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Abstract

This paper analyses, from an institutionalist perspective, the emergence, nature and ways in which Parliamentary "scientific and technological advice" activities are carried out in different European countries. We argue that the connection of Technology Assessment (TA) with the political process can only be understood if this type of information resource is regarded not only as an input in the decision-making process but also as a legitimising mechanism. Some local pre-conditions are important for the emergence of these practices, as well as the existence of some political entrepreneurs willing to advance the initiatives within their respective political systems.

Two different models of arrangements of Parliamentary TA are identified, the instrumental and the discursive one. The adaptation, consolidation and differential impact of these information production practices are mediated by two factors: the capacity of PTA organisations to gain support both inside and outside the Legislature, and their capacity to access decision-makers in an environment of competition with other organisations that also produce TA. The two models have both types of these capacities in differing degrees. It is argued that differences in impact are to be analysed in the context of the rules of the political game and the types of incentives that TA organisations face.

1. Introduction

This paper addresses the relations between scientific knowledge and politics, and more specifically the role of knowledge and information about highly technical issues in politics. The connection between science and politics, the relationship between Government (the executive) and science (Smith, 1992) has been studied at certain length, from the viewpoint both of science as a system that demands funds and resources (Cozzens and Woodhouse, 1995), and of the role that scientists and experts

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play as advisors in the political process (Barker and Peters 1993; Bimber and Guston 1995), both to presidents (Bromley, 1995), bureaucrats (Jasanoff, 1990) and even to the judicial system (Jasanoff, 1995). Some steps have also been taken to gauge the impact of scientific advice (The IPTS Report, 2001; The IPTS Report, 2003).

Fewer studies have focused on the relationship between science and the legislature, between scientific knowledge and parliamentary decisions, with the exception of the literature on the US Congress, and specifically the Office of Technology Assessment (OTA) (Gibbons and Gwin, 1988; Bimber, 1996; Bimber and Guston, 1997). However, it is also true that there is a steadily growing array of literature on the provision of scientific and technical (S&T) advice to Parliaments in Europe (Vig and Paschen, 2000), and on the demand and use of technical information by the US state legislatures (Jones, Guston and Branscomb, 1996).

The aim of this paper is twofold: First of all, to analyse the emergence, nature and way in which Parliamentary "scientific advice" activities are carried out in different European countries, especially when that advice is provided through a specific practice called "*Technology Assessment (TA)*" and through organizational forms of production of this knowledge that, albeit differing, are known as Parliamentary Offices of Technology Assessment (POTA), and provide a service to Parliament, either as their only customer or as a special customer. Secondly, to outline the similarities and the differences in the organization of these POTA and, from an institutionalist perspective, to analyse and explain the diverse impacts of these organizations' S&T advice or TA activities.

Analysis of this specific knowledge production instrument known as technology assessment (TA) has been heavily dominated by normative approaches, which have even been characterized as various paradigms of TA (van Eijndhoven, 1997), and methodological approaches (Porter, 1980; Kuhlman *et al*, 1999; VV.AA. 2000), which underscored its values as a practice associated to the design of science and technology policies (Smits, Leyten & Den Hertog, 1995) or to the forging of stronger ties between science and society (Rip, Misa & Schot, 1996).

As for TA's connection with politics, many authors have analysed the political process that led to the creation of the OTA, the first Parliamentary technology assessment organization, its subsequent operation and the causes of its demise (Bimber, 1996); others papers have focused on the influence that social and cultural factors have had on the dominant form adopted by POTAs in several European countries (Petermann, 2000) or on the institutional aspects of their establishment (Vig, 2000), but most of the studies describe how the different POTAs are run (Paschen, 2000; Kluver, 2000; Laurent, 2000; Norton, 2000; etc.)

In our opinion, the nature of these unique information production practices and their emergence are phenomena that can only be understood within their institutional context. Our contribution places the institutions, the rules of the political game and the types of incentives that TA organizations face, at the heart of the explanation for their adaptation, consolidation and differential impact, pointing out the contradictions that sometimes exist between the institutional arrangements and the relative impact of the TA produced by the organizations linked to Parliaments. We argue that the *institutional arrangements that govern POTAs* are key factors for explaining the depth and extension of the impact of their TA activities; therefore, if one wants to understand TA's impact in

the political and social process, one must first understand and characterize the institutional context in which it takes place.

Our analysis is constructed upon the comparative method (Collier, 1993), albeit in circumstances determined by a small number of cases (*n* small). The argument will be contrasted empirically with a set of cases from several countries that have created "Parliamentary scientific advice" institutions, analysing their institutional arrangements, as well as the type of TA that they perform and its impact. The information has been collated from questionnaires and interviews conducted with the people in charge of these organizations. The impact is gauged on the basis of the role description and the typology of possible impacts drawn up by the TAMI team.

In section two, and since history has a bearing on understanding the present (Rose & Davies, 1994), we take a brief look at the emergence and consolidation of TA as a practice that produces information about S&T matters, oriented and linked to the political process, specifically to Parliament. In order to explain the emergence of TA, in section three we put forward a theory regarding the use of scientific advice and information in Parliament and in policy making in general. To this end, we adopt a hypothesis that complements the traditional rationalist model of "information" as input in the decision-making process, and also regard information as a mechanism for legitimising decisions and as an instrument in power struggles. Section three puts forward an analytical structure for understanding how TA has emerged in different degrees as a practice with its own identity in several countries and, above all, for explaining the reasons why TA is or is not adopted in its parliamentary form, i.e., linked to the political process, and what types of arrangements are established. Section four analyses the institutional arrangements and organizational structures in which TA occurs in the Parliaments of some European countries, and to do so defines and characterizes two models or types of arrangements governing TA as the practice of producing information for the political process: the instrumental model and the discursive model. Section five explains the types of impacts and their relationship with the diverse institutional arrangements existing in the POTAs. Some empirical evidence is then used to establish general descriptive and normative hypotheses. Lastly, section six, presents some conclusions.

2. The emergence of TA as a specific cognitive and information practice

In this section we characterize the concept of *technology assessment* (TA), that unique variety of production of information or "policy advice" related to S&T matters. To that end we take a historical approach, describing the emergence and creation of TA as an information-production practice, with its own identity and special ties to the political process, as the outcome of a specific juncture in the United States, in which it attained a high degree of institutionalisation.

Broadly speaking, TA has been defined as the production of information about the possible consequences of S&T developments to improve public policies. More specifically, we regard TA as a type of information about highly scientific or technological problems that tends to come in written form, in documents or reports, and that is developed to "improve the information for policy-making"; in a few evolved

forms, TA also seeks to foster debate, public understanding or acceptance of the impacts of science and technology from a neutral, non partisan position, always using scientific information of the best possible quality[1].

In the United States, the ever growing importance of science, not only because it demands resources from our societies, but also as a core element of political decision-making, gained relevance in 1957, after Eisenhower created the post of the President's Science Advisor and the "President's Science Advisory Committee" (PSAC) (Killian, 1977).

By the mid-Sixties, US society harboured a growing concern about the negative side effects, in environmental or health risk terms, of the development of certain technologies (for example, nuclear technology or pesticides, which won their discoverers the Nobel Prize of Chemistry). This prompted a movement to reassess technological developments, and even led to a literary best seller in the shape of Rachel Carson's book *Silent Spring* (1962).

