The Transformation of NMAs from Government Departments to Independent Organizations: An Economic Overview

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Abstract:This paper first covers the ground economic concepts that determine the Public Sector intervention concerning the collection and production of Geodata and its influence on the structure of the National Mapping Agencies (NMAs) and their regulation. And second, analyses the transformation in Europe of NMAs in entities with the legal structure of a private company, though still regulated by the Public Sector.

Keywords: information goods, regulation, market failures, National Mapping Agency, public corporations

1.- Introduction

The intention of this paper is to provide intuitive understanding of the economic context that involves the collection and production of geodata goods, which will explain first their public production, and second the widely structural transformation in Europe of the NMAs in public corporations or also called public agencies.

It can be observed throughout Europe the transformation process of government departments in charge of the production of geodata into public agencies or corporations. To mention some examples, the British Ordenance Survey became a trade Fund in 1999[1], The National Geodetic, Mapping and Cadastre Agency of Portugal in 1999 and The National Survey and Cadastre of Denmark in 1989. The

resulting agencies, independently of the legal form they adopt, are given more responsibility for their own finances and planning and more freedom to develop new initiatives.

This process should not be considered as an isolated event. In fact that is one consequence of the government institutional reform, carried out to improve the efficiency of the public sector activity and therefore to reduce the public deficit of the government.

Market failures are derived from goods with production functions that present increasing returns to scale, goods that present "special" economic properties (e.g. public goods, externalities), incomplete markets or information failures in which economic efficiency does not result when markets are left to the competitive forces.

In our particular case, geodata present public goods properties, normally associated with externalities, and productions characterised by increasing returns to scale. Which means that the production of geodata goods will drive to natural monopolies and explains why the production of geodata is not left to the free entry and exit of private enterprises in the framework of competitive markets.

When market failures arise the market economy does not allocate the resources of the economy in an optimal way. Then it is necessary the intervention of the public sector, or government, to correct the deficiencies of competitive markets.

There is much of discussion about which is the best way the public sector should intervene in the economy. But in any case, the first thing the public sector will decide is whether they will provide these goods and services directly by their means or will allow the production to the private sector. The public sector can produce geodata by their means, with public owned enterprises or government departments or agencies, or can determine a private enterprise that will produce the good attending to regulation and law mechanism like fixing price levels, levels of outputs and special taxes or subsidies. The regulation mechanisms that can be used are very various (e.g. rate of return, price caps, price discrimination, Ramsey prices, multipart tariffs, etc.) and produce different effects, therefore every case requires specific analysis in order to establish the most suitable mechanism.

The public sector intervenes in the economic activities of private enterprise in the interest of economic efficiency, fairness, health and safety. For instance, the market failures can result in the existence of monopolies (just one producer of a good exists in the market) that can decide to reduce the production under the demand levels in order to increase the prices.

But the state intervention has a price that must be paid via the taxes collected, and with distortions to the private sector activity that slow down the economic activity, e.g. preventing investment from the private sector, administrative costs, etc. So it is very important to analyse the consequences of a particular interventionist economic policy and its suitability.

Though theoretically the public sector intervention could reallocate the resources optimally, in practice there are political, psychological and practical factors that make the public sector economic activity very expensive. Therefore, there are "government failures" because the government has limited information, limited control over private market responses, limited control over bureaucracy and limitations imposed by political processes.

There does not exist an optimal way in which the public sector must intervene. Some characteristics of the economy to take into account when deciding how to intervene are the degree of development of the public institutions' structure, her degree of competition and the type of good or service to be provided, e.g. in some cases privatisation of a public corporation is not an option due to the economic conditions which can make the privatisation more expensive than the public provision.

As mentioned above, we observe that the process currently selected by the European governments in power to increase the efficiency of the public sector is the corporatisation of the departments in charge of the collection and/or production of geodata goods.

The process of transformation of NMAs observed in Europe, though at very different paces, from government departments into public corporations is one of the consequences of the global institutional reform in the public sector, the deregulation and privatisation processes that intend to make the economy more competitive and efficient, shifting from natural monopoly to competitive market structures. We are going to discuss the economic implications of this reform but we would also like to point out the limitations of economic theory and analysis since there are or might be political reasons that account when making economic decisions. Let's for example notice that one can decrease the overall size of the public sector by setting up corporations (independent agencies) and enterprises. There might not be a real difference, in terms of economic funding, whether the NMA is a department of the government or a separate corporation receiving a subsidy from the government, but if it is a department, all of its income and all of its expenditures will be included in the government budget, if it is a separate enterprise, only the deficit, the difference between its expenditures and income, is recorded.

