralised average ($\overline{m}$), the more it is possible to have distortions in the system (see function ξ - equ. (26)).

The model stresses again the relevance of the districts' specific characteristics. In particular it investigates how important factors such as the districts' political preferences could influence and distort the outcome, when an integration policy is implemented.

Case 4 – Hypothesis b)

Differentiated districts, system with externality

mi **¹** *m-i*

k > 0

Decentralised system

It has been demonstrated that the factor ξ is really dependent from the negative externality and this could modify and distort the second best equilibrium. How seen for case 3, ξ depends on the pro-autonomy component. Indeed ξ increases with *mi* modifying such a second best equilibrium.

Centralised system

The centralised system presents characteristics similar to the case 3 above. The centralisation presents "better" second best equilibrium w.r.t. the decentralised one because of the internalisation of externalities. Such centralisation is a best policy if there are not large differentiation between the districts considered in the system.

3.3 Comparative analysis

In order to compare the main results obtained in the previous sections, I introduce the following table, for all the cases considered.

Tab.1	mi = m-i identical districts		mi ¹ m-i different districts	
	K=0 No externality	**K>0** Externality	**K=0** No externality	**K>0** Externality
System				
Decentralised	$\xi < 0$; PMC $\Downarrow$ (1)	ξ depends on the critical value K*. a) for k<K*, PMC $\Uparrow$ b) for k> K*, PMC $\Downarrow$ (3)	$\xi < 0$; PMC $\Downarrow$ (5)	ξ depends on the critical value K* as for (3). (7)
Centralised	$\xi < 0$; PMC $\Downarrow$ (2)	It does not depends on k $\xi < 0$; PMC $\Downarrow$ (4)	Distortions introduced by very differentiated *mi* (6)	It does not depends on k. It depends on *mi* differentiation (8)

It is possible to consider the following cases:

1. case (1) presents characteristics similar to the (2) without externalities (k=0) and for identical districts (mi=m-i);

2. case (3) is more uncertain than the (4) because of the externalities (k>0);

3. the cases (5), (6), (7) and (8) depend on externalities and districts differences (k>0 e *mi ¹ m-i*) with the following specifications:

    3.1. *mi* distribution around the average

        3.1.1. case (5) is similar to the (6) for k=0;

        3.1.2. case (7) is more uncertain than the (8) for k>0

    3.2. with very differentiated *mi*:

        3.2.1. case (5) is greater than the (6) for k=0;

        3.2.2. cases (7) and (8) are more difficult to compare for k>0.

4.Some considerations on the italian LPUs evolution

It is interesting to analyse the model, by far introduced, referring specifically to the italian LPUs evolution.[19].

The italian LPUs evolution represents a relevant case for a simple application of the model I have rationalised in this paper. Summarising, the model treats both the political support to the LPA in order to give more or less flexibility to the local LPU in a certain district, and the process that gives to the LPU more private goals allowing to find outside the districts economic opportunities. The more flexible is the relationship with the LPU, the less is the negative externality that the district has to sustain.

The privatisation and liberalisation process in Italy has, certainly, both the above relevant variables. I try, now, to bring together the main results obtained with the model, delineated in the above sections, and to see if they are relevant to explain some of the crucial variables for the italian LPUs case.

4.1 The political variable

I really think that the political variable is a relevant one in explaining the evolution of the LPUs, specially in Italy. The political/administration decisions are crucial in defining the evolution between the LPA (in this case the municipality) and the LPU. The italian system is still characterised by a relevant public ownership of public utilities even where such utilities have been transformed into limited companies (the majority of stakes is public ownership). Another characteristic is the responsibility that the LPA has with the local community for the services provided. For this reasons Contract of Services have been introduced and these represents, together with more specific normative for some services, important commitments for the LPUs.

Following this reasoning, the nature of the relationship between LPUs and LPAs could be summarised as it follows:

1. the LPAs have a complete control over the LPUS, according to the classic vision of public firm. In this case the citizens have certain preferences over the services provided and these preferences are expressed politically by supporting a certain political coalition. The LPU provides services taking into consideration the potential demand by citizens, such as imposed by the LPA.