Civil society, especially the scientific community, sponsored the development and production of information, based on the best scientific evidence available, about the "polemical" aspects of scientific and development technological. The goal was to offer policy makers insight that would help them to make decisions about impact-relevant projects. Broadly speaking, the analyses, originally sponsored by the research facilities, were designed to provide advice about scientifically relevant issues and, in short, to influence political decisions. What one might call "grass roots TA", or what Van Eijndhoven (1997) labelled "classical TA", developed in the Sixties, especially in wealthy countries such as the United States, and peaked when it expanded its boundaries and merged with politics. In October 1972, the United States Congress decided to set up a specialized internal agency, the *Office of Technology Assessment* (OTA), stating that "the basic function of the Office shall be to provide early indications of the beneficial and adverse impact of the applications of technology and to develop other coordinant information which may assist Congress" (92nd Congress, 13 October 1972, Public Law 92-484) (quoted by Holt, 1977).

The creation of the OTA should be seen in the light of the effect of those concerns about technology's negative impacts, or the technological optimism that has been the hallmark of US bureaucracy; yet it is also essential to place it in the right political context. The United States is a political system marked by a "divided government". It should also be seen in the light of the effort that Congress made, at the start of the Seventies, to bolster its position vis-à-vis the executive (Bimber, 1996). Thus, the two key factors behind that unique event were: the aim to reinforce the scientific and technical information available to parliamentary decision-makers with non-partisan, unbiased information, of the best scientific quality available and, secondly, the aim to bolster Congress' power vis-à-vis the executive, an institutional effort that is also to be observed in the creation or the reinforcement in those years of other Congressional agencies (Sundquist, 1981). The OTA, whose creation was initially sponsored by the Democrats and triggered certain distrust among the Republicans, finally managed to earn itself a reputation as an

[1] TA has been applied frequently in areas such as transportation, energy policy, bioethics, GMOs, consumer regulations, waste policy, environmental policy, etc. See, for example, the history of the OTA in its reports (OTA, 1996).

agency that provided non-partisan advice, in order to improve decision-making within Congress.

The OTA and its activities managed to afford "*technology assessment*" an identity, as information based on scientific and technical knowledge, but different from scientific knowledge *strictu senso* and from the information produced by Washington's think tanks or interest groups, and geared towards offering neutral advice to Congressional policy-makers. Further on we look at the explanatory significance of the impact caused by the fact that an internal, instrumental model for producing information and advice on scientific matters for public policy, such as the OTA, arose within the institutional framework of a divided political system, with a clear separation of powers between the executive and the legislature, in which legislative power has been traditionally decentralized in the Committees and Subcommittees (Polsby 1968; Cooper & Brady, 1981; Polsby & Schickler, 2002). It is against this political background of decentralization where an internal instrumental model has the strongest capacity to influence political decisions, even in the absence of strong external ties. However, the same circumstances that allowed the OTA to enjoy extraordinary resources, and therefore facilitated its impact, were no guarantee for its survival when the political conditions changed radically in 1995.

Therefore the first successful example of TA as a practice in a political context can be explained by circumstantial and local reasons. However, this activity, which took place with political institutionality in the United States, and its experiences contributed to afford TA an international identity. From that moment on, the OTA and TA model became available for rational imitation (Hedström, 1998), international policy transfer (Wolman, 1992), or inspiration in the context of drawing lessons for policy (Rose, 1991). So to understand why the same type of TA was developed and adopted in other countries' political systems, as well as thinking about local preconditions, one must pay attention to other issues such as the international diffussion of models and policy ideas, or the emergence of an epistemic community around TA as a practice.

The next section explains how the diffussion or imitation of, and inspiration in the OTA model were influential factors in the development of parliamentary TA in Europe; however, it seems evident that today TA is not a significant source of information in guiding technology policy throughout the world. The reason for this perhaps lies in the general nature of its method of work, subject to the political processes of conflict and agreement; or perhaps in the fact that it has not incorporated or constructed a "policy paradigm" (Heclo, 1974) or has been unable to form an "epistemic community" (Haas, 1992) in which the producers of policy ideas and policy makers share the same model and goals; or, perhaps, in the fact that there are countless sources of information that compete for the "limited attention" of political organizations' decision-makers.

3. The diffusion/adoption of TA in different national contexts

If the traceable origins of both the grass roots and institutionalised versions of TA are to be found in the United States, then two questions remain to be answered: first of all, why has TA developed as a type of unique S&T information, with its own identity, in some societies, but not in others? Secondly, why was TA adopted in its parliamentary form? Why were Parliamentary Offices of TA set up in some European countries?

This section puts forward an analytical structure for understanding the emergence of TA as a specific practice of information production on S&T policy matters in the different European countries, and also outlines the factors that explain why some countries adopt the parliamentary form of TA while others do not, and the types of arrangements that are established.

To answer these questions about TA (there are always some type of similar practices), we must distinguish between two levels of analysis: the analysis of the emergence of TA in general produced by different groups, and the analysis of TA's ties with politics. First of all we will analyse the general conditions in which the supply (the producers) of this type of information arises and, then examine the social construction of demand from the political system and its institutionalisation.

In the cases we examine, there seems to be a sequence in which the supply of TA or a form of quasi-TA arises first and is then followed in time by demand, in a context of political processes where drawing on other countries' experiences and recently the activism of the European Parliamentary Technology Assessment (EPTA) network seem to be key factors.

Until now, no clear answer has been found to the first question, because most of the case studies conducted have a selection bias and only analyse countries where these organizations have indeed developed, and/or also in which TA has been linked to the Parliamentary scientific advisory process. One might suppose that the US precedent spread, leading others to imitate and drawn upon the OTA’s experience, yet the almost total absence of TA in some countries seems to indicate that this information production practice only emerges if certain prerequisites are met.

After analysing the cases in which TA has developed in general and where the groups that produce TA have flourished, we can put forward a general explanation associated to the importance of local preconditions. Three macro social factors serve to explain the relative abundance of this type of practices, and the consolidation of groups or organizations in the general panorama of socio-politically oriented "scientific and advisory" institutions: first of all, the country's level or degree of S&T development, measured by the percentage spending relative to GDP or by the number of researchers per person in employment; secondly, the existence of a problem of "public perception of science" (whether negative or positive) in each of the countries, and a certain balance between the "hope and fear" that the technological developments generate; lastly, in some countries the civic and participatory nature of democracy matters, insofar as TA is generally a grass roots movement.

In short, one could say that this unique type of information, TA, can only exist if there is already a certain level of S&T development in those societies, where the scientific community is concerned about the social responsibility of science, and also where the new social movements such as environmentalism have been politically relevant. TA is the normal outcome of the existence of a "rich" scientific system, where research facilities have surplus capacities and abundant manpower because, generally speaking, the first people to practice TA are the very same scientists who, for different reasons, try to influence the course of political decisions.

Therefore, TA can emerge –and as a matter of fact has emerged– regardless of the context within which it is used; in theory it can emerge even without any explicit demand from the political system. However, experience shows that the organizational density of the ecology of countries' TA and S&T policy analysis centres is a good predictor of the emergence of the political system's demand[2].

With low levels of S&T development, there is little opportunity to make decisions about scientific matters, yet at the same time without democracy, which is also closely associated with economic growth (Przeworski *et al*, 2000), and without a civic culture, the road to decisions about public policies is closed to practices such as TA.

Hence TA is a special type of "policy analysis and advice" produced by scientists, or heavily influenced by scientific method; yet to gain acceptance it must compete –and try to coexist- with many other sources of information that politicians, governments, bureaucrats or parliaments use. As a practice mainly of the academic community, or of social movements, TA has had to compete with other information, because there are many other sources that produce information about "the possible outcomes of technological options": the experts who work in or for the government, regulatory agencies, bureaucrats, think tanks, interest groups, etc.

In our countries, there are plenty of sources of S&T related information that can inform public decisions, and that seek to influence them; one might say that the different organizations that produce information and "advice" on political matters, many of which relate to S&T, compete with one another, and that when one of them emerges, there is a greater likelihood that more will appear, though perhaps less of a likelihood only one of them being used by socio-political actors.

One form of S&T information production quite similar to TA –and perhaps with shared roots-, but that has normative powers and the authority to impose sanctions is the one that has emerged in the two last decades in the "regulatory agencies", which are unquestionably specialized competitors of other TA organizations'; this "variety of TA" has developed under the executive, especially in the technology related regulatory agencies, albeit sometimes with institutional arrangements that tie them to the legislature, as occurs with the Spanish Nuclear Safety Council; however, in these cases, even if the production of S&T information is guaranteed to have an impact, its quality or independence has varied greatly. The missions have been clearly defined and specialized, as in the case of the agencies responsible for nuclear safety, evaluating drugs or environmental technologies and, more recently, health technologies. These regulatory agencies have built up such highly specialized S&T capabilities that, in most of the countries, they enjoy a quasi-monopoly in their respective fields over the knowledge about the aspects or problems associated to those technologies. In fact, regulatory agencies could be said to have spread as a result of the pressure exerted by social actors and the technical "rationality" being imposed in the settling of conflicts.

If the development of regulatory agencies with very strong S&T powers in traditional TA fields such as the nuclear industry, the environment, etc, that report to the executive, has not hindered the growth of demand for TA by the Parliaments, perhaps it is because Parliaments have helped to institutionalise TA and afford it an identity as an

[2] A brief look at the database of TA institutions in the world seems to confirm this argument.

information production practice and a generalist methodology. Furthermore, it is worth assessing whether the development of these regulatory agencies is likely to threaten the survival of POTAs.

So it seems that there is something about TA, its method, and how its identity has been built that makes it especially prone to being connected with Parliaments, to the institutionalisation of its relations with the legislature. That is why the second part of this section analyses the development and institutionalisation of several varieties of TA linked to the political system, and more specifically to Parliaments, and not with just a symbolic or rhetoric, but substantive nature in those countries that had met the prerequisites. The concepts that are used to argue this bond (demand) have to do with the legitimation of decisions, with power, more specifically with the distribution of power.

As we have said, TA, insofar as an information production and awareness practice, became established and acquired its own identity in association to the political system, perhaps due to the impact of the experience of the US Congress OTA and its subsequent international diffusion, and with the intention of influencing public policies with a high S&T content. Understanding this bond involves adding an alternative hypothesis to the traditional rationalist model, which regards “information” as input in the decision-making process, so that information is also regarded as a decision-legitimising mechanism. Organization theorists have long known that organizations have and demand a lot more information than is actually used in decision-making processes. That is why they say that "having the information" is quite often a legitimation mechanism, rather than an aid for making decisions (Feldman and March, 1981), decisions that are usually made applying rules different to those imagined for decision-makers endowed with "Olympic rationality" (Simon, 1983).

In this context, the volume of information from different sources, and sometimes linked to specific groups and interests, means that decision-makers can be faced with a lack of legitimacy, and thus claim that they do not have any neutral, independent information. To understand this, one should remember that the TA produced by the organizations linked to the Parliaments in the different countries, is only one of the "types of information products" related to decision-making that is available, but what is special about it is that this information is produced institutionally in the Parliament, at the request of Parliamentary bodies, and that parliamentarians may have influenced when and how it was produced, giving it a "owner" identity.

With such a proliferation of alternatives sources of policy analysis production, the recipients may become saturated, and the mass availability of information from interest groups can also lead to politicians wishing to receive "neutral" information, a wish that can be satisfied by an independent organisation. As true as it may be that, if the impact is the power to influence, that power is inversely proportional to the existence of alternatives sources for achieving the same information resource (Emerson, 1962), at the same time, if the need for neutral information is essential in order for politicians to claim legitimacy, then it is just as relevant to argue that decision-makers' attention capacity is limited, and that any channel of direct access to them, with the right timing, is a major organizational asset. This latter case includes the POTAs.

What is specific about Parliament-linked TA, as part of its identity, are the "neutral", "independent" and "non partisan" values of the information produced, values built on traditional Mertonian scientific exceptionalism. It is in this context that the claim regarding the "scientific" nature, due both to the method and its significance, of the information produced through TA, becomes all the more relevant, because it implies the use of the legitimacy derived from the scientific knowledge in the political and parliamentary process. Furthermore, despite the legitimising functionality of the information, parliamentarians and experts must build up a relationship based on trust.

Having already found a functional explanation, namely the legitimacy, for the connection between TA, and other types of information, with the political process, another question that remains to be answered relates to the emergence of POTAs in Europe: are they the result of the international diffusion of that political innovation, based on imitation or on any other concept? Or alternately, can POTAs be said to have emerged and emerge as the result of socio-political preconditions?[3]

Looking at the dates on which the European POTAs were created (and actually began operating), one finds a certain process of "international diffusion" or imitation of this US local innovation, namely the OTA. Innovation diffusion processes have had a long tradition of study (Coleman *et al*, 1957; Coleman, 1966; Rogers, 1962/95); scholars have studied the international diffusion of organizational models and norms (Meyer and Hannan, 1979; Meyer *et al*, 1992; Finnemore, 1996), the diffusion of political innovations within the political system (Polsby, 1984; Walker, 1969; Berry and Berry, 1990) or on an international scale (Wolman, 1992; Rose, 1991; Majone 1991).

Rose (1991) spoke of 5 different ways of drawing lessons from other countries' experiences, albeit while referring to public policy programmes: 1) copying; 2) emulation; 3) hybridisation; 4) synthesis; 5) inspiration. This last model often occurs when political decision-makers travel and, upon seeing a familiar problem in an unfamiliar environment, they expand the ideas of what is possible, etc. There is little doubt that the OTA and other subsequent experiences, thanks to the information exchange mechanisms in place between the legislatures (for example, the Inter-Parliamentary Unions, etc.) were a source of inspiration for tackling the problems identified by the European parliaments and, by resemblance, shed light on easier paths forward thanks to the solutions that others had adopted beforehand. In the European case, apart from national activism, one cannot forget the European Commission's initiatives, such as the FAST programme, which at the start of the 80's contributed to open up a Europe-wide debate, in the context of the European Technology Assessment Conferences, which began in 1987 in Netherlands (Smits, 1987).

Yet while the simple diffusion model may well be valid, the fact is that other preconditions are necessary for the diffusion of political innovations. We have already said that socio-economic preconditions explain first the level of development of TA in general. However, despite being necessary, these conditions do not suffice for TA to be linked to the political process in Parliaments. There also have to be political entrepreneurs (Schneider, Teske & Miltrom, 1995) willing to push forward the initiative in a context in which either they want to strengthen Parliament's position vis-à-vis the executive, or else foster participatory models that involve a better informed citizenry.

[3] The problem has already been addressed in literature from the methodological viewpoint and is known as Galton's problem.

According to Kingdon (1984/95), the policy process is formed by 3 different streams: the problem stream (there is a problem involving information or asymmetry of power), the solution stream (here the existence of models of other countries from which to draw inspiration is crucial) and the stream of the political juncture that prompts political entrepreneurs to match problems with solutions. In other words, the political entrepreneurs, from the institutions, "will bring the solution", in the form of POTAs, for the problems that they perceive to exist in the Parliaments.