Finally, we arise a question concerning how far the public sector intervention should go if the production of final geodata goods is viewed as the following two-step process:

- Collection of geodata: that we are going to call raw geodata, which implies the collection, gathering of the data and maintenance of the databases
- Production of geodata: final goods produced mainly but not only with the raw geodata

As a consequence of this division, then the natural monopoly is considered confined to the first part of this process. We suggest that the public sector intervention should be limited to the collection of raw geodata and then let the production of final products to free competition. We will not discuss the price at which raw data should be released, though the reader should notice the wide variety of geodata goods and therefore the multiple potential consumers and uses; these facts have to be taken into account when setting the price of the data.

In the paper, we follow the standard theories of regulation that presupposes regulation is actually needed in natural monopoly situations, and therefore we do not discuss the approach that argues the existence of natural monopoly is not, in itself, a reason for regulation and shows that optimality can be attained without regulation, even with only one producer (Demsetz 1968, Posner 1972, Baumol, Bailey and Willig 1977). We consider it would not be appropriated to privatise NMAs, even using some kind of regulation, because there might be a danger of underproduction of geodata

essential for the public sector activities (e.g. emergency situations actions), though not profitable for commercial purposes.

The paper is organized as follows:

1.- The first section explains the economic characteristics of geodata goods.
2.- The second section outlines how the public sector will provide goods and services publicly.
3.- The third section specifies how the government intervenes in the economic activity collecting geodata through government departments and how, and why, they are transformed into public corporations.
4.- The forth section provides an example of the deregulation process of the electric sector in California, widely discussed currently.
5.- The fifth gives a summarizing overview of the topics discussed in the paper.
6.- This last section enumerates the conclusions and describes future work topics.

2.- Economic Characteristics of Geodata Goods

Geographic data is a very broad term that includes a wide variety of goods, depending on:

- The format in which the geodata can be available or presented, digital or paper, and
- The multiple goods that can be created with the geographic data

The format in which the data is available is very important in economic terms since it will make easier the latter use of the data for the production of final goods; for example, digital data is easier to transform than data in paper format.

In any case, there are underlying characteristics that are common to geographic data and produce market failures or the failure of competitive markets:

- Collection of geodata leads to **natural monopolies**, due to the economies of scale that this activity implies (high initial investment costs and low marginal costs of production).

Unregulated monopolies, whether natural or not, will restrict output to attain a higher price, that is called rent-seeking behaviour. And this behaviour will produce welfare losses.

- Geographic data, being information goods, present properties associated to **public or quasi public goods**:
  - Non-rival in consumption: the consumption by one individual does not diminish the amount available for the rest of the individuals. There is a zero marginal cost for the additional individual enjoying the good, the marginal cost of supplying an additional unit is zero
  - Non-excludable in consumption: nobody can be prevented of consumption. This property, in the case of geodata, just holds if the data is freely available or almost freely available at reproduction costs
  - Non-rejectable: individuals cannot abstain from their consumption even if they want. This property does not hold for geodata goods

Non-excludability and non-rejectability imply that is not feasible to ration the good by the price system and therefore the competitive market will not

generate a Pareto-efficient amount of the public good. The private sector will not produce this good because they will not make any profit, it is impossible to know how many individuals are consuming and which amounts of the good they do consume, and therefore the government will provide the goods financing them via taxes.

- Collection and production of geodata goods are associated with **positive externalities**

Market failures mean that the competitive markets do not assure economic efficiency, that is, the efficient allocation of the resources with the maximum utility for all agents, and explain the need for Public Sector intervention in the economic activity. Now we proceed to analyse in detail the meaning of these concepts.

2.1. Natural monopoly

A natural monopoly exists when a single firm supply the market more efficiently, because there exist high initial costs that make the long-run average cost curve decreasing over the required total output level (market demand).

A natural monopoly arises from two sources: economies of scale and economies of scope[2].

- ***Economies of scale (Increasing returns to scale economies)*** exist when the average cost of production decreases as output expands. The most prevalent source of economies of scale are fixed costs, that is, costs that must be incurred no matter how many units of output are produced. When output expands, the fixed costs are spread over more units, such that average cost declines[3]. Economies of scale can exist over some ranges of output but not others. A natural monopoly exists in the production of one good only if economies of scale exist over a sufficient range of output relative to demand. Then minimum-cost production is attained with just one firm, the existence of, for example two firms, would make the production costs of the two firms exceed the costs of production incurred with just one firm.

In fig.1 economies of scale continue only to output Q_0, after which diseconomies of scale set in. One firm could supply Q_1 output at an average cost of AC_1. If two firms supplied this output, each firm would incur averages costs of $AC_2 > AC_1$ if they share the market equally. If the two firms split the market unequally, their average costs would differ, but the total costs with two firms would always exceed that with one firm. At any division of output, production with two firms costs more than with one firm being therefore less efficient, and indicating that a natural monopoly exists.

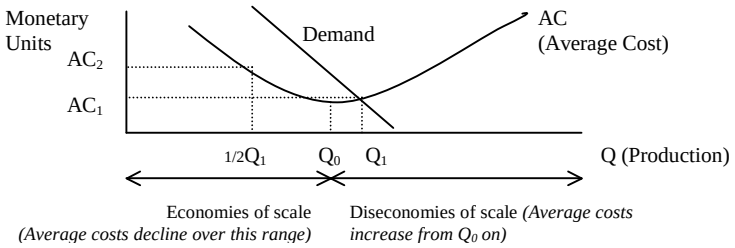

Fig. 1.- Economies and diseconomies of scale. Natural monopoly

If economies of scale are exhibited over an even smaller range of output relative to demand, then a natural monopoly does not exist. Competition occurs when economies of scale are exhausted at a level of output that is small compared to market demand such that minimum cost production is attained with numerous firms. This can be observed in Fig.2., where N firms with average costs AC_N will be needed to satisfy the market demand.

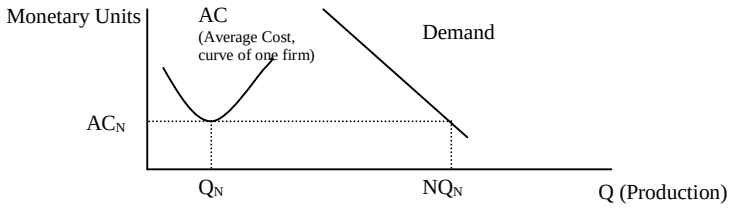

Fig. 2. Competitive Market

- ***Economies of scope*** exist if a given quantity of each of two or more goods can be produced by one firm at a lower total cost than if each good was produced separately by different firms. That is, if $f(x,y)<f(x,0)+f(0,y)$, the cost of producing both goods together, $f(x,y)$, is less than the combined cost of having one firm produce good x but none of good y, $f(x,0)$, and another firm produce good y but none of x, $f(0,y)$.

Geodata collection drives to natural monopolies since its production function present increasing returns to scale. The average costs of production decrease when the production increases. The cost of producing one unit is very high, due to the high cost of the technology used in the production, but once the first unit have been produced the cost of producing an additional unit is very low (marginal costs of production close to zero). Therefore since economies of scale are presented in a big range, it is just profitable for one enterprise to go into the production of geodata goods.

Natural monopolies are therefore associated to production and cost functions structure. But there are other types of monopolies not naturally established, but maintained by the legal framework. This is the case of legal monopolies imposed by the copyrights, patents or trademarks. It seems that the European governments have taken a pro-copyrights position. This is a topic for further research but information goods with lots of electronic opportunities or network effects[4] should have a softer copyright regime than traditional information goods, a rigorous copyright regime will result in underutilization of the goods [5].

2.2. Public Goods

As mentioned before public goods have three properties: non-rival in consumption, non-excludable in consumption and non–rejectable. There are just a few goods that fulfil the three of them, and therefore a few pure public goods, national defence and lighthouses are the typical examples of pure public goods. In the case of geodata goods is observed that they are non-rival in consumption but they can be excludable

in consumption as soon as the data is priced. Stiglitz [6] mentions the inefficiencies derived from the private provision of public goods "…[I]t is possible to charge for many goods for which the marginal cost of an additional person enjoying them is zero. These goods can be provided privately. The argument for public provision is that it is more efficient to have them publicly provided. When there is no marginal cost to an additional individual using the good, then it should not be rationed. But if it is to be privately provided by a firm, the firm must charge for its use; and any charge for its use will discourage individuals from using it. Thus when public goods are privately provided, an underutilization of these goods will result."

As illustrated in fig.2, pricing these goods will produce a welfare loss, that is, what is not consumed as a consequence of pricing the good at *P* (price). We observe that the marginal costs of production of the good are zero along the whole demand function. If no price is charged, that is *P=0* the quantity demanded is Q_M. When pricing the good at P_1 the quantity demanded will decrease to Q_1 which means a welfare loss equals to the striped area.

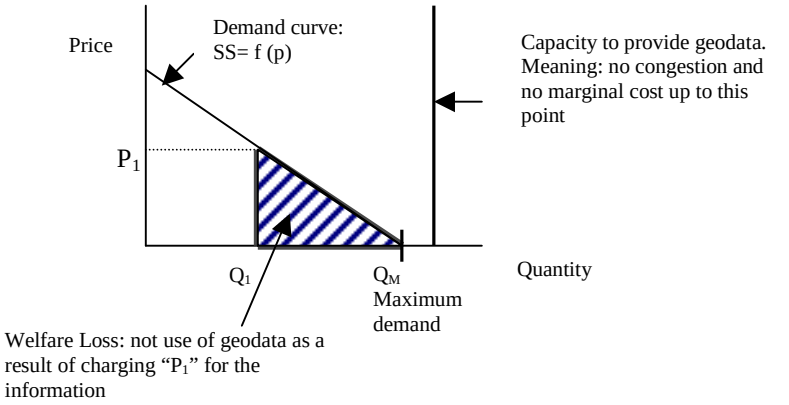

Fig .3. Welfare loss resulting from pricing geodata

Geodata goods also present production functions in which the costs of producing an additional unit are zero, the marginal costs of production equal zero which is the same as saying that the production costs are all fixed, this enhances the non-rivalry property.

2.3. Positive externalities

An externality, Mueller [7], occurs when the consumption or production activity of one individual or firm has an unintended impact on the utility or production function of another individual or firm.

Externalities can be defined as consequences for welfare or opportunity costs not fully accounted for in the price and market system. There are negative externalities (of production and consumption) that cause reductions in the social welfare and positive externalities (of production and consumption) that may arise where the

existence of several factories stimulates the availability of skilled labour, shopping facilities or component supplies.

Defence or other public expenditure on research and development is sometimes justified on the additional grounds that it stimulates the development of new technology that may become freely available to all. They are also called spillover effects (non pecuniary externalities).

The collection and production of geodata have positive externalities[8] in: the support for the defence of the realm, the support to the emergency services (civil disaster, floods, etc.), input to better business and policy-making decisions, ease of coordination between users (saving time and resources). Spillover effects resulting from the availability of geodata and proper pricing policies are the development of new geodata goods or products, the creation of new geodata enterprises, the growth in R&D, etc. These spillover effects will contribute to the growth of the economy.

3.- Public Sector Intervention in the Economic Activity, Public Provision of Goods and Services

The situations in which the public sector decides to provide goods and services are, concisely, related to:

- Market failures: failure of competition (e.g. monopolies, natural monopolies), public goods, externalities, incomplete markets and information failures
- Redistribution and welfare considerations: goods and services which exclusion in consumption is feasible but not desirable because implies welfare loses, and publicly provided private goods which can be provided privately but their private provision implies welfare loses

As we have discussed, the government's geodata production activities are related to both situations.

Once the public sector has decided to provide the good or service, there are two alternatives, the good or service can be publicly produced (the public sector controls the production directly) or privately produced (public sector controls production indirectly).

- Public Production. The public sector will have to decide over a number of issues when producing publicly:
    - How to allocate the output?. This is determined through a political process and lies in the field of public choice. Comprises the following topics: determination of public-goods expenditure and appropriateness of the expenditure level, accountancy of citizens preferences' in the provision, and procedures to find out about the preferences of individuals
    - How to charge for the good: market prices, cost of production or below the cost of production?
    - How to provide the good?: freely and uniformly or discretionally, according to the perceived needs of benefits
- Private production. The government will allow the private sector to produce the good or service, then the public sector will still intervene in the economy to assure a correct functioning and avoid abusive behaviour of the firms:

- With government regulation: introduced as an attempt to protect workers, consumers and the environment and to prevent anticompetitive practices and discrimination
- With taxes and subsidies to discourage or encourage specific activities by producers and consumers

Depending on the private or public production of the good or service, the institutions that will produce them are:

- **Government departments**. Problems associated to the economic performance of government departments are that they are weak at controlling cost and tend to influence and be influenced by non-commercial pressures
- **Public corporations:** a corporation established to perform a public function, frequently commercial but not necessarily, it may be social, advisory, or of any other character. The public corporation attempts to reconcile public accountability for the use of public finance, freedom of commercial operation on a day-to-day basis, and maximum benefits for the community.
- **Private enterprises:** the activity of the firm is controlled with regulation and taxes or subsidies.

The dependency of the three entities from the public administration is decreasing from top to down.

The boundaries between what are public institutions and what are not are often unclear. One example is the unclear difference between nationalized enterprises (legally similar to public corporations and State Owned Enterprises) and companies in which the government is a major stockholder.

Government departments or public corporations are the institutions that produce geodata in Europe. In the following section we describe NMAs structural change from government departments to public corporations and the goals this change pursues.

4.- From Government Departments to Public Corporations. The Institutional Reform Process in the Public Sector

In this section we will explain the structural change of NMAs as a result of the global institutional reform process in the Public Sector. The governments are transforming NMAs from government departments into corporations or agencies, which means, public bodies become publicly owned agencies that operate like commercial companies.

The institutional reform[9] is a consequence of the “liberalisation” process started in Europe in the 1980’s and continued during the 1990’s, in order to enable internal markets to open to competition, and therefore be able to face the globalization process the economy is experiencing.

By the institutional reform is aimed a more working efficient economy, encouraging free competition and creation of business opportunities by letting the private sector the provision of all goods and services (or as many as possible). The actions used are:

- **Corporatisation of government departments** or activities: process of turning appropriate government services into public corporations and running them on commercial principles
- **Privatisation of public corporations**: transference of the ownership of a former public body to private individuals and institutional investors, generally through the floating of shares available to the public and subsequent listing on a stock exchange. Normally some regulation is established to control prices or production to certain levels
- **Private provision** of public goods and services: the production is let to private enterprises in a competitive environment

Some departments of the public administration are experiencing their transformation into agencies or corporations; they are transformed into commercial companies though still owned by the Government. These agencies are independent in the sense that they are allowed to operate outside the line of hierarchical control by the departments of central government. Some examples of the departments or offices that are experiencing transformation into public corporations, may include: Statistic services (National Statistic Offices, NSO), Insurance services, Mapping and Surveying departments (NMAs), Employment Offices, Stocks Exchange, etc.

This does not mean that every government department has to become a corporation. As Majone[10] writes, the model of the independent agency does not apply to every public policies or activities. The corporation is more relevant in areas where expertise, flexibility and reputation are the key to greater effectiveness. Redistributive policies, or policies with significant redistribuitive implications, should remain under direct control of political executives.

Under the Australian State Owned Corporations Act 1989 (SOC Act)[11] a body is corporatised when the five principles mentioned below are satisfied, when the first four principles are satisfied an entity can be said to be fully commercialised. The five principles are:

- Clear commercial objectives: differentiation among commercial, social, policy, advisory and regulatory functions of the entity
- Appropriate managerial authority and autonomy: Giving boards of directors and management greater responsibility and authority for accomplishing the body objectives within the commercial parameters set by the Government as shareholder. (That means that key internal operating decisions are made by Boards and management)
- Effective performance monitoring
- Rewards and sanctions on performance: in order to effectively promote good commercial performance and to sanction poor performance
- Competitive neutrality in input and output markets: any special advantages or disadvantages applying to corporatised enterprise by virtue of their Government ownership must be removed

Therefore, by the corporatisation of the Mapping and Surveying departments a bigger efficiency is pursued by limiting the public sector influence in the decision processes of the NMAs.

There is one more question we would like to point at, is privatisation of NMAs the next step to corporatisation?. As we have referred some government departments are first corporatised to move on then to their privatisation, this step forward intends to make the markets more competitive, that will be translated into better prices for the consumers and therefore higher social welfare.

In the case of NMA we think that the collection of geodata is crucial for some aspects of the government activity as the support to the emergency services, national defence and policy-making decisions. One consequence of privatisation can be the stop in producing some geodata necessary for these government services but not profitable for the company, because they are not demanded by the rest of the market. Or the goods are produced but at very high prices due to the fact that there would be just one buyer (the government), and probably also one producer in the collection of geodata (therefore with a monopolistic position). Once again we can compare the NMAs with the NSOs, whose role in the production of data for the government is very important and provides different departments of the public administration and therefore are kept under the government control, though with a high degree of autonomy.

5.- Deregulation Policies, an Example.

This section outlines the example of the electric sector deregulation in the state of California (USA), to illustrate roughly the consequences of deregulation policies that did not fully account the economic and technical conditions of the environment.

Though this example lies out the field of NMAs, we find it interesting because, first it provides insights in relation to the deregulation process, second it highlights the need to make deep analysis before proceeding to its application and third it points out the problems that arise once the deregulation process has been implemented.

Up to 1996, in California the electricity was produced and distributed by three utilities (Pacific Gas & Electricity, Southern California Edison and San Diego Gas & Electric) and the prices were established by the State of California. To proceed to the deregulation of the sector the business was divided into[12]:

- Producers of the electricity: the generating plants. They are unregulated private companies, they operate in a competitive economic environment
- Distributors of the electricity: they own and control distribution systems, the wires that supply homes and businesses. They are utilities.
- Transmissions: Transmission lines and power grids were transferred to the ISO (Independent System Operator) a private non-profit organization that manages the system's operation

This deregulatory process[13] was supposed to increase the competitiveness in the sector and lower down the prices, but the results are far from that. The consumer paid the subsidies the generating plants and distribution companies were granted to compensate them from the expected competitors, they are paying energy market prices (not the regulated fixed rates granted by law) to the generating companies in order to overcome the crisis, and they will have to pay the distribution companies'

debt. And last, they are facing very likely energy price increases. Ill-considered deregulation policies can be expensive.

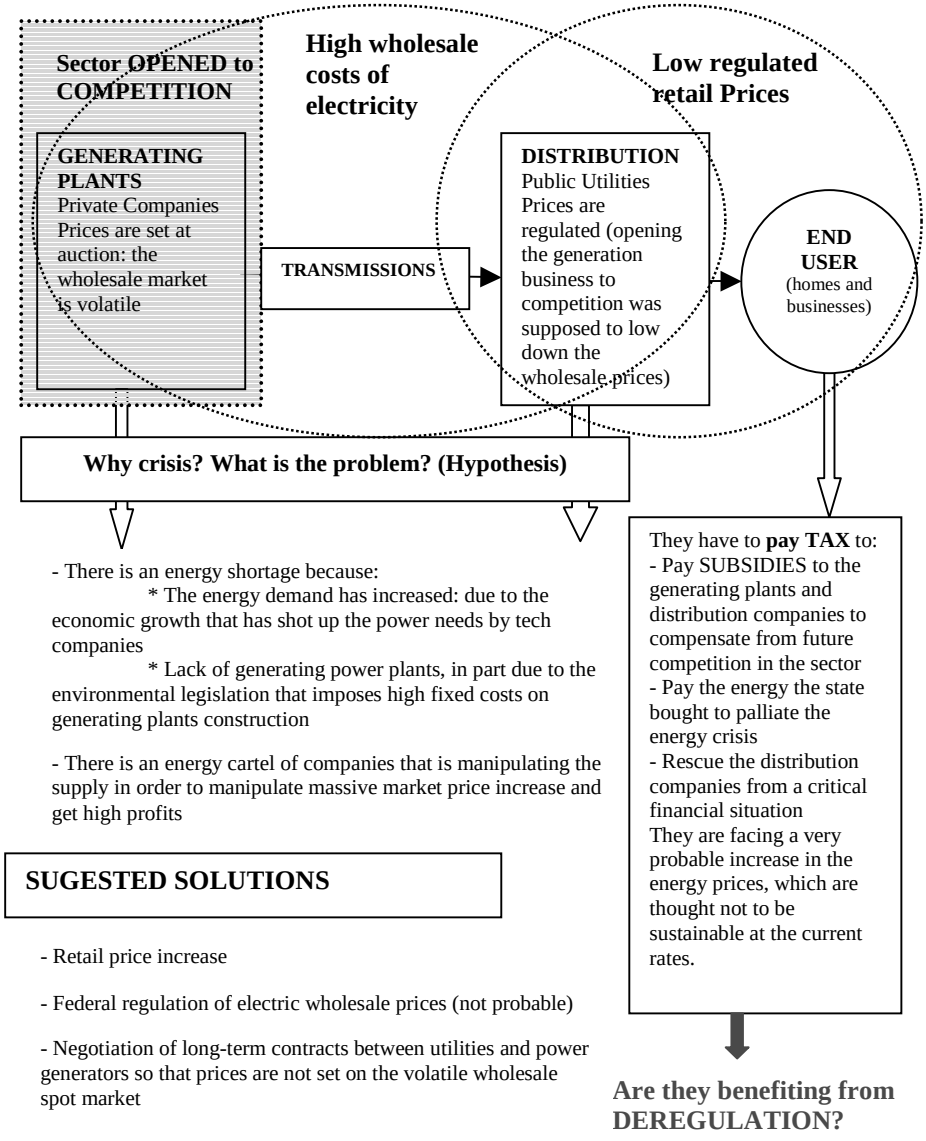

Fig. 4. The perils of ill-considered deregulation policies. The consumer pays for wrong policies.

6.- Summing up. Remarks.

Next we provide a summary of the main economic and legal aspects of geodata collection and access as plotted in fig. 5.

1.- Geodata is an input for public sector and private sector production and activities. Geodata is an essential input for the production of national defence. National defence is a pure public good, which therefore is provided by the public sector. This is not a trivial remark, because it means geodata will be collected independently of the market demand.

In spite of the lack of information referring the specific geodata needs of national defence bodies, in some countries there are duplication of efforts in the collection of geodata by civilian and military institutions. Though, because of strategic reasons, not all the geodata produced by the military institutions can be used and benefited for the rest of the civilian institutions directly, at least some waste can be avoided when setting an agency in charge of the collection of raw geodata. This will:

- Provide access to a uniform geodata set for public and private sector agents. Who can decide to improve the data available for their purposes, with extra measurements, or create final products for specific needs or services
- Guarantee the provision of all geodata, profitable and non-profitable from a private business prospect, necessary for the defence of the realm and proper operation of public sector activities
- Stimulate, in the case of services or products commercially profitable, the growth in R&D, variety of products, competition in this sector and therefore decrease in prices. Fostering the economic activity and improvement of the geodata for specific needs and services
- Increase in the quality of the geodata, as a result from its subsequent transformation by the private companies, multiple companies transforming the data will contribute to detect mistakes in the data processing

2.- The natural monopoly is confined to the collection of raw geodata

3.- The transformation of NMAs into public corporations reduces some existing institutional impediments to access geodata. This will bring economic efficiencies as a result of the decrease of transaction costs.

4.- NMAs have to define the implications of copyright policies and their appropriateness: rigorous copyright regimes will lead to underutilization of geodata.

5.- NMAs have to define the pricing policies for the distribution of the data. As mentioned before, there are different users of geodata, one type of users that get high revenues with the exploitation of the data and another type that get low or no revenues, but they get welfare benefits in terms of reduction of transaction costs. This suggests the solution might be a price-differentiating monopolist where the fixed costs of supply are recovered from higher value users, but users with a lower willingness to pay are charged a lower price.

6.- The geodata collection process in Europe and the United States is similar, in both continents this part is done by NMAs; but big differences exist concerning the access to the data, copyright policies and pricing policies.