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[19] Interesting is also the german case with the Stadwerke.

2. The LPA-LPU relationship could be more flexible. Also the relationship with the citizens changes in this situation. In this case the LPU sees the citizens more as a consumers of its services referring more to the effective demands than to the potential demand, instead, as in the previous case. The LPU's activity is more private in the aims and regulated by Contract of Services imposed by the LPA. Of course important is to consider the degrees of freedom in such Contract of Services. In some cases such Contracts are very rigidly filled and imposed by the LPAs.

3. In other cases, such Contracts are more flexible and the LPA leaves more discretion to the LPU. There are example where is the LPU that proposes the Contract of Service and the LPA, in a second time, approves it. The LPU is then more autonomous in its choices and the LPA just require some minimum standards for the services provided.

The above three cases describe possible models of linkage between LPA and LPU derived from the restructuring of the sector. From a situation where the LPU refers to the LPA as a demand actor to a situation where the consumers, more than the citizens, is the main important actor to refer to. There also cases (and these are not unlikely), where the LPA-LPU relationship is more flexible and the LPU has more degree of freedom, if this assure a certain cash flow to the local authority. According to Italy it seems (but we still are in early stage to suggest a definitive interpretation) that the LPUs have more flexibility and independence w.r.t. the LPAs commitments but the LPUs are really considered important actors for the financial needs of the LPAs.

The political influence is relevant but, in order to understand it, it is necessary to consider both what are the main aims for the LPA and at what stage of evolution is the privatisation process[20].

4.2 The LPUs evolution process

Together to the political implications is important to consider at what stage is the LPUs privatisation and liberalisation process.

The general sector normative[21], together with more specific ones, do have really started a dynamic process for the LPUs' sector.

It is not the point, here, to stress in more details the characteristics of such evolution but it is necessary to summarise the following points:

- important changes in the ownership structure for the LPUs, evolving toward limited company with, usually, public ownership of the majority of stakes;

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[20] See Danahue (89) for more discussions.
[21] For example in the energy, water and waste management sectors.

- more efficient and productivity services provided; medium and long-run investment plans and decisions; more qualified employees;

- more customer oriented strategies for the services provided paying more attention to the relationship with the customers, diversifying the services provided and stressing the fidelity of them[22]; development of more different activities w.r.t the previous public utilities traditionally supplied[23];

- the dynamic process started with privatisation and liberalisation, together to the economic opportunities in other markets, have pushed the LPUs firstly to reinforce themselves in the district and secondly, to look for new alliances and partnerships outside their district[24].

The above issues stress, in few points, the evolution of the LPUs toward more competitive and liberalised markets than in the past, partly transcending from the traditional link with the district. Generally speaking it is possible to affirm that there has been evolution from a situation where the number of relationships were limited – the main relationships were between the LPAs and the LPUs, the LPUs and suppliers (generally monopolies – as in the energy sector), and the LPUs (usually local monopoly) with their user/citizens – to a more complex situation. The latter characterised by relationships between a greater numbers of agents (multi-agents system) in a more liberalised market for these utilities.

5.Conclusions

The main issue of this paper is to investigate on the dynamic evolution of the LPUs. In particular I have considered two relevant variables for the LPUs' sector: the political preferences and the negative externality.

The negative externality derives form a situation where there are lost economic opportunities for the local community not to open to outside-its-district advantages. The political component, instead, focuses on the political support for such an openness toward other districts. Analysing only two possible variables, more simple has been the model developed in the previous sections. It has considered a SWF and the relationship existing between the LPU, the LPA and the political preferences expressed by the citizens/users in the system. It has been possible to find, then, a second best equilibrium modified by negative externalities and by political pro-autonomy and pro-co-

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[22]See for more details Di Domenico *et al* (2000).

[23]Such as, for example, the new telecommunication services.