An analysis of the individual cases shows that political entrepreneurs were essential in the institutionalisation of POTAs, because they managed to overcome the reluctance of the Parliaments and their majorities, most of whom were little inclined to the experiment, given the nature of continental political-parliamentarian systems. In short, promoting this type of Offices in European Parliaments should be accepted institutionally as a mechanism for "reinforcing" Parliament's position with respect to the executive, with respect to the Government of the parliamentary majority party or parties. Therefore, the creation of these organizations was only politically feasible if there was a consensus. The POTAs developed and became consolidated in Europe, although under no circumstances on the same scale as the OTA, as was to be expected in Parliaments that lacked the US Congress' enormous powers. The nature of the European political system, in which Parliaments serve to support the Governments, meant that most POTAs had to "be authorised" by the latter (Denmark was the exception because the opposition majority in the Parliament imposed its opinion upon a minority Government) and, therefore, may have been a "concession" or an exchange with others, or a gesture of commitment to the democratic institutions.

In this section we have shown that the development of TA supply and the political construction of demand are two different processes. When TA began to form part of European Parliaments, the OTA's experience began to become known internationally, but only when some political entrepreneurs took it upon themselves to combine the "problems" identified in the Parliaments of overdependence on the bureaucrats', government's and lobbies' information, with solutions adopted in other environments. Indeed, one of the reasons mentioned most often for creating these POTA is not so much to sift the executive's information, but rather as a means of defence against the avalanche of information from the lobbies. That is why the POTAs' success and survival hinges on their capacity to respond to the incentives of their customers and others who request their information appropriately, in an institutional manner, building a relationship of trust with legislators that serves the key goal of legitimising decisions.

4. Institutional arrangements for TA in Parliaments: Dominant models and adaptive strategies

This section outlines the institutional arrangements that connect TA with politics and specifically with the Parliaments in some European countries. The analysis of institutional arrangements has traditionally sought to distinguish between: a) the conditions in existence when these institutions are created (at whose initiative, in what circumstances, how, etc.), that let the political entrepreneurs play an active role, and in which the constitutional rules are established and b) the effects of these constitutional arrangements on the incentives and opportunities structure to which that actors respond

during normal operation of the institutions, and as a result of which they develop adaptive strategies that maximise their survival and influence. In line with this distinction, in this section first we will analyse the origin of POTAs in Europe, then analyse two predominant organizational models, and lastly compare the importance of two fundamental dynamics in the adaptation processes and impact of these organizations in institutional contexts marked by the centralization of political power: on the one hand, the development by the Parliaments of a sense of ownership of the POTAs' information that gives the latter the edge over other producers of S&T related information, and secondly, the construction of support coalitions by these organizations.

4.1. Origins

Following the expansion of the idea to provide Parliament with S&T advisory functions, and after several failed attempts to imitate the American model -for example, in the German Parliament at the end of the Seventies and start of the Eighties-, from the mid-Eighties onwards, Europe began to witness certain successful initiatives, sponsored either by the government, on its own or on Parliament's initiative, or by Parliament itself, to set up different mechanisms designed to provide Parliament with an S&T advisory service.

It seems that the decision to start up these mechanisms, devised either solely to support Parliamentary or with a complementary mission, and the adoption of the constitutional model, essentially have to do with the nature of the country's political system, with the type of specific government-parliament relations, and above all with the civic traditions of civil society and how open the political elites are. The volume of means and resources with which the support mechanism is endowed, in other words, its organizational capacities to carry out the TA mission, unquestionably mirrors the Parliament's desire to assert itself (especially if it is an exclusive service) vis-à-vis the executive, a circumstance that existed in the case of the OTA, which at one time had a 200 people staff. As we have said already, the presence of political entrepreneurs who act as catalysts in the right circumstances is essential to success.

In most of the cases studied, it was Parliament who took the "initiative", although in a few cases it was the Government who provided the solution (see table 1). In France, the United Kingdom, Germany, the European Parliament and even Denmark, it was Parliament who rubber-stamped the initiative and supplied the resources. In France, the early creation of the OPECST seems to have been a by-product of the demands for the democratisation of French society that spurred the left wing's electoral success and the Mitterrand Presidency (Laurent, 2000). As for the British Parliament, the POST arose after several MPs sponsored and demanded the creation of a TA office, which was private during the trial phase and subsequently institutionalised within Parliament (Norton, 2000). In the case of the European Parliament, the demands made by a powerful Standing Committee were resolved internally by setting up a Parliamentary support unit within the European bureaucracy (Holdsworth, 2000). In the Danish Parliament, it was the majority opposition that forced the Government to create it (Kluver, 2000). In these cases, and in others such as Germany (Paschen, 2000) or Flanders, broadly speaking there was a favourable political juncture that enabled the respective parliaments to bolster their position with respect to the government or technocrats, but in our opinion the core variable is the sense of identity and reliability of one's own source of information production that the model of parliamentary support

mechanisms created to compete not only with the government sources of information, but above all with the lobbies' sources.

Table 1.- Institutions and offices providing scientific advice and Technology Assessment (TA) to some European Parliaments

Country	Acronym	Name	English translation	Year of creation-operation
Denmark	DBT	Teknologi-rådet	The Danish Board of Technology	1986
European Union	STOA	Scientific and Technological Options Assessment at European Parliament	Scientific and Technological Options Assessment	1985-88
Flanders region	viWTA	Samenleving en Technologie	Flemish Institute for Science and Technology Assessment	2000-2
France	OPECST	Office Parlementaire d' Evalutation des Choix Scientifiques et Technologiques	Parliamentary Office for Evaluation of Scientific and Technological Options	1983-85
Germany	TAB	Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag	Office of Technology Assessment at the German Parliament	1990
Switzerland	TA-SWISS	Centre d'évaluation des choix technologiques Zentrum für Technologiefolgen-Abschätzung	Centre for Technology Assessment (CTA) at the Swiss Science and Technology Council	1991
The Netherlands	Rathenau	Rathenau Instituut	Rathenau Institute (former NOTA)	1986
United Kingdom	POST	Parliamentary Office of Science and Technology	Parliamentary Office of Science and Technology	1986-89

Source: Own elaboration

In other cases the initiative, or at least the solution to the provision of the service, stemmed from government. The cases of Netherlands (van Eijndhovern, 2000) and Switzerland, although in the latter case the mechanism was created upon a joint initiative, represent a way of responding either to the demands of Parliament, which for constitutional reasons cannot create any new body (the case of Denmark), or to parliamentarians' demands for information and advice on S&T matters.

Given the nature of European political systems and relations between the executive and the legislature, in both cases the creation of the POTAs entailed the majority Government (except in the said cases of minority Governments such as Denmark) accepting or tolerating a limited experiment in giving Parliament a service that could be "used by the opposition". The political conditions that enabled these mid-80's initiatives to succeed in Europe underscore the importance of local and contingent elements; when it arose in Europe -unlike what occurred in the US in the Sixties-, it triggered a "hope" that technology would enable companies to become more competitive, and therefore what some have called the classic paradigm of TA (Van Eijndhoven, 1997), which

focused on the "early anticipation of adverse consequences", lost ground in Europe to other models such as the attempts to adapt the OTA paradigm, which focused on clarifying options and the provision of S&T advice, basically geared to Parliament (France, UK, Germany, European Parliament), or to models that emphasised the democratic control of technological developments and broader grass-roots involvement in decision-making (Netherlands, Denmark). Whatever the case, one of the key reasons behind the promotion of TA and POTAs in Europe is a hope that technology can further contribute to enhancing people's living conditions and boosting competitiveness, and perhaps that is why it is more closely connected to the policy process, albeit in a relatively marginal place such as Parliament.

It must be underscored that not all the initiatives to create parliamentary information and advice mechanisms were successful. In fact the difficulties involved in going beyond rhetoric and creating real and effective mechanisms, still persist in some of the POTAs that were equipped with scant resources, just as Parliaments are poorly equipped in comparison to the executives. Certain initiatives failed, albeit on a temporary basis, one example being the case of Germany, whose first initiatives date back to the mid-Seventies, the proposal having been explicitly rejected in 1982. Others, such as the 1989 proposal to set up a POTA in the Spanish Parliament, (Quintanilla, 1989) failed to get off the ground when early elections were called and the policy entrepreneurs changed. The causes, which are closely linked to parliamentary and political life, refer to the specific parliamentary sessions during which the initiatives were put forward; the fact that some MPs leave office whenever the political cycle changes means that sometimes these initiatives have failed, but also that they can be put forward again.

Attention should also be drawn to the contingency of POTAs, and of TA centres, in Europe. The same political dynamics that created the conditions for TA's institutionalisation may have created the conditions for its demise[4] (Bimber, 1996). These cases go to show that if POTAs' opportunities of emerging hinged on political factors, such as the institutional reinforcement of Parliament vis-à-vis the Executive, and the will to make TA part and parcel of parliamentary life, their chances of survival are conditioned by the local adaptive strategies that they adopt.

4.2. The models in their political context

Despite the extraordinary variety of institutional arrangements that govern how POTAs are run, a functional analysis will show that there are two main models (Petermann, 2000), in terms of their relationship with Parliament, that reflect the key mission/s of each case: *instrumental* and *discursive*. The instrumental model (which could have applied to the defunct OTA) includes the POTAs whose chief (or only) customer are the respective Parliaments or their Committees. This is the case of POST, TAB, STOA, viWTA and OPECST; more recently, similar initiatives have been launched in countries such as Italy and Greece, but they are less active. The discursive model applies to the countries that have a long-standing civic tradition and have asked the TA institutes not only to contribute to "enlighten" parliamentarians' (and even the government's) decision-making processes, but also to help their respective societies to foster a social

[4] The issue is an important one, due to the government decision to cease funding the Baden-Württemberg Centre for Technology Assessment in 2003, or the pressures that the Danish Board of Technology has had to put up with since a conservative majority coalition took office, for the first time in many years

debate about the acceptability of technologies. This second type of organization, whose customers are not limited to Parliaments, include the DBT, Ratheneau, and TA Swiss. The three agencies' remits include the possibility of also advising their respective governments.

Broadly speaking, the political systems in which these European POTAs operate are characterized by a more formal than actual separation of powers, so the legislature and the executive tend to overlap, and in fact many ministers are also members of parliament. They are also characterized by a strong degree of party discipline in the parliamentary arena. Similarly, one finds a considerable degree of concentration of legislative initiatives within the government or the executive. Furthermore, Parliamentary Committees usually mirror the distribution of power of the respective Parliaments, and their role tends to be limited to preparing and drafting legislation, while the Plenary Session has the last word. All these characteristics portray a context marked by the centralization of power, so the differences in our cases in the frequency with which the POTAs inform either the parliamentary committees, or individual MPs or the Plenary Session, might not be very relevant from the impact viewpoint.

On the issue of differences, and the variables linking the political system to the POTAs' institutional arrangements, stable majority governments (either of one party or with very small coalitions) are more frequent in the United Kingdom and Germany, while minority and/or multiple coalition governments are more usual in Flanders, Denmark, Netherlands and Switzerland. It is also to be noted that interest groups' and stakeholders' relative capacity to influence the political system is very considerable in Flanders and Switzerland, strong in Netherlands, Denmark and Germany, yet more moderate in the United Kingdom. A political spectrum fragmented into several represented parties would seem to favour the emergence of discursive POTAs, insofar as one would expect the beneficiaries of the TA output to be widely distributed (and not concentrated) between the parties and society.

Some empirical evidence has been gathered in order to provide a certain amount of information about the TA production process[5]. The POTAs studied face a major dilemma. First of all, and as far as the scope of their activities is concerned, one might think that generalist organizations are at an advantage to specialist organizations, which would have to compete with regulatory agencies and others producers of very specific TA. Yet at the same time, in Europe these organizations have always had very limited budgetary and human resources, and when resources are scant, sometimes it is better to specialize. Most of the cases we have studied are generalist organizations, and all operate in social contexts in which TA development capacities are widely distributed, so no single organization enjoys a monopoly of this mission. However, several of the POTAs work exclusively or mainly for Parliament (TAB, STOA, POST and viWTA), and the last three depend directly on it; whether or not this more restricted relationship derives in a greater impact on some of the roles, is something to be verified empirically. Be that as it may, STOA and POST are supervised by their respective parliaments, while in all the other cases, the “administrative” supervision or dependence (for core funding) is linked to some ministry, normally the one responsible for science-related matters.

[5] A survey was conducted among POTAs directors, using a semi-structure questionnaire covering a variety of topics about the mission, way of funding, resources and external links of their offices.

Inside the political system, POTAs must compete with other bodies that produce information about scientific and technical matters. These POTA generalist organizations exist alongside specialist regulatory agencies or committees linked to the executive or the Administration, and lobbies that produce information associated to certain interests and which also tends to be of a more specialized than generalist nature. Despite certain differences existing in the size of such organizations, those we have studied have modest, limited resources and have in common that public funds are their main source of finance.

POTAs tend to resort to scientific sources of information, although one should not underestimate the importance of non-scientific sources more related with the interest groups and civil society in general, especially in Netherlands, Denmark, Flanders and Switzerland, where their assigned missions are wider ranging. Even though it is the boards or councils of these organizations who decide what projects are taken on, there is a certain diversity in the degree of politicians' relative participation in these boards, which is greatest in STOA, in France, in POST and in viWTA. In all cases, the reports are widely distributed, although not of all these organizations have the promotion of social debate as part of their mission; it is in the case of Flanders, Denmark, Netherlands and Switzerland.

Finally, it must be stressed that none of these POTAs, regardless of the differences in the force of their political mandate, has been given anything resembling a power of veto, or even the compulsory role of informing certain legislation before it is passed. Their mission is limited to producing information and providing advice, and therefore in the absence of this type of institutionalised formal powers, the capacity to extend the bases of their internal and external ties, i.e., of networking, becomes very important, in particular with a view to their consolidation.

4.3. Adaptation strategies

Now we shall look at the incentives and opportunities that foster the interaction between politicians and parliamentarians on the one hand, and the POTA and its experts on the other. Some concepts of the organization theory apply to the analysis of POTAs which, once formed, face the challenge of surviving in local political environments, and therefore have to adapt their strategy and behaviour to their respective environment.

Very often, POTAs are initially approved for specific legislative periods, with reviews of the Offices' activities being scheduled beforehand, forcing these POTA to draw up adaptation strategies. Thus the first measure of a POTA's success is its capacity to develop strategies for adapting to the local political context, which enable it to survive and also to enhance its impact. We say adaptive success because they have survived reviews and also, in general, have turned into permanent parliamentary information production institutions.

Adaptation strategies are built upon the interaction between three factors: 1) the nature of the information required by politicians or legislators, or of the missions assigned; 2) experts' strategies in meeting these demands; 3) institutional arrangements. Thus there are two relevant issues: firstly, the attributes of the decision-making process and of the role that information production plays in it and, secondly, institutional constraints.

