The "Programming Approach" and Urban Economics

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Abstract

1. Premise

In some recent works of mine[1] I developed the concept of "*optimal centrality*" as the pivotal point of a "strategic" urban policy. The concept of optimal centrality has emerged as the meeting point (or trade-off point) in the fulfilment of two permanent objectives of urban theory and management,[2] but by their own natures highly conflicting:

1. the fulfilment of a high quality of urban life, related to the intensity of superior services and to the maximisation of work, recreational, social, cultural, and etc., opportunities; and so demanding a higher concentration and density of activities;
2. the fulfilment of a sustainable pressure and a minimal impact of those activities on the environmental resources (atmosphere, water resources,

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[1] See Archibugi, 1995a and b; 1997a and b.

[2] At least in the urban theories and management today, but anyhow also present – *mutatis mutandis* – even in the urban planning of the 19th century and in the first half of the 20th century. See for this Archibugi, 1995c.

soils, urban and natural landscape, heritage buildings, etc.) that are always at risk of an overloading from pollution, congestion, social imbalances and deviance, poverty, lack of social communication, etc.

In a research conducted under my scientific co-ordination on behalf of the European Commission, we proceeded to identify the ways through which measuring the thresholds of the "city effect" (in the purpose of programming and controlling the application of the first objective) and the thresholds of "environmental overloading" (in the purpose of programming and controlling the application of the second objective).

On the basis of the exploration for appropriate indicators, and of their experimentation within the current reality of four European countries[3], in that research we have proceeded to design some guidelines of a policy at a European scale to be adopted at any decisional level (city, city networks, regions, states, and even European Community) for trying to achieve and/or conserve the thresholds of "optimal centrality".[4]

In the course of the research, the emerged concept of "optimal centrality" has recalled, of course, a classic theme of urban and regional economics – that of the optimal city size. For this reason it is opportune to examine with more clarity which relations can subsist between the "classical" approach (to be true, "neo-classical") of urban economics and the research approach in question as outlined above in brief. This paper is aimed toward this clarification.

Retracing critically – but very succinctly – what I believe is the essential path of urban economics in this limited field, I will try to highlight what is common, and what on the contrary is divergent in the two indicated approaches.

On the optimum size of cities - if it exists, first of all - and what conditions determine it, there are dozens of theoretical analyses which have added up to a very vast literature which I have no intention of summarising here[5].

I would only like to point out here a question of approach to the problem of optimal centrality, which we are dealing with. And such a

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[3] The four countries involved with four different themes in the research are: France, Germany, Italy, and the United Kingdom.

[4] The research findings are illustrated in the report presented to the Commission (Archibugi, *et alii*, 1997b) which is forthcoming in publication.

[5] Among the first systematic studies there is the well-known contribution by Alonso (1971). Other contributions are in Neutze (1965-68), Evans (1972), Richardson (1972), Knox (1973). See also the more recent approaches in Bullinger (1986) and Begovic (1991).

question deserves a brief clarification, even at the cost of a little deviation from our line of reasoning.[6]

2. The Operational Problem

First of all, I wish to emphasis that the explanatory or interpretative models of the urban phenomenon, and in particular those connected to the "positive" identification of the optimal city size[7] - models which aim at the definition of the existence of a city, or of the city agglomerate, "equilibrated" or "optimal" - have little pertinence to our problem. In fact, admitting, although not completely accepting, that they can be useful for understanding urban organisation *for what it is*, as it manifests itself to us, it is likewise our opinion that they have little usefulness - given the *operational*[8] problem with which we are faced today - to determine *what should be* the optimal urban dimension.

A first general remark is, exactly, that the research of the optimal city size in urban economics has been poorly dealt with in operational terms (even if many people could be of the opinion that it would not be difficult to transform the theorems of urban economics into operational terms).

First of all, we must be precise that the word "operational" is used here in its usual sense employed today in operational research, with the meaning that a problem becomes "operational" when a multiple number of possible solutions is conceivable, among which one is selected as "optimal" in relation to a preference function previously prescribed.

To the extent that such a definition is accepted, two things become essential: a) the system must have open goals; and b) a defined preference function must be formulated.

But we can also understand the use of the word "operational" in other senses as well: 1) in the meaning that only *observable* concepts are used, for which empirical correlates may be determined (in a particular context on the basis of various possible existing or potential statistical sources),

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[6] The line of reasoning is that followed in the course of research which we have noted above. See again Archibugi 1996a and b, and 1997a.

[7] Whatever the complexity, and relative sophistication, of such models, based on an abstract or "theoretical" behaviour of the subjects: individuals-families, companies, collectivities, states, etc.

[8] I consider it superfluous to recall what the operational problem means as developed in operational research. I would recommend, however, its critical vision as sustained by the methodological "rethinking" developed within the category of practitioners and academicians of Operations Research (see particularly the paper collected by Tomlinson and Kiss, 1984).

which we will call *indicators*; 2) that the method of reasoning is *quantitative (or also qualitative, but in some way measurable quantitatively)*, in such a way that the planners and (on the basis of their work) the political decision-makers are helped in the process of the formulation of coherent and feasible plans and programmes.

This first observation, even if it doesn't cleanly mark the difference between the two approaches, must be kept in mind when we will conclude – in the final section – about a "programming approach" for the optimal city size.

3.   The Poor Meaningfulness of Interpretative Models

A further observation concerns, on the contrary, the same meaningfulness of the interpretative models, based on a process of sophistication that nullifies, as far as it proceeds, this meaningfulness.[9]

By "sophistication" of the reference models we mean the procedure of reasoning, usual in neo-classical economics, which starts from functions (models) that are simple, rich or loaded, with "assumptions" (concerning both the number of variables in play, and their dynamic stability which is expressed in the well known expression "ceteris paribus"), then gradually "release" (or disengage itself from such assumptions, by introducing new variables and new relations. Relaxations and extensions which - as it happens - are always introduced in the name of "greater realism".

Taking for example a procedure which is pertinent to the regional and urban economy[10], we can summarise it in the following stages or steps:

A.   Start from a simplified function, of a single object (let us say the household) which chooses its place of residence. It is supposed (and/or taken for granted) that this choice takes place on the basis of certain factors. An attempt is made to classify such choice factors in an exhaustive way and it has been proposed that these are included in the following four categories: 1) accessibility (to goods and services); 2) space (habitational area of the land or dwelling); 3) environmental amenities; 4) distance from the town centre; and that this choice has two constraints: a) budget and b)

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[9] This is a general statement we can consider valid for the most of theories of (so called) "neo-classical" economics. For an critical application of the statement to other theories of the regional science, see Archibugi, 1993.

[10] And which corresponds to a large amount of the evolution of "regional science".

time available11. Already, such selection (but also any other) of factors and constraints implies an assumption: that these are exhaustive.

The function-model which derives, must rest - from the start - on a series of assumptions[12]: **[1]** that the referred to urban area is monocentric; **[2]** that there is a relatively important radial system of transport; **[3]** that the territory is flat. Other assumptions necessary for such a simple model will be: **[4]** that the family (but obviously all other institutional subjects that later will be introduced) intends, to *maximise its function of utility* (in a way subject to the constraints of budget indicated), understood as the sum of goods and services to which access is possible (apart from the territory, because otherwise the whole pack of cards of spatial economics would fall!) and, to *maximise the consumption of territory* (for example, the size of the residential lot), which implies that the *function of utility is continuous and growing* with any increase of the above-mentioned consumption (goods and services and residential space), which is not always a valid assumption; **[5]** that there is an *ever-increasing cost for transport*, etc.

B. But then, such a model (defined as "basic") may be made more sophisticated, relaxing it from the assumptions of the few variables on which is has been organised: for example, introducing into the model **[6]** *the "time" factor* (cost in commuting time)[13]. In such manner, the maximisation of the utility - by the single household - becomes subject also to access times constraints. Therefore there can be introduced **[7]** the *"structure of the household" factor*, which - while assuming supposed "rational" behaviour - may also make possible, behaviour that is very divergent whilst in the same preceding framework of functions (by structure, for example, as variables to take account of, the *number of components* and the *number of active persons* who work in the family)[14].