[24]Let us mention, for example, the alliances in the energy sector-purchasing of gas, production of electricity-, partnerships with actors having the necessary Know how in the telecommunication sector, alliances with other LPUs in order to increase the number of customers served, and so on.

operative preferences. The exogenous political preferences, in this model, is related to the Political Economy theory that consider the relevance of the bureaucracy and the political behaviour of agents[25]. In particular, this theory stresses how the political behaviour of agents really matters for the general equilibrium of the system.

The political preferences have been considered in the model and, together to the presence of externalities, it has been demonstrated how the second best equilibrium is modified according to such political preferences.

The policy implication derived from the main results of the model stresses the importance of the economic opportunities outside the original district for the LPUs. Opening to the market, though, it is not always associated with an increase of the SWF for the local community. The welfare implications depends also on the political preferences by those local citizens.

The analysis in this paper tries to rationalise only one of the possible alternatives: the more efficient equilibrium obtainable by the single district when external-to-district economic opportunities are sought and implemented.

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[25] Voters, parties, election and so on. See Nannicini (1999) for a brief summary of such theory.

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APPENDIX

In this appendix some simulations for possible values of the function ξ (eqn.23) with $mi \in [0,1]$ have been investigated. For this reason, it has been considered arbitrary values for the parameters k, a, $(\P W^2{}_{11}/\P q_1)$.

Fig.1

x £ 0
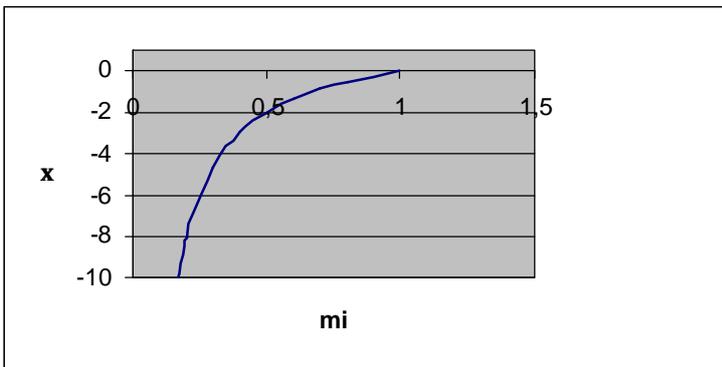
a=0,1; k=0,1 $\P W^1{}_{22}/\P q_1$=-1E-11

Fig.2

x £ 0 for mi £ 0,5
x> 0 for mi > 0,5

a=0,5; k=0,5; $\P W^1{}_{22}/\P q_1$=-1
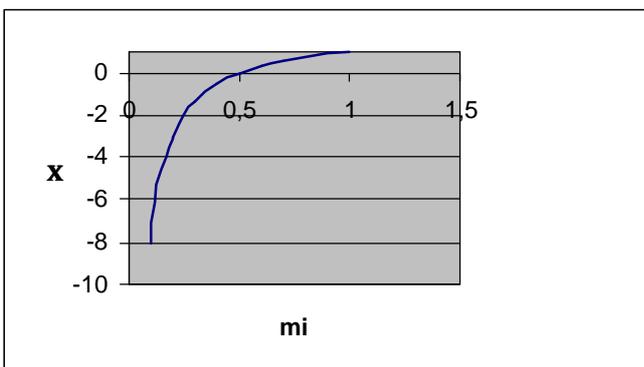
Fig.3

x > 0 for mi > 0,5

x £ 0 for mi £ 0,5

a=0,1; k=0,1 ¶W$^1_{22}$/¶q$_1$=-1
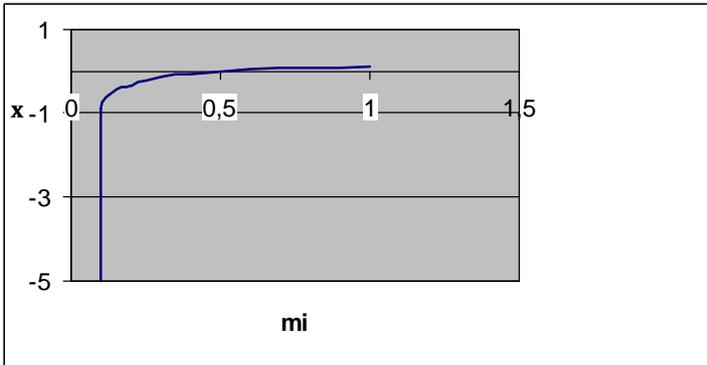
Fig.4

x > 0 for mi > 0,15

x £ 0 for mi £ 0,15

a=0,1; k=0,5; ¶ W$^1_{22}$/¶q$_1$=-1

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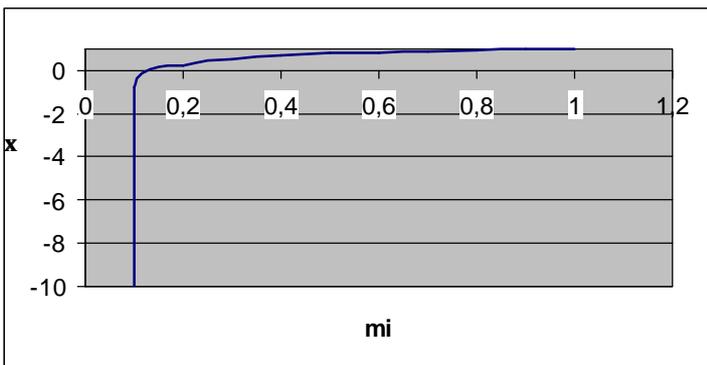
Fig.5

$x > 0$ for mi $> 0,1$

$x \pounds 0$ for mi $\pounds 0,1$

a=0,1; k=0,95; $\P W^1_{22}/\P q_1$=-1
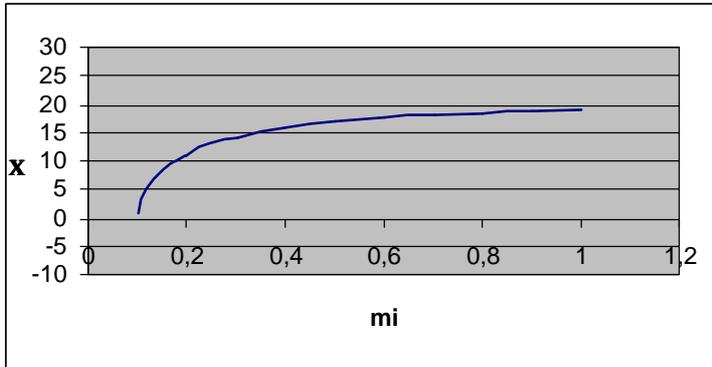
The above figures illustrate only some of the possible cases for different values of the parameters.

1. Fig.1 represents the variable x functions of *mi* (political support pro-autonomy). For high infra-districts dependence (factor $\P W^1_{22}/\P q_1$) associated to a limited impact of the externality in the system (*k=0.1*) the variable x assume always negative values.

2. Fig.2 represents a system with high externalities. This is the case for positive values of x when *mi>0.5*.

3. Interesting are Fig. 3, 4 and 5 where, for identical values for *a*, $\P W^1_{22}/\P q_1$, different values for the externality have been considered (*k=* 0.1, 0.5, 0.95). In particular, a comparison between the graphs highlights the fact that x is positive for higher values of the pro-autonomy parameter *mi* but associated to lower level of the externality factor *k*. Indeed Fig.3 shows x>0 for *k=0.1* and for *mi>0.5*; Fig. 4 shows x>0 for *k=0.5* and for *mi=0.15*; eventually Fig.5 shows x>0 for *k=0.95* and for *mi>0.1*. In conclusion the function x is positive (distorted *second best* equilibrium) for high value of *k* (externality) associated to low values for the parameter *mi*. This is equivalent to say that with high externalities also a little pro-autonomy political preference introduces more inefficiencies in the system.