Adaptation strategies are based on identifying the incentive structures to which these POTAs must respond (the needs of the parliamentarians who act as their "principal") and keeping to the mandate established in its mission[6]. The adaptation strategy will depend on the power structure and its distribution: first of all, on the power / subordination relations between Parliament and the Executive; secondly, on the centralization of power within parliament, or on its decentralization; and lastly, on the type of autonomy / dependence (authority) relationship between the POTA and its parliamentary principal. Hence the reason for this TA's preferential connection with Parliament can only be explained if one understands its nature as an information production process constrained by the political and parliamentary system's institutional arrangements.

In European parliamentary systems, it is the Government who has the legislative initiative and, more often than not, parliamentary majorities serve to support government projects. Whatever the case, consideration must also be given to the parliamentarians' objectives, and their relationship with the Parliament's functions in relation to the Government. If the parliamentarians' essential objective is re-election, and this depends on their performance in their constituencies or with regard to their party, the tendency will be to legislate or to influence legislation; in European parliamentary systems, this means negotiating with the executive. Parliamentarians may also seek to enhance public policy, in which case the tendency to exercise the mission of controlling the government creates a context that is more favourable to the use of POTA-produced information[7].

One of the essential aspects of the institutional arrangements governing interaction between the demands for information and the POTA's capacity to supply it is the extent to which power within Parliament is highly centralized or, on the contrary, more distributed; this is essential for understanding the nature and type of relations that may exist between Parliaments and POTAs[8].

If a Parliament's regulations vest the Bureau and the House with all the powers, then the legislative committees have little authority and depend heavily on the political parties, which find it easier to control discipline in the House. For example, in the Spanish Parliament, the Committees act "by delegation" from the House and, actually, tend to be the mechanism where the legislative proposals put forward by the Government are implement if there is a large enough parliamentary majority. On the other end of the spectrum, in a European Parliament-type structure, it is essentially the Committees that "prefigure" the House's decision, because they prepare and hold lengthy discussions about the different matters on the agenda, and party discipline is very limited.

When Parliaments and their committees make decisions, or when parliamentarians form their opinions, these are generally based on their political preferences, public opinion,

[6] Though relations can be explored on the basis of the principal-agent relationship idea, if one goes beyond the metaphor, the problem is that determining who the principal is in each case entails taking for granted that parliamentary structures are similar. Parliament is a principal, generally represented by the speaker, but there may be other principals within Parliament, which is not a hierarchical body.

[7] It would be interesting to ascertain to what extent the type of specific information products provided by the POTAs makes it easier for parliamentarians to "legislate" or to "control"; in principle, given that TA is a slow process, we are inclined to think that it is more relevant in the control tasks

[8] The number of different political parties could provide an alternative explanation for the decentralization of power in parliament. Germany (4/5), Denmark (8), Holland (9/10).

the stance taken by the parties, especially those that support the Government, etc. and above all on the information produced by the bureaucrats who serve the Executive, and perhaps on the information produced by interest groups.

Their success and impact depend on their adapting to the environment; but the POTA's model of organization will mirror the model of "centralization of power". If power is highly centralized (as tends to occur in European Parliaments), there are fewer chances of consolidating a pluralist clientele. The more power is centralized within Parliament, the more demand for "policy advice" is likely to become politicised, and the more likely it is that information will give rise to back-up information rather than debate, and the provision of information will tend to come from the Executive, supported by the parliamentary majority.

Events at the OTA have shown that, of the two models described above, the instrumental model has the greatest impact in a relatively decentralised power structure marked by division. In different circumstances, and given that none of these organizations have been given institutional powers to veto policies, this model may come up against political hurdles when it attempts to really influence decisions. Even though it cannot be denied that having Parliament as one's only or chief customer, and a more specific mission, can be advantages for gaining access at the right time.

The third factor associated with the structure of power and its distribution refers to a POTA's degree of autonomy or dependency with respect to Parliament. Despite their acknowledged autonomy, the instrumental POTAs' dependence on or the "authority" of the legislators produces a sense of "owner identity" that in fact constrains their autonomy, and can manifest itself in the selection of objects for analysis. If this argument is taken to the extreme, sometimes it is the majority parliamentary groups who decide how an instrumental POTA operates.

In this context, following adaptation strategies devised to strengthen POTA experts' autonomy and independence is limited by the distrust that this can trigger among the principals, who will only support the POTA insofar as, apart from being neutral, non partisan etc., it is instrumental to their political goals. Remaining loyal to the principal fosters trust and that, in theory, is the decisive factor for increasing access.

However, the fact is that politicians inevitably have countless alternative sources of information and decision-making criteria. Besides, having only one principal, as occurs with instrumental POTAs, makes them extraordinarily dependent upon their functionality.

In the case of discursive POTAs, the Parliamentary information and advice service is provided by organizations that are significantly more independent and autonomous. Having a large number of missions, i.e., principals (Parliament, the public at large, sometimes the Government), makes them extraordinarily more independent. The slip side is that, even when there is a minimum degree of neutrality, non-partisanship, etc., there is unquestionably less of a sense of "owner identity" regarding the TA results. Furthermore, these institutions' capacity allows them to manoeuvre socially in order to further the proposed objectives directly.

Theory has it that the less centralized a Parliament's power structure is, the more likely a POTA will be to establish itself and have an impact. By impact we mean the ability to have a bearing on socio-political change, or on the change in policies. So far we have seen how factors conditioning the distribution of power essentially constrain POTAs' opportunities to access and have an influence on Parliamentary decisions, and now we must look at a second issue, namely POTAs' capacity to manoeuvre with respect to the world of social and political actors outside Parliament. In institutional contexts where political divides and decentralization are not so common, a POTA's impact largely hinges on its ability to build coalitions that defend and support its information products, and this entails mobilizing actors outside Parliament, which is difficult and can trigger institutional conflicts with a POTA's principal, namely the Parliament.

A large body of literature has taken the "advocacy coalition" (Sabatier, 1988) perspective as the theoretical framework for analysing public policies, and especially their changes. Some of this theory's premises can be very useful for the subsequent empirical analysis of how the TA organizations' impact differs in line with the dominant institutional models that we have outlined. First of all, this perspective focuses on the relevance of S&T information in the political process and in the change of certain policies. Secondly, any impact on changes in policies can only be broached from a broad time perspective of several years. In other words, applied to our case, coalition-building is associated to the prior institutional consolidation of the TA organizations. There are several reasons for this, but perhaps the most significant is that these organizations must be capable of gaining recognition and visibility before they set up networks. Thirdly, any analysis conducted to ascertain why policies change in our societies should not be limited to a single organization, be it governmental or of any other type, but to the subsystem of that policy, or what has become known as "policy domain". Besides, the concept of "policy domain" must be broadened to include not only the traditional triangle formed by the Administration, legislature and interest groups, but also two other categories of actors: on the one hand, the Media, academia, and political analysts, and on the other, the subnational and supranational levels of government, which sometimes give rise to innovations and disseminate ideas.

Another question is the stability of the effects and their duration. Institutional arrangements permit different degrees of legislative change: much less so in a system with a strong separation of powers than in a parliamentary system. A POTA's TA product or process may influence political options, but not necessarily remain in time. In parliamentary systems in which the majority holds most power, the majority coalition or party can change not only policies but even legislation many times, provided that they consider that this will not overly damage their electoral gains in the medium term. This is where the breadth of coalitions comes into play and where the apparent advantage of enjoying direct access to parliamentarians and the sense of owner identity regarding its products can become an obstacle. TA stems from and is institutionalised on the basis of relations between technology and society that are always complex and sometimes opaque; the organizations that produce TA will have an impact as long as there are enough actors who perceive their effects as positive, not only because they clarify options, but because they legitimate some of them through their evaluation. TA can create or change the point of view not only of politicians, but also of industry or of the public at large. External ties matter because the power bases that are behind the several options are very often external to the political system.