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[11] Here we are at the earliest stages of the theory of localisation (Loesch, Isard, etc.). The classic and most familiar version - founded in fact on these hypotheses of factors and constraints - is that constructed by Alonso (1964).

[12] As does in fact the basic model to which we have referred (Alonso, 1964).

[13] This extension has been discussed by a great number of authors; it is particularly dealt with by Henderson (1977). By some the basic model, extended to include the time variable, has been augmented by the introduction of multiple forms of transport (see LeRoy and Sonstelie (1983).

[14] This sophistication - that we encounter very often in the literature - seem to have been treated first by Beckmann (1973). In any event, no scholar of "urban economics" exists who has not noted (in the reality of his personal experiences, "American" or "European") how numerous within the family are the generational conflicts regarding the preference to live in the centre of the city or in an "affluent" periphery.

C.   Thus, to the "basic" model (concerning the behaviour of each single household) is added the more "realistic" circumstance that the household is never alone in deciding a localisation, but in fact *competes* with all the other households: for this reason the concept of "competitive equilibrium" in land use is introduced, which refers to the fact that the decisions (theoretical and rational as supposed) of *all* households, taken under the constraint of a given curve of land rents, must be mutually coherent and compatible; and in particular that there are the conditions for equality between the supply and demand of land use. And, since the balance between supply and demand does not seem necessarily to be a desirable condition, although indispensable, the concept of *optimal allocation* of the land use still needs to be defined.

        But, already the condition of equilibrium of the territory assumes the concomitant presence of *other* particular conditions (thus of other assumptions) which alter the validity of the starting model: for example **[8]** the *perfect information* of all the operators (households and owners) of the land rents in the territory itself (in our case the city). Furthermore: **[9]** that *no participant*, or selected group of participants, *may exercise a monopolistic power*. As an alternative it should be assumed that each operator will receive the land rent in the city *as given* (which constitutes a further assumption).

D.   But this is not enough. Subsequently, the equilibrium model, in order to function, needs to choose between two other cases: **[10]** if it is applied to an population "exogenous" to the city, (for example the model itself could be called the *closed-city model*), or, **[11]** if it is applied to a population (households), of the city which are free to move without excessive expenses within the confines of the city itself (*open-city model*)[15]. Furthermore, some other important variables which condition the functioning of the model (and which link in particular with the two preceding ones but obviously interfere also with all the others) are **[12]** if there is a case of *absent land ownership* or **[13]** of *public land ownership*[16]. In the first case - still with the assumption that all households are similar - the assumption is in force that the supply of bid rent varies in a decreasing proportion to the distance from the centre. In the second case, the possibility is introduced that the determination of the supply of rent is not

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[15] It seems that the definition of "open city" was introduced by Wheaton (1974).
[16] The public property model was introduced by Solow (1973), and has been largely dealt with in works by Kanemoto (1980, 1987) on the "theory of urban externalities", which we will come back to later.

the individual utility of the landowner but an undefined "public utility". By itself, this hypothesis renders insignificant the entire construction of a model of this type, even if it obviously does not dismantle its intrinsic logical-mathematical consistency (which draws on other factors, which, however, have nothing to do with the object of the urban economy).

In any case, because of the presence alone of this possible extension of various hypotheses, which follows a sought-after "realism", there arises a "casuistics" of crosses between assumptions which multiply the formulations of adaptive models (which are called, euphemistically, "refinements").

E.   But, even if the equilibrium is assumed to be possible - at the condition of respect for the set of assumptions and/or specification or "casuistics" above mentioned - the analysis continues to be made more sophisticated through other cases or hypotheses.   Leaving aside the hypotheses that are being born from alternative *objective functions*[17] (that are obviously the basis of measurement for the *optimality* and that would be valid, even in any case of a *decisional model*, of which we, again, will come to below[18]), we recognise that the land use equilibrium can even be influenced by other parameters (and parameter changes) as such: **[14]** *agricultural rent*, **[15]** *population*, **[16]** *household income*, **[17]** *transportation costs*, **[18]** *estate and land ownership taxes*, **[19]** *zoning*. How could we forget these elements within our model?

But, to take account of these elements terribly complicates the calculation. If the intervention of these other factors are analysed, one by

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[17] But, in this case, we enter into another general problematical area which is extended much beyond the objective function of the location: that of the validity in itself of a "social welfare function", has been theorised by modern "welfare economics". Without even lightly touching on the general problem of the "social welfare" (for which we would refer the reader to the positions taken by Frisch or Johansen that we consider to be definitive) in this setting, some critical adaptations of the welfare economic theorems to the case of the urban economy deserve to be remembered (always in the ambit of the path with which we are occupying: the recurrent sophistication of the models of the spatial/urban equilibrium). In fact, while in welfare economics the social welfare function is considered as the sum of the utilities of the individual households (but even in this case with the assumption of a sum of identical households) in the spatial/urban economics, the utility levels (and therefore of social welfare) of household, even identical, are dependent on the locations and this produces "an unequal treatment of equals". Supposing, as is obvious, to choose a objective level of utility (or welfare objective function), and that this be chosen regardless of the different household locations, then the instruments (for instance taxes or subventions territorially motivated) are found according the cases if the households utilities are at a higher or lower level than the predefined objective level.

[18] See section 6, below.

one - while the model keeps its simplest form or while the extensions are also dealt with, one by one - it is possible to achieve a theoretical configuration that in some way is effective, although abstract. But if all of these variables enter the field simultaneously, a free-for-all is created of which we cannot assure the governance, even through the most advanced and potent of the analytical and mathematical formulations and formalisations.

F.   Despite all of this, the reality is still *much more complex* then described above, and it escapes any effort to capture it easily within a web. With all of the variables introduced, we have worked with the assumption (in this case it would be more correct to call this a premise or postulate) that all individuals or households be of only one type: all similar and of similar behaviour (a postulate that is also less realistic).

In this way, it restarts from the beginning toward the introduction of the model and in its formalisation of the, **[20]** *typological multiplicity* of the decision-makers.[19] The function of the "bid rent" of the household type has been displayed according to a "curve" of the same bid rent based on testing (as in the case of the unique subject) the existence and uniqueness of the equilibrated and optimal land use.

However, all this has required other assumptions, for instance that, **[21]** of *bid rent functions are ordered and obedient*. The problem seems to be only by itself, mathematical[20]: at which (formal) condition, the bid rent function, and the related lot size function, can be acceptable as determinants of locational choice, and in this way, of the theoretic validity of the model?[21]

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[19] And we are still, and uniquely treating of the institutional decision-maker, "*household*". But, as we have already said, there are also institutional decision makers, "firms" and "state (or government)" that, even within themselves, are not always equal and of equal behaviour.

[20] On this point, see Chapter 4 of the work of Fujita (1989) and Fujita and Smith (1987).

[21] But here, the demand emerges again: if the theoretical validity of the model (even in itself!) is so difficult to achieve, and only on the basis of very complex mental and formalistic acrobatics, what can we say about its practical validity? And, at the conclusion of this path, emerges another demand: are we aware enough of the point to which we have arrived, dragged only by this mental exercise? We are pushed to ask ourselves if it would not be more reasonable (even if terribly counter-current) to invoke a return to a critical Kantian spirit against what manifests itself as a real meta-physics of the urban phenomenon; against a theory on the basis of which we build models without any capacity to be quantified and that seem good only for academic exercises useful only to exercise the minds of students through mathematical equation solutions (only symbolic) but certainly with scarce operational utility.

G.   The desire, in any event, to fix the law of development of land use on the basis of theoretical assumptions related to the subject behaviour[22] has not stopped here. In fact, the reasoning coming from the behaviour of the household and firms with respect to land use and locational choices has assumed a enormous quantity of hypotheses and simplifying assumptions all founded on that assumption (quite abstract and unrealistic) of only one "centre", in a world without competitive centres. It is the *monocentric* hypothesis. In such a way, it has been obligatory also to introduce the principle of spatial aggregation by itself, or of the "city function".

Here the theory of urban economics approaches our problem a little bit more. An explanation of the city through the principle of the economies of scale and the externalities produced by it has begun. In relation to what? Who knows! In relation to the *non-city*[23] or - more reasonably - to a range of many possible and effective centres of different sizes that produce economies of scale and different externalities: so that we have a curve of economies of scale and externalities for each type of cost and benefit taken into account (or in other words, we have as many curves as we have types of costs and benefits taken into account.)

From a substantial point of view, this side of the path of "regional science" approaches, as we have said, the problem of optimal centrality as we have posed it. But, even here, it is necessary to clarify in which sense and with limits this connection could be acceptable[24].

4. A Standard Theory of the Agglomeration and of the Urban Size

The standard theory of the advantages, or benefits, of agglomeration tend to group such advantages in the following categories:
1. advantages in the field of available resource and transport
2. economies of scale

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[22] Right now, we have spoken about households, but the same criteria could be applied to other subjects such as firms, or the state or government, albeit for the last there are behavioural problems and choice problems and thus decision making problems that are much more complex, based on objective functions much less simple regarding those of the institute, household or firm; problems that are less psychological and more sociological.

[23] In fact, a good deal of abstract reasoning or modelling of this type has used, antinomically, the concept of "country": but, is it reasonable, today, to think in the western countries about the existence of a "country" that is not part of the city function?

[24] Which means a clarification of the way the optimal centrality is conceived in the "regional sciences" and in "Planology". For a more extended examination of the relationship between "regional science" and "Planology", see (Archibugi, 1993).

3. externalities and costless interactions
4. the variety of choices in consumption and production

Each of these categories constitutes, for the theory of urban economics, a component of the "urban function". Normally, such advantages are counterbalanced by the disadvantages or costs that the urban agglomeration produces in terms of *time and nodes of accessibility*, and thus, in terms of *transport costs*. One of the more current assumptions is that the transport cost increases proportionally to the commuting distance between residences and the "urban" central place.

Usually, it is assumed that the presence of *localised natural resources* (minerals, natural harbours, natural beauty, etc.) favours (but, it would be better to say that it favoured, in the past) the formation of urban agglomerations. We cannot ignore, in fact, that by now - in front of the pre-existence of cities in the urban structure of the territory (and this is valid overall for the western countries but it is also valid for those non-western countries that have new territories to develop) - these factors are strongly superseded by *other* factors, most importantly the simple fact of *urban pre-existence*; and their (natural resources) impact has almost completely vanished.

The *economies of scale* (in consumption and production) are, instead, the most important factors. And, it is well known that such economies of scale pertain, essentially, to the indivisibility of certain exchanges of goods (persons, residences, factories, infrastructure, public utilities, etc.). The indivisibility of persons produces a labour specialisation; and the infrastructure cannot be used effectively if not on a large scale. The efficient co-ordination of many specialised persons, of infrastructure, and of production processes requires the proximity of all such factors, always improved by communication services and helped by the savings in transportation of products and raw material. From all this, it follows that the median, comprehensive, production cost of a good will be less to some extent if it can be obtained on a large scale and within contiguous localisations. And, even the relationship of productive "interdependencies" between different sectors can give advantages through the proximity of the productive process. Furthermore, even many public services (such as schools, hospitals, electricity, water, gas, and other utilities; and even roads) are factors that are susceptible to economies of scale.

Even the "*technological externalities*" represent an important urban function. It is a matter of advantages that are collected without paying a price. And, the same is true for those intangible externalities that come from the larger quantity of cultural and recreational exchanges; in a word from a higher social interaction that the scale of the city offers.

Finally, *the variety of opportunities and choices* that the scale of the city offers, is another important and recognised factor of agglomeration. The higher freedom of choice produces (at equal price) a greater utility for consumers; and thus, a greater income (to the extent to which "utility" means "income": which it is not always wise to assume).

All of these "factors" of an increasing utility intervene in the production of an economically advantageous "*complementary effect*", which - along with others that are by nature also intangible and always more present in determining the behaviours and motivations of the users of the city - can be called, as we have done, the "city effect".

In urban economics more in-depth study, of course, has been tried regarding the city size under the profile of the functions of economy of scale and externalities. For simplicity, we will speak only about *externalities*.[25] And, even in this case, the use of the expressions certainly is not satisfying if we do not also clarify the reference framework of the analysis.

Indeed, since the institutions of the economic system are (from the point of view of modern system analysis) *interdependent*, what is an "externality" for one institution can be an "*internality*" for another. This fact is often neglected in the use of the expressions, neglecting also, in this way, to make explicit *from which (institutional) point of view* we are proceeding with in the analysis. Since we have internalities and externalities that are reciprocally both positive and negative, we well know that a positive externality from the point of view of a firm can be specularly negative for the household or for the community and vice-versa. But, it is not necessarily the case: we must see case by case. In fact, a *complementary effect* can occur which operates, not only for the benefit of the individual unities of each institution, but even between unities belonging to institutions that are not only by nature *competitive* as normally are those of the same institution (household vs. household, firm vs. firm, community vs. community) but even *conflicting* as happens to the unities belonging to different institutions (households vs. firms, and firms vs. communities).

Besides, even overtaking in a certain way, the logical semantic problem mentioned above, there continues to be even more substantial defects of approach in conventional urban economics. Even accepting that

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[25] The first functions can be distinguished from the last (in the Marshalian sense of the expression) with the fact the first are "internal" and the second "external" to the individual *firms*. This is less conceivable if the reference is made to the single unities of the *institution -household* instead of to the *institution-firm.* (The question becomes even more complex if the reference is made to the *institution-state, -government,* or *-community*).

it could be possible to set (and at the same time to solve) the problem making explicit the concept of *positive externality* (that we have called *city effect*) and the concept of *negative externality* (that we have called *overload*); and even taking care to make explicit the institutional point of view from which we are looking; until we have defined the *positivity and negativity thresholds* of the externalities, it will not be possible to confront the *operational problem* of giving an optimal size to the city. And, neither will it be possible to evaluate the policies of intervention or the corrective measures to restore eventual theoretical condition of equilibrium.

In such manner, operationally, we must define the optimal level of the city (always in conformity with the objective function that must be predefined as in any elementary scheme of operational research) at that level of urban goods for which it would be meaningful to research the *complementary effect* that we have called *city effect*.

In the abstract models of "explanation" of the city, for example, attempts have been made to introduce - as said above - the externalities.[26] But on this point, the concepts are not at all clear in the literature, and poor references are made to the contents and the empirical correlatives that we have called *indicators*. At this point, it seems to be very necessary to make a bridge between the urban economics and the empirical analysis of the indicators (and their relative selection).

5. A Programming Approach to the Definition of the Optimal Size of the City

At this point, in effect, we can pose questions to ourselves regarding the standard path of urban economic theory.

The first question is the following: given the current modelling[27] and taking into account all the "principles" of spatial economy, already

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[26] This problem has been the subject, in the literature, of several formalised descriptions: some general, others applied to single portions of territory or urban function. For the general formalised descriptions see, for instance, two essays of Papageorgiou (1978) and all the second part of the work by Fujita (1991) which includes numerous bibliographical references.

[27] A very well informed and critical illustration of the modelling developed by urban economic theory is in the second and third part of the work of R. Camagni (1991). Here, the models are grouped as follows: A. Static Model: a. "of continuous space"(those of which we have made a rapid schematic reference in paragraph 3); b. "of discrete space" (which are more adaptable for decisional modalities); c. "hierarchical". B. Dynamic Models: a. "aggregate models" (among them those macroeconomic and those ecological/biological); b. "disaggregate models".

abundantly elaborated[28], would it not be better (in the sense of more useful and more practical) *to start from objective functions or preference functions, based on the real conditions in front of us, and directly expressed by the decision makers*, without making a "theory" about them founded on abstract assumptions?

And obviously, all this should occur by adapting the procedure to the future decision-makers concerned (households, groups, responsible politicians); and by adapting it to the future environmental and spatial level at which such choices and decisions are applied (through programming, projecting, or planning).[29] This last approach, that I will call programming (or programmatic, or decision oriented, or planologic), marks a turning point in the traditional and mainstream approach in economics, which is an analytical/positivistic approach, since it legitimises this process only within the limits of an intellectual exercise which - if prolonged without critical spirit - becomes superfluous and without a way out, i.e. sterile.

This type of approach produces, what elsewhere I have been pushed to call (with a certain amount of roughness), the syndrome or neurosis of *casuistics*. Starting from elementary functions, people are induced - from their evident incapacity to represent reality in its complexity - to introduce even more numerous complications in the attempt to capture reality in its multiple manifestations and "cases". But, this process, by its nature endless, never will be able to give reliable answers. What is attempted, in effect, is to capture (or "explain") reality within interpretative models which try to give an account of *all cases* that have not been included in the

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[28] Even in this case, we recommend the illustration of Roberto Camagni in the first part of the already quoted work, which enumerates the "principles" (as he, very opportunely, called them, where others might use the improper term, "laws" and other, again, the even more improper terms, "factors" or "criteria") of spatial economy. Camagni's principles are listed as follows: 1. Principle of Agglomeration; 2. Principle of Accessibility (or Spatial Competitiveness); 3. Principle of Spatial Interaction (or Mobility and Contact Demand); 4. Principle of Hierarchy (or City Order); 5. Principle of Competitiveness (or Export Base). The modalities with which these principles are interwoven is not discussed, even if many models described later in the second part of the work (see preceding note) are strongly based on one and often more of the above principles. In reality, the effort to enucleate these principles from the spatial economy literature is an end in itself; it is didactic and taxonomic; and as such it is useful to put in order a literature that is somewhat in disorder. Toward this effort, we do not apply the reserves that we have pronounced about heuristic (and even less operational) capacity of the behavioural models which try to replicate the functioning of reality. The principles serve not to interpret reality (as the models claim to do), but only to classify the logical categories that govern the knowledge of reality itself; and no more.

[29] We mean choices and decisions on: the goods or services to consume, on times and ways in which to access such goods and services, on the places in which to develop activities, etc.

basic (simplified) model, until finally, the result is a proliferation of models, complicated and sophisticated, which are used only to decree, actually, the dissolution of every model.

Moreover, the tool of mathematics is, today, at our disposal to give to the language the aspect of a logical rigor in this endless and circular cognitive process, achieving the maximum scientific appearance with the minimum of operational utility and truth.[30] Two profound connoisseurs of mathematical epistemology and its applications to the social sciences and especially to economics, Frisch and De Finetti, irreverently have called this syndrome: "playometrics" (that De Finetti translated into Italian, "*Baloccometria*").[31]

The trouble is that in the evolution of economic thinking (and in the other social sciences), this syndrome is increasing, perhaps because of a scarce familiarity of the economic studies with the foundations of logic and philosophy; and it is not by chance that the most sceptical with regard to the theorems of the neo-classical economics have been precisely the mathematicians who have occupied themselves with epistemology.

Little attention has been given, in contrast, to the fact that the variables on which any function or modelling is based, in the economic and social sciences are variables relative to "human" behaviour subject to the liberty of evaluation and choice; i.e. behaviour unpredictable enough *ex ante* in positive terms, but determinable *ex ante* only in decisional terms.

In sum, in the social and economic sciences, the most important variables (on which all modelling is based) are those of the human preferences (of individuals, groups, cultures, nations, etc.). And, these preferences are determinable only as functions of value judgements, which change with time, and which it is possible to assume as effective *only in the moment* in which they are expressed and influence concrete decisions. It is doubtful that rational behaviour could be determined (by whom?) on the table through abstract hypotheses in the models, and it is doubtful that these choices can prejudice, in the decisional phase, the choice between alternatives that the models themselves put on the table.

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[30] "The utility of this model is purely theoretical and didactic by nature," the already quoted Camagni states (1991, p. 175), and he acknowledges that most recent contribution on these themes "are become often merely exercises of mathematical virtuosism." (ib., p. 176).

[31] For the special criticism of the conventional "econometric" approach by Frisch, see some specific contributions (Frisch 1964, and 1970); but for the general planological conception of Frisch, see his last, more meaningful contributions, posthumously published (Frisch 1976) and for the critical work of De Finetti, largely convergent (and in part referential to) with that of Frisch, see at least two works (De Finetti 1965 and 1969).

The structure of the variables in play, and therefore the structure of the models in use, must reflect - in the selection of the variables themselves, or in the selection of the relationships between those variables, or in the assumptions of the parameters on which basis are registered such relationships - the nature of the problems on the field; and must reflect, overall, the values on which basis the decision makers (of whichever kind and level) make their decisions, given the constraints that those values will represent.

From this, it follows that our problem of the search for an *optimal centrality*, albeit similar in its logical formulation to that of the search for *optimal urban size* developed in urban economic theorems, diverges from it strongly because it is taken for granted that the search itself will implicate the search of the welfare indicators not in the sense of possible variables of a *positive* analysis, but in the sense of possible variables of a *decisional* analysis. In such a way, they will be indicators which some hypothetical decision-makers must, in a certain way, select and apply in order to achieve the plan objectives.

The research work that we are designing here is not other than propaedeutical, and at the same time a proxy, of the decisional work. In other terms we prepare ourselves for that work in this decisional setting and phase.

6. The Major Research Operations to be Developed

Therefore, resuming the line of reasoning on the development of urban research aimed in its entirety toward the definition of an optimal centrality, we should dedicate ourselves, first, to understand and establish what are the constraints and conditions for some strategies and planning interventions (in any given situation) which would have the possibility of success in such a way: *to achieve an adequate centrality, and to acquire an adequate critical mass of users*.

Then, if the strategies and policies of decentralisation (for the greater cities) or those of centralisation (for the small and medium cities)[32] would be founded on the concept of optimal centrality, i.e. a feasible and

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[32] I refer to a concept evoked at the beginning of this paper and developed mainly in another book of mine on "The Ecological City and City Effect" (Archibugi, 1997), following which the greater cities suffer from the overloading and congestion effect and must be subject to a decentralisation strategy and policy; and the small and medium cities suffer from a lack of the city effect, and must be subject to a centralisation strategy and policy.

sustainable centrality, in the future of urban studies should be developed, first, the following basic operations:

1. *to go deep into and define (through appropriate indicators, whether qualitative or quantitative) what are the essential components that today provide and guarantee such optimal centrality, and what is the critical mass that can constitute an effective justification of it[33]*

Since each plumbing the depths of the centrality components – although it is not substitutable in a research aimed toward action, rather than toward the mere registration of past phenomenon – cannot but spring from a theoretical reflection, still even this deserves to be sustained by empirical observation. Urban studies should be oriented, therefore, even:

2. *to going deeper into and illustrating what are the essential components which today have provided – and are providing with evidence – the centrality, in a vast gamut of cases and urban situations.*

Once the collection of definition of sufficiently valid information and knowledge has been accomplished (via operations 1 and 2), the future urban studies should be further put to the test with:

3. *a joint and parallel exploration of the urban scenario situation in different countries with the aim of researching practically which solutions could be suggested for a reorganisation of the same scenario in a coherent way with the result of the research operations (of 1 and 2).*[34]

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[33] Obviously this "going deeper into" cannot be the object of factual analysis, but rather of conjectural analysis about what behavioural scenarios and lifestyles could emerge and dominate in the near future. Certainly it will be possible to base ourselves on factual analyses of urban situations in peculiarly dynamic environments, and with recognised function of leadership of the habits and socio-economic development. The most recommendable techniques to outline these scenarios is the expert's consultation (like the Delphi method, for instance) in different fields in which the urban life is expressed: from the educational services to that of health, culture, recreation, etc., which characterise mainly the life and urban quality. (For some more considerations on the research methods in the urban field, see Andronovich and Riposa, 1993).

[34] A first sketch of a rebalanced spatial system at a national scale (for the four countries of the above mentioned research for the European Commission: France, Germany, Great Britain, and Italy) has been elaborated as the conclusion of the research itself (see Archibugi *et alii*, 1997b) For Italy, one can find a further advancement of the proposal for a rebalanced spatial system, from the "Progetto 80" forward until recent years in the reprising work of F. Archibugi, 1999 on "Urban Eco-system in Italy". However what is

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missed in all countries is a territorial or urban policy at a national scale, permanently oriented to using the concepts and strategy of urban eco-systems and the research of an optimal centrality, as instruments of any form of direct or indirect intervention on the territory.

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