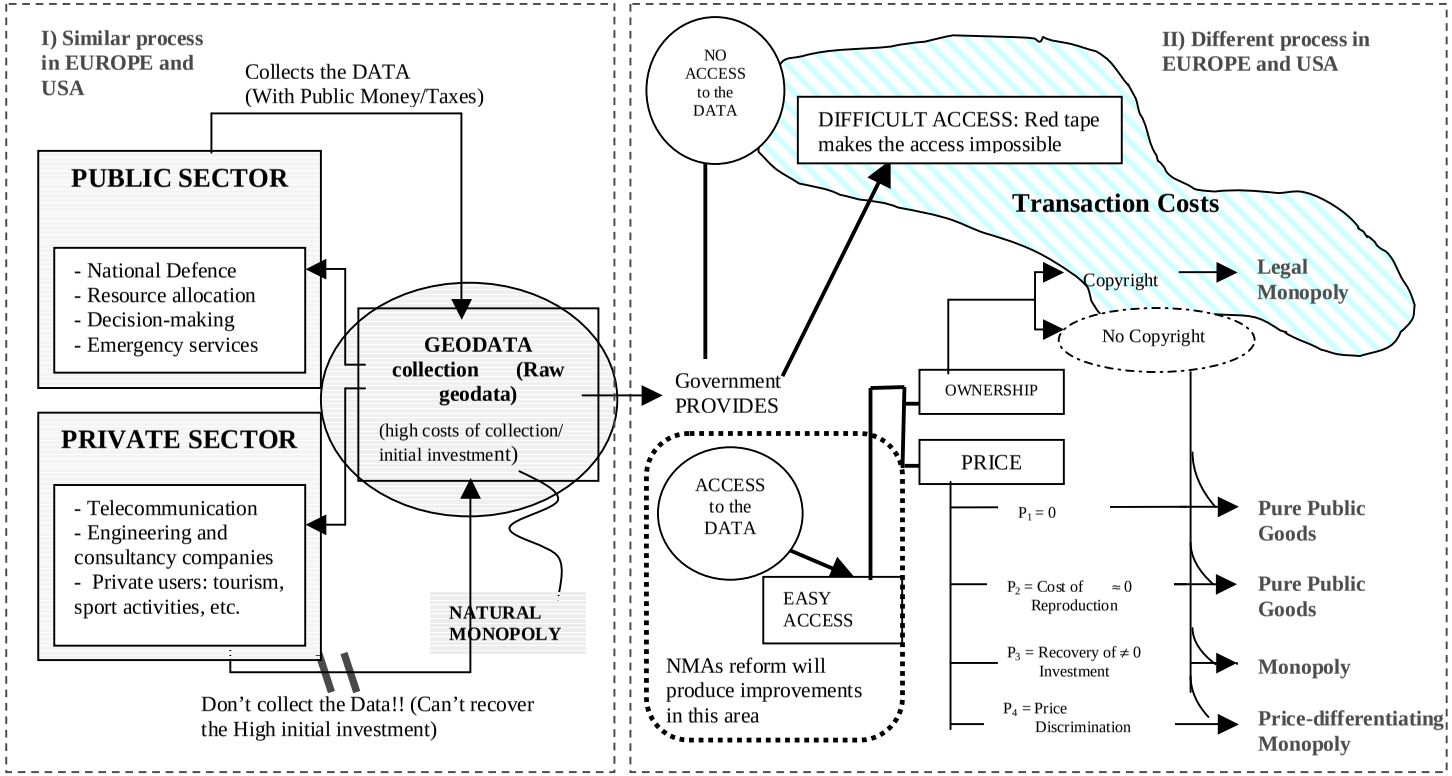

Fig.5. Economic and Legal aspects of geodata collection and access

7.- Conclusion. Future Directions

Geographic data goods have other characteristics that not every public, quasi-public good, whose production lead to natural monopolies have.

Geodata is necessary for the Public Sector activities:

- Taxation
- National Defence
- Natural disasters management (e.g. earthquakes, floods, droughts, etc.)

And the collection and production of geodata have spillover effects in the welfare of the economy as well as other pecuniary externalities, e.g. better operation of the public sector and all its bodies, economic growth produced by the release of geographic data that increases the number of enterprises that produce refined products out of the data.

As a result of the above explained situation we observe that:

- The Public Sector intervene in the collection and production of geodata mostly via the NMAs
- The degrees of autonomy of NMAs vary and their legal structures influence the economic efficiency of the agencies, being public agencies or corporations in the sense explained in the paper a more efficient organisation structure than that of government departments. But in any case NMAs are regulated or owned by the Public Sector
- The activity of NMAs should be limited and should not interfere more than necessary in the market economy but just to overcome the market failures geodata collection produces. NMAs should not create unfair competition that shall prevent the entry of competitive firms
- The transformation process of NMAs can be compared to the transformation of other public bodies as the National Statistic Offices in pursuit of greater efficiency

Some open questions we are working on are:

1.- The consequences of copyrights policies. The economics reason for copyrights existence.

2.- Appropriateness of NMAs involvement in the production of geodata goods beyond the production of raw geodata goods: Unfair competition issues and economies of scope.

3.- The comparison of Europe's and USA's situations: analysis of the NMAs' legal structure, the scope of regulation, pricing and copyright policies.

4.- Identification of raw geodata types in order to design appropriate pricing policies. A first division is:

- Big geodata: geodata with application to the "big industry" with high revenues, high returns to investment. Small target population but big in economic terms
- Small geodata: geodata with application to "small industry", with lower revenues. Big target population, in population terms, but not in economic terms. A priori it seems that this type of geodata can develop SMEs, which will produce a wide variety of final geodata goods for a wide number of potential users, increasing

therefore the social welfare. This has to be taken into account when pricing this type of geodata. The next step will be to quantify the economic impact of the free release of this geodata

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