In this section we have shown that is possible to predict the evolution of POTAs or at least, given the institutional context, their best adaptive strategy. Straying from that optimum strategy can trigger conditions that jeopardise their very survival. Furthermore, this analysis has provided the key elements of an institutional theory regarding the factors that determine how TA activities are likely to impact the political system and society.

5. The impact of TA in Parliament

One might suppose that the impact of TA activities is the direct result of the "quality of information", of the "professionalism of the producers of that information", of the unique nature of the subject matter, or of any other intentional or simply voluntarist variable. Our argument, however, is that *the institutional context* in which TA takes place and the *modes of organization of TA production*, the interaction between politicians' demands and the POTAs' experts' strategies, are key factors in the general explanation of the levels of impact and the varieties thereof. Then we argue that the institutional arrangements that govern POTAs, the rules of the political game and the incentive structure that POTAs face, are key factors for explaining the depth and extension of the impact of their TA activities[9], as well as their adaptation and consolidation. In this respect, we would emphasize the contradictions that sometimes exist between the institutional arrangements and the relative influence of the technological assessment of the organizations linked to the Parliaments. The two institutional properties discussed in the previous section: autonomy/dependence and exclusivity/non-exclusivity of the assessment for the parliaments are essential for understanding the diversity of impacts.

We aim to construct an analysis that lets us associate the probability of a given type of impact (see the typology) to the dominant types of institutional arrangements (and the access and coalition structures that they permit or foster); however, we might also understand that institutional structures are "prerequisites" but do not suffice to predict the type of impact and the results in each specific case. This exercise does not aim to explain each and every one of the cases of TA reports and their impact, but basically to use empirical analysis to put forward a normative proposal that lets us understand the expected impact of TA activities, and at the same time that lets us reinforce or maximize the influence of its products.

In the previous section we have shown that POTAs' impact is the result of the combination of two main variables: the first is the organizations' capacity to build broad support coalitions both inside and outside the legislature, and the second is their capacity to access decision-makers in a context of competition with other organizations that also produce evaluative information about technological options. Instrumental and discursive POTAs have both types of these capacities, in differing degrees, and this degree depends in turn on the institutional context, the rules of the game and the incentive structure within which these organizations operate.

[9] The explanation is essentially probabilistic, because in specific circumstances, other general explanatory variables (political leadership, changes of political juncture, etc.) or regarding the nature of the specific policy domain affected by the TA, may also serve to interpret the situations.

It seems clear that the POTAs' degree of autonomy-dependence means that, in principle, the instrumental types enjoy more direct access to parliamentarians; yet at the same time, to avoid jeopardising their survival through disloyalties to their principals, less capacity to engage in building coalitions "outside" Parliament. On the flip side, the more discursive POTAs' direct access to parliament is more conditioned by the lack of a sense of "owner identity", because these institutions can work for other principals; in compensation, their greater autonomy enables them to foster the mobilization of support coalitions.

If empirically the two aforementioned dimensions occurred at the same time in a certain type of TA organization, predicting its impact relative would be very simple and linear. However, this would only be imaginable in a world where politicians only cared about the truth and about improving public policies. In the real context of political systems and, in particular, of parliamentary ones, with the actual incentives and restrictions, a contradictory relationship exists between those two dimensions; in other words, if a greater capacity to build broad coalitions were associated inversely to the capacity to gain more direct and restricted access to legislators, a clear relationship could not be said to exist between a specific POTA model and a greater impact. What we argue is that not only can those contradictions occur, but also that the relationship is far more complex, and controlled by variables associated to the specific institutional arrangements, such as: political centralization or decentralization in the legislature, the relative power of the parliamentary committees, the strength of party discipline, the power of the political mandate given to these organizations when they are created, and by the dynamics by which the politicians obtain legitimacy for their decisions. In addition to all these variables that are external to TA organizations, there are other internal factors, related to these organizations' information production process, which have to do with organizational capacities (budgetary and human resources) that must also be borne in mind when analysing the impact.

The coalitions' breadth and access matter because the impact of TA, or any policy advice, is also conditioned by the information communication structure. That structure is what connects those who produce the information and those who use it or its customers. Be that as it may, what seems certain is that, in absolute terms, the broader the "coalition" of political, social and media actors, the bigger the impact of the TA (science-based knowledge for political use in non-academic communication formats) produced by specialised institutions. The greater the inclusivity in the number of actors (stakeholders) associated to the "technology" or to the "problem" who assimilate the proposal, the greater the impact[10].

Impacts can be classified according to the typology[11] we present in table 2. We will now relate this with the institutional types that we have developed, in order to at least generate a few descriptive or normative hypotheses as to how POTAs can augment their impact. The implicit assumption of this typology of impacts is that they are not

[10] Some case studies based-analysis has found that the strength of the OTA analytic process was its emphasis on broad participation. This practice increased the likelihood of impact by involving many of the actors crucial for an effective "distribution network" (Whiteman, 1997, p. 188).

[11] This typology has been developed by the research team of the project TAMI (Technology Assessment: between Meted and Impact) coordinated by Miltos Liakopoulos and Michael Decker, and involving most of the European POTAs.

constrained to the “change in policies”, but instead can be limited, in a gradient, to “raising knowledge” or “framing the problem”. It might seem that the only "justification" of POTAs is that they produce substantive third dimension impacts, yet depending on the dominant institutional arrangements, it may suffice if, with the "information's owner identity" it achieves impacts associated to raising knowledge or forming of opinions.

Table 2: Typology of Impacts

IMPACT DIMENSION ISSUE DIMENSION	I. RAISING KNOWLEDGE	II. FORMING ATTITUDES /OPINIONS	III. INITIALISING ACTIONS
TECHNOLOGICAL /SCIENTIFIC ASPECTS	SCIENTIFIC ASSESSMENT a) Technical options assessed and made visible b) Comprehensive overview on consequences given	AGENDA SETTING g) Setting the agenda in the political debate l) Stimulating public debate n) Introducing visions or scenarios	NEW R&D POLICIES v) New action plan or initiative to further scrutinize the problem decided q) New orientation in policies established
SOCIETAL ASPECTS	SOCIAL MAPPING d) Structure of conflicts made transparent	MEDIATION h) Blockade running i) Bridge building j) Self-reflecting among actors	NEW DECISION MAKING PROCESSES u) New ways of governance introduced w) Initiative to intensify public debate taken
POLICY ASPECTS	POLICY ANALYSIS e) Policy objectives explored f) Existing policies assessed	RE-STRUCTURING THE POLICY DEBATE k) Comprehensiveness in policies increased p) Policies evaluated through debate o) Democratic legitimisation perceived	NEW POLICIES r) New legislation is passed s) Policy alternatives filtered t) Innovations implemented

Source: TAMI Report (2003), forthcoming 2004.

According to this typology of impacts, POTAs can be said to have succeeded in the traditional mission of providing information for the political process. The review of their work point to a bigger impact on the roles included in the “knowledge production” dimension than on the other two dimensions. However, it must be added that a POTA's organizational age is a good predictor of a growing impact on this traditional role.

Conversely, we have found less of an impact on the roles included in the third dimension, "initialising actions", than in the other two. Therefore, in accordance with one of our initial hypotheses, the more constrained ties between certain POTAs and their respective parliaments do not seem to guarantee a bigger impact on legislation or on the change of policies in contexts marked by the centralization of power and control by majority. Perhaps the fact that the structure of Europe's parliaments is more prone to promoting the function of "controlling" the Government's action rather than legislation, explains the limited impacts, on the basis of this institutional constraint. There is no question that the lack of a strong political mandate, with a certain veto capacity, has something that do with this result. Yet this is only part of the explanation.

Furthermore, the three dimensions of the impacts must be considered from a time perspective. In time, the organizations studied seem to have consolidated the roles related to the production of knowledge, as demonstrated by the hundreds of briefings, notes, and dozens of reports, hearings, public debates or consensus conferences. Nonetheless, the impact on the first dimension roles are closely linked to capacities and resources, in particular scientific advice and policy analysis in specific matters that require a high level of internal or external expertise[12]. The quality of these products depends heavily of available funding, but their impact also depends on the relative use that decision-makers make of alternative sources of information production. However, with equal resources, discursive-type POTAs may have a bigger impact on the knowledge production role known as “social mapping” (the role whose output is to outline the structure of conflicts) due to factors basically related with the process (method) by which the information is produced. The impact in this dimension depends on the sense of owner identity that politicians and parliamentarians afford this information, on their trust in the POTA, which is divided between institutional neutrality and loyalty to the latter.

The importance of the time perspective is evident due to the simple fact that information production, as a product or process, is a precondition for influencing the opinions and attitudes of the actors involved, which is the second impact dimension of the typology. Influencing the agenda is one of the roles within this second dimension, and there are several ways of doing this, but one traditional one is “framing the problem”(Schön & Rein, 1994) or structuring the issue. Influencing the agenda means that the decision-makers accept that the information must be considered politically. Gaining access to decision-makers and attracting their attention can be a determining factor, especially when different sources of production of information are vying to attract politicians and legislators' attention. Once again, the POTAs that respond to a model in which external ties play an important role in the information production process, such as discursive POTAs, are likely to have a bigger impact on other roles of this dimension, such as brokering and communication between actors (breaking deadlocks in dialogue, bridge-building) or stimulating of a debate in which the options are assessed, because they have access to actors other than politicians.

The instances of strong political impact, which pertain to the "Initialising actions" dimension, are few and far between. Mention has been made of a DBT report on "food and genes", which sparked a political debate that led to legislation on genetically modified food, although the DBT interviewees acknowledge that it is very difficult to

[12] According to some role descriptions made by TAMI, in certain areas it can be difficult to find competent, independent experts: e.g.: FX nuclear power, pharmacy)

attribute the legislation to the TA's impact, i.e., to isolate that cause. Other examples of outputs reviewed on “policy alternatives filtered”, are also Danish. The limited examples in this dimension seem to indicate that having a second dimension impact, i.e. the change in attitudes and opinions, can be a precondition for having an impact on policies and legislation.

TA organizations seem to have established themselves, and have survived minor changes and “reviews” of their activities, in which they have received support. The DBT "crisis" or the recent demise of the Baden-Württemberg CTA point to the unstable balances that TA organizations face in the context of the political system.

6. Conclusions

Having reached this point, it is time to draw a few normative conclusions. In the context of today's political systems, the two types of POTA face such a dilemma about their future that one could say that they are not balanced systems, even if they have attained a certain degree of recognition and institutionalisation. The advantage of the more instrumental varieties, which tend to be subject to greater political authority, is that they have direct access to decision-makers, but the way in which the latter demand the information only contributes decisively to their impact when the information has a clear "owner identity", as compared to external, non-parliamentary sources. Developing an owner identity entails building up parliamentarians' political -and not just technical- trust in the POTAs, and that is achieved through loyalty, i.e., by POTAs limiting their own capacity for initiative, especially if this is not consistent with the current parliamentary majorities. POTAs that are overly active in promoting TA options run the risk of jeopardising the institution's sense of collective identity and trust; if the activism is or has been consistent with the parliamentary majority, the risk might occur if there is likely to be a change of majority that may have regarded the POTA's activism as too instrumental in favour of the government majority. By way of example, POST and TAB grew stronger during “left-wing” majorities. So forcing the impact, especially in the initiatives dimension, can put the organization's very survival at risk in the medium term.

Furthermore, the more discursive POTAs, which are less instrumentalised by their respective parliaments, have greater scope for manoeuvring to enhance the impact of their TA output, because access to social actors is one of their institutionalised missions. They seem to have less of a direct influence on parliamentarians, in information terms, insofar as the sense of ownership of the information is not so intense as in the instrumental POTAs, although it is potentially larger due to their capacity to build social coalitions in the public opinion that change the political vision in a specific field. The risk that these POTAs may face is that they are nothing more than "independent institutes" that depend on the national budget and may end up paying the price of their autonomy and independence if their activism upsets the political preferences or interests of the politicians in office at a given moment. The development of discursive TA approaches in civil society, supported by private establishments, might be a justification for stopping their public support.

If these organizations focused on low profile missions (as a documentation service), perhaps they would run less of a risk, but the impact might be marginal, because it

entails complete submission to political authority. If the information functions multiply, then maintaining it calls for technical discipline (neutrality, etc) and an institutional identity that can only be maintained through less autonomy and loyalty to the institution.

If the option is to "act", by building coalitions to enhance the impact, then there is no risk in the short term if they align with the "parliamentary majority"; in the medium term, however, a new majority can make one "pay" for institutional disloyalties. In short, the shift to activism entails remaining subject to the costs and benefits of the political alignment.

The fact is that some of the best adaptation strategies that POTAs use to improve their chances of survival clash structurally with the desire to increase the direct impact of their TA activities on policy-making activities.

Lastly, it is important to understand how the organization of power (the extent to which it is centralized) conditions the POTAs' adaptation strategy. The more concentrated power is, the higher the "risk of partisan policy or politicisation", and the more likely they are to survive in the short term. At the same time, the more power that the (few and disciplined) parties and the Speaker of the House have than the Committees, the fewer opportunities they will have to build up broad supporting customer bases inside the Parliament (see table 3).

Table 3.- Descriptive and normative hypotheses regarding the survival and impact of POTAs

- Quality, neutrality and external communication are factors that influence the impact on all the aspects considered.
- Quality depends heavily on organizational capabilities (budgetary, human, etc), and neutrality depends on access to sources of independent expertise.
- The scope of communication depends on the density of the external networks (with academia, the Media, stakeholders, industry) that allows the autonomy to be increased.
- The impact on some roles is closely related to the participatory information production processes (methods), which call for a certain density in the external networks.
- A specific mandate and close ties with the institutions make it easier for POTAs to gain access to politicians, due a sense of owner identity, as opposed to competitor organizations
- The instrumental type POTA model is related with a more specific mandate and a potentially more direct access
- Capturing politicians' attention depends not only on the access but also on the extent to which the former see gains in terms of legitimacy for their decisions
- The capacity of paying attention to or receiving information is conditioned by trust in the source, and this trust increases with the sense of identity and "exclusiveness"
- The legitimacy of decisions is related to the scientific-technical quality of the information input and also with the breadth of the social base behind them (transparency).
- In a political system marked by the centralization of power in executive, with Parliaments dominated by majorities or coalition governments, with little separation of powers and where committees mirror the distribution of power in the house, the POTAs stand the best chances of survival and impact if they form support coalitions that include outside actors.
- The discursive model of POTA, with more general missions that imply more external relations, is more likely to be able to form such coalitions.
- The risk of transforming either of the two models into activism is that it is subject to the costs and benefits of a political alignment subject to changes.

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