Public R&D and Budgeting: Ontological Discussion, Country Examples, and A Technical Note on Turkey

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Abstract

What does Research and Development (R&D) mean for public economy? Is it a typical investment, a function of public service, or a kind of politico-economic gambling? Grounding on its "risky" economic character, we argue that, it is a "sui-generis" type of both economic and fiscal activity. Then, if so, the question is "where it should be displayed throughout the government budget? Due to the fact that, it is not a function of the state, R&D appropriations ought to be classified in "economic classification" of public budgets. This should be done for two ontological reasons: First, in a neo-liberal age, in which there is strong emphasis on the "minimal state", a R&D type of -so to speak- investment cannot be perceived as a normal state activity. Even if it is so, and second, since it is an economic endeavor, it should be classified under the economic classification, not in functional one. Furthermore, the society has the right to discern the share of outlays on R&D within total public spending. The best way of doing this is to annex a brief chart to the budget or to issue a separate budget or report on R&D expenditures of state agencies, unless it is possible to do all.

Keywords: Public R&D, Public Budgeting, Turkish Budgeting System, Budget Classification.
JEL Classification Codes: H59, H61, O30, O32.

INTRODUCTION: PUBLIC SECTOR AND R&D

González and Pazó (2008: 371), have argued that [as a result of "non-rival" and "partially excludable" character of R&D] externalities seen in R&D processes lead to "a gap between private and social profitability of these activities" and this decreases the resources allocated to R&D among private sector (see also Diao et al., 1999: 365-366; Breznitz and Zehavi, 2010: 302). They called this situation as "market failure", and public intervention to solve this problem is legitimate for them. This indicates that, even after "Keynesian Technostatism" period, i.e. in a neoliberal age, the state intervention is still a valid tool to ameliorate market failures. In this sense, Tyfield (2012: 155) argued that the "[n]eoliberalism, represents the definitive repudiation of conceptions of science as a self-justified 'republic' of rational-empirical argument productive of public knowledge, by attempting to subsume this republic of science within economic marketplaces".

Comparing the social optimum and the competitive equilibrium paths, Perez-Sebastian (2007: 3814) has found that "public intervention can produce important benefits, and that both technology and capital accumulation policies have very similar contribution to the welfare improvement. This finding is interesting, because in R&D-based non-scale models of growth in Jones (1995), policy does not affect long-run growth. [He has] shown, however, that

level effects, and thus preserving the important role attributed by more traditional R&D-based growth models to policymakers may be significant.

Generally, we can mention about three types of state intervention regarding R&D and innovation: (i) the public financier/private provider model with minimal state involvement beyond public funding; (ii) the state as a facilitator—a middle ground model in which the state is involved through the setup of different types of inter and intra-industry collaborative forums; and (iii) public production—a more expansive model of public involvement in which public institutions are actively involved in production of industrial R&D (Breznitz and Zehavi, 2010: 301-302).

Public sector, out of direct public production, encourages R&D in private sector via subsidies as grants and loans, and especially as expensing or utilizing tax credits by tax policy (Lee, 2011: 256). Many OECD countries, and the U.S. federal government as well as many other states, provide R&D incentives. For example R&D spending in Canada can be expensed. Unused deductions can be carried forward indefinitely. The statutory credit rates are 20% and 35%, respectively, for larger and smaller Canadian-controlled corporations. [Similarly] U.S. firms can expense R&D spending or they can take an R&D tax credit. Unused credits can be carried back three years and forward 15 years. The statutory credit rate is 20% of qualified costs in excess of a 'base amount. (Russo, 2004: 314, 319). In Turkey, firms can expense 100% of R&D expenditures and carry back the unused part of them forever.

Diao et.al. (1999: 367) in their study on R&D projections for Japan, as results of R&D subsidy scenarios, have found that to reach a 3.07% long-run growth rate, the needed subsidy is equivalent to 6% of total R&D production costs. The subsidy is financed by a lump-sum tax on household income. The cost of the R&D subsidy policies, as a ratio of gross domestic product, is found to be quite modest. In the case of the 6% R&D subsidy, the lump-sum tax is calculated to be equivalent to 0.3% of the country's GDP. Similarly, to finance the 6% subsidy to employers of differentiated capital, the lump-sum tax is equivalent to 0.8% of the GDP.

Regarding R&D, the most extensive form of state intervention is the production of R&D by public sector. Public production is commonly understood to imply research conducted in government research institutes, universities, and non-profit research institutes such as hospitals (Breznitz and Zehavi, 2010: 301-304). Here I should touch on a criticism towards direct public R&D activities which is the thesis that the public R&D will lead to a "crowding-out" effect in private sector (Lee 2011: 256-257; Breznitz and Zehavi, 2010: 305). However, based on a survey financed by the Spanish Ministry of Industry, the Survey on Firm Strategies, a study by González and Pazó (2008) have resulted in indicating that there is no crowding-out effect of public R&D support, neither full nor partial.

The traditional view on public sector service organizations, have used to characterize them as lacking in innovation discovery and being slow to adopt and diffuse innovations from other service sectors. Several studies have found that, this may not be true. A Canadian study found that between 1998 and 2000, more public entities have produced organizational and technological innovations than the private sector corporations. Empirical studies reveal that the public sector is a fertile ground for innovation. In a study measuring

innovation in public institutions in Nordic countries, has found results that as high as 91.5 of public entities were reporting innovations (Townsend, 2013: 21). Similarly, in Japan, it was the state that bureaucratically welded together corporate activities around an organizational and technological research program that brought Japan into competitive pre-eminence through industrialization (a model that was subsequently followed in South Korea, Taiwan, Brazil, Singapore and now plays a crucial role in China) (Harvey, 2011: 92). In Taiwan, the state had mitigated the problem of information asymmetries [between state and industry] by undertaking the core R&D itself, such as that on semiconductors (Breznitz and Zehavi, 2010: 305). Also in EU, in absolute terms, government science and technology (S&T) budgets are still growing, despite the ratio of the S&T budgets share of the total government expenditure has remained roughly idem in most countries (Makkonen, 2013: 818-819).

1. Risk Factor and Sui-Generis Character of Private and Public R&D Activities

Non semper ea sunt quae videntur[*]

Bel (2013: 74) has calculated that "out of 3,000 initial ideas, 300 gave rise to experiments or patent files, out of which 125 became real projects, generating two product launches. Of these, only one became a real commercial success". Similarly, another study has revealed that "in a sample of 1,091 inventions, only 75 actually reach the market place" (Davidson and Spong, 2010: 366). Nasierowski (2012: 17) has estimated that "only 1 out of 7 innovative projects bring commercial success". As the last example, for Brown and Osborne (2013: 187) "only 20 per cent of innovations are viable and sustainable". As it can be seen, investing in R&D is a fireball of the ultimate risk.

Actually, because of this risk factor inherent in R&D and innovation "in the sense that innovative actions aimed at the future always confront uncertainty" (Berglund, 2007: 500), these calculations and results are not surprising for researchers. This risk factor is also called "idiosyncratic risk" (IR) what is "the degree to which firm-specific returns are more volatile than aggregate market returns" (Mazzucato and Tancioni, 2008: 779).

Romer (1990: 72) puts forward that you can estimate approximate returns on conventional investment. On the other hand, investment on R&D is never grounded on approximate or definite calculations on expenditures nor returns. During R&D process, on expenditure side, you may meet additional unintended expenses on extra material, hardware or software; and on return side, your R&D endeavor may totally fail and there may be any profit from relevant R&D project. According to me, its mentioned differences from conventional investments and risky character that emanates from unpredictability, make R&D based innovation a "sui-generis" activity within economic progress.

Although there are arguments contending that uncertainty risk "negatively affects the innovation of entrepreneurial firms far more than that of publicly owned firms" (Caggese, 2012: 288), I propose that "the risk" is valid for public sector at least as that for private firms. Even I go far by arguing that the

[*] In most cases, things are different from their appearance.

risk in public factor is far more higher and is structural on account of "personnel motivation" problems. That is, "incentives in the public sector are usually 'softe' than those in the private sector: employment, pay, and rank are generally more flexible in the private than the public sector (Breznitz and Zehavi, 2010: 306; also see Townsend, 2013: 24). And this makes public R&D activities more risky in terms of attaining success at the end of the process. In addition to this, due to the target differences between "maximization of profit" in private sector and "maximizing public benefit" in public, the calculation of costs and benefits in private sector is easier than that in public (Brown and Osborne, 2013: 189, 193; Townsend, 2013: 30). Naturally, this situation increases the uncertainty and the likelihood of failure in public R&D activities.

A second problem about the risk assessment in public sector is that, as a mechanism that is grounded on risk minimizing, accountability, control and on efficient use of public resources; public sphere has a structural dysfunctioning characteristic concerning R&D. That is, "The New Public Management (NPM) is characterized by efficiency, accountability, performance measurement and rational planning … and all levels of public employees would suffer penalties and be viewed as 'wasting resources' if the experiment failed. [This non-risk-taking behavior is also identified as 'not making waves' or 'not bucking the system'. Here the goal of efficiency is inconsistent with the goal of innovation" (Townsend, 2013: 26)]. Thus, the public pressure (and scrutiny) on risk-taking is more relevant for public sector than that on private one (Brown and Osborne, 2013: 189, 193).

Another risk factor regarding public R&D is financial risk in public procurement. "The United States, along with Japan, China and other Asian countries, has been using public procurement to promote innovation since the nineteenth century. The Internet, GPS technology, the semi-conductor industry and passenger jets are perhaps the most prominent examples which have resulted from government innovation-oriented procurement. … [I]n contrast to regular procurement in which governments place orders for ready-made or ''off-the-shelf'' products, procurement for innovation involves procuring products that might require additional R&D efforts and, consequently, carry additional risks" (Kalvet and Lember, 2010: 241-242).

Finally, other group of risks may "emerge from a range of unforeseen events which may cause various actors involved in the process to reassess their priorities and change their expectations, which, in turn, may lead to further dysfunctional responses by other actors involved in the process, and so on and so forth". These are called "turbulence risks" (Kalvet and Lember, 2010: 244).

The risks mentioned above, make the transparency of public R&D activities and expenditures a vital issue before policy makers and public attention. By looking at the budget, if policy makers have no idea about total or the sum of expenditures used by each administration as well as total government R&D spending, then they cannot create and implement proper and good coordinated R&D policies. Needless to say, these variables are crucial in modern information economy. Because of the fact that we cannot mention only about information economy, but also information society, the budgetary display of these variables is also staminal for the society to make sure that the government applies right R&D policies with accordant resources. Let's make it more precise.

2. R&D Display in Public Budgeting

The issue of how R&D spending should be displayed in the public budget is an important matter for two reasons. First, the composition of the budget must categorize expenditures and revenues in accordance with their ontological congenerics (i.e. similar items should be grouped or classified together). When we do this, we will not only classify items, but also we will do this on an ontologically correct ground. Secondly, the same composition (meaningly classification) should make it possible for researchers and common man to comprehend the totals (and distribution) of public R&D (among public institutions). Thus, the fiscal side of innovation based economic policy will gain a high level of clearance before public scrutiny. In this effort, here I have analyzed the situation in some OECD countries and eventually in Turkey with a final technical recommendation for her.

2.1. Experience from Selected Countries

Due to the fact that Turkey is an OECD member, it will be better to choose countries from the Organization. Firstly I should admit that, because of their different economic and fiscal backgrounds, it was very difficult to incorporate information from selected countries into one chart. Furthermore, because of the difficulty (and impossibility in some cases) in reaching English versions of budget texts and case studies on budget classification systems, the linguistic obstacle on evaluating budgetary terms was very coercive. Despite these difficulties, with in silico help of information technology (this was also meaningful for a study on R&D) and of colleagues who use native languages of selected countries as their second language, eventually I could succeed in revealing a precise portrait. Results are given at the Table 1.

Table 1: R&D Expenditures Display in General Budgets of Selected Counties

Country	A Codification System Displayed in Budget Text?	Classification Type that R&D Expenditures Classified	Classification Level of R&D Expenditures	R&D Expenditures are Placed under (or separately):	Separate R&D Budget or Report Related to General Budget
USA*	Yes	Object (line-item)	2	Contractual Services And Supplies	Yes
UK**	No	Program	2	General Public Services	No
GERMANY	Yes	Object and Functional	1	Education, Science, Research and Culture Issues	Yes
FRANCE	Yes	Functional (as Programs)	1	Research and High education Services	Yes
ITALY	No	Functional (as Missions) and Institutional	1	As a separate Function (Mission)	No
SPAİN	Yes	Functional (as Expenditure Policies)	2	As a separate policy	No
CANADA	No	None	None	Each Topic	No
AUSTRALIA	No	Institutional and Functional	1	Each Institution	Yes***
TURKEY	Yes	Functional	2	Each Function	No

*As "Research and Development Contracts".

** In UK, the total of R&D expenditures are not shown in general budget, but in "Public Spending Statistics" by Treasury, and R&D expenditures are provided under "General Public Services" in this text which is classified in accordance with program type of budget classification.

*** In line with functional classification at the preliminary of the General Budget.

Source: Based on data taken from relevant budget texts and web pages of concerned ministries from each country.

a. Unites States of America (USA)

Starting with the "most developed one", USA, we face an interesting picture. Although the state has proceeded to the Performance Budgeting System (PBS), neither she has a type of namely "performance classification" nor a multi-classification system in the Federal Budget. The fiscal system of the federal government uses an "Object Classification" based on line-item. On the other hand, it is impossible to follow R&D expenditures after consolidation of the Federal Budget. Id est, if we look at tables in "Fiscal Year 2014 Budget of the US Government", we cannot see any "R&D" row. We can find it by turning the pages of "Object Class Analysis" annexed to the Budget. For each administration, the expenditure on R&D is placed under "Contractual Services and Supplies" item or object. In addition to this, White House Office of Science and Technology Policy, that is also responsible for coordinating the R&D priorities of government bodies in partnership with the Office of Management and Budget, presents a "Federal R&D Budget" to the President, that includes and sums the R&D expenditures of these bodies. This is a very important and consolidating practice and illustrates the emphasize on R&D and innovation by the executive body. It is also useful to practically compare government bodies' R&D expenditures and estimates to prioritize them.

b. United Kingdom (UK)

In UK, public spending is classified as "missions", however in real fiscal world, these missions are "programs". This is why we have identified the British classification system as "Program". Unfortunately, we cannot see any R&D item under this classification (there is only an item named "R&D Tax Credits"), because the budget text is very short and summarized. And if someone desires to see that item, (s)he must look at the "Public Spending Statistics" prepared by the Treasury (which also functions as Ministry of Finance and responsible for the preparation of the Budget). As I will analyze below, the classification type used in the Statistics has the same systematic with Turkish style budgeting of R&D expenditures. Each function has its R&D item in itself. The main asperity in this style is the difficulty to see the general picture in terms of inline and total R&D spending of government bodies. The total amount of government spending on R&D may also be seen in different reports prepared by several bodies of the state (such as "Research and Development Funding for Science and Technology in the UK" report by National Audit Office, or "UK Gross Domestic Expenditure on Research and Development" statistical bulletin by Office for National Statistics). On the other hand the inline listing of R&D spending by government bodies is still missing. I think that the US R&D Budget practice is the best solution to solve this problem, and for the coordination and prioritization of R&D expenditures of spending authorities.

c. Germany

When we come to the Federal Budget of Germany (*Bundeshaushaltsplan*), we see a detailed and also interestingly simplified budget classification with two components: The first and overwhelming component is the "object classification" in respect to administrations (*Einzelplan*). The second and the annexed one is the "functional" reclassification of the items as complementary and explanatory tables. And we face three display of R&D expenditures in the system. First, within object classification, there are R&D expenditure items under each part (*Kapitel*) of the budget on relevant ministerial activity. For example in the budget of the Ministry of Defense, there is a *Kapitel* as such "1420- R&D on Military Research, Technic and Related Activities" (Wehrforschung, Wertechnische, und Sosntige Militärische Entwicklung und Erprobung). Secondly, and mainly, there is the budget of the Ministry of Science and Research (Einzelplan 30: Bundesministerium für Bildung und Forschung) as a whole R&D budget. And thirdly, there are annexed tables based on functional classification of public expenses including R&D.

d. France

Concerning R&D expenses of public budget, until here, probably the most systematic classification type belongs to France. In this country, the general budget is purely classified in accordance with the functional classification with definite functions as "*Mission*"s, and each mission has sub-functions as "*programme*"s. Then, Each programme is assigned to one ministry or administration or more. Needless to say, a ministry may be related to more than one mission and each mission may be undertaken by different ministries. For example the Ministry of Economy and Finance (Ministre de l'Économie et des Finances) is responsible for the execution of some programs under the

"Administration of Public Finance and Human Resource (Gestion des Finances Publiques et des Ressources Humaines) mission such as "Financial and Fiscal Administration of the State and Local Governments" (Gestion Fiscale et Financière de l'État et du Secteur Public Local), and the Ministry also undertakes, for example, the "Economic and Financial Aid for Development (Aide Économique et Financière au Développement) program of "Public Aid for Development" (Aide Publique au Développement) *mission*. One of these functions is the "Research and Higher Education" (Recherche et Enseignement Supérieur), and the main part of the budget on R&D is that mission. Under that *mission*, for example, while the Ministry of Research and Higher education is responsible for the execution of "University R&D Formation" (Formations Supérieures et Recherché Universitaire), of "Student Life" (Vie Étudiante), of "Multidisciplinary Scientific and Technological Research" (Recherches Scientifiques et Technologiques Pluridisciplinaires) programs and some others; the "Research and Higher Education on Material Economy and Industry" (Recherche et Enseignement Supérieur en Matière Économique et Industrielle) *program* is executed by Ministry of Productive Recovery" (Ministre du Redressement Productif).

e. Italy

Regarding the budget of Italy (*Il Bilancio dello Stato*), again we face a functional composition of missions (*missione*). The functions of the state are classified into 34 missions like Justice (Giustusia), Social Solidarity (Soccorso Civile), Public Order and Security (Ordine Pubblico e Sicurezza); Agriculture, Agricultural Policy and Fishery (Agricoltura, Politiche Agroalimentari e Pesca) … etc. The seventeenth *missione* is R&D (Ricerca e Innovazione). Missions are assigned to government bodies (ministries) as programs (*programma*). If there is only one mission in one program, ministries are shown in first column of the table from top to down. Otherwise, if there are multiple missions, then, these missions are listed at the first column, and ministries are listed at the first raw of the table from left to the right. Actually eight ministries are responsible for Ricerca e Innovazione program: Economy and Finance (Economia e Finanze), Economic Development (Sviluppo Economico); Education, University and Research (Istruzione, Universita' e Ricerca); Protection of Territorial and Maritime Environment (Ambiente e Tutela del Territorio e del Mare), Infrastructure and Transport (Infrastrutture e Trasporti), Defence (Difesa), Cultural Property and Activity (Beni e Attivita' Culturali), and Health (Salute) . Here you can see data on R&D on both ministerial base and the total spending allocated to the *missione*. It is a very "functional" use of budget classification regarding disbursements on R&D.

f. Spain

Spain's General Budget (*Presupuestos Generales del Estado*), consists of 16 volumes or tomes (*Tomo*) that based on administrations, that each body constitutes a section of a Volume. First *tomo* includes appropriations for Kingship (Casa de su Majestad el Rey. Cortes Generales) and supreme courts, second *tomo* for Ministry of Foreign Affairs and Cooperation (Ministerio de Asuntos Exteriores y de Cooperación), third *tomo* for Ministry of Justice (Ministerio de Justica) and so on. The 14th Volume is "Ministry of Economy and Competitiveness" (Ministerio de Economia y Competitividad), and this volume also covers public R&D allowances. In Spanish budget classification system, public spending is divided into Expenditure Policies (*Políticas de*

Gasto) as functions, then into Program Groups (*Grupos de Programas*) as sub-functions, and finally into Programs (*Programas*). Unlike the Turkish classification system (in which only numerical codification is used), both numeric and alphabetical codifications are used in the *Presupuestos*. Here, we should also point out that, although there is an "Undersecretariat of R&D and Innovation" under the Ministry of Economy and Competitiveness, we couldn't find any report by the Undersecretariat that portraits public R&D expenditures in totals with respect to General Budget and spending authorities. And this is an important deficiency in the Spanish budgetary system regarding the consolidation of R&D expenditures.

g. Canada

May be, the most interesting budget publication system among selected countries is that of Canada. There is neither classification nor codification displayed in the General Budget. The Budget (actually the "Budget Plan") is composed of "Chapters" like a book on national fiscal and/or economic issues. In this sense, we can express that, the Canadian General Budget is a good example of "intellectual macro-budgeting". Chapters are "1) Introduction", "2) Economic Developments and Prospects", "3) Supporting Jobs and Growth" and "4) Plan to Return to Budget Balance and Fiscal Outlook". The actual chapter that includes disbursements for public services is the third one. Under these chapters there are topics (or headlines) and sub-topics that can be evaluated as "programs" or "functions". For example under Chapter 3, there are topics like "3.1 – Connecting Canadians with Available Jobs", "3.2 – Fostering Job Creation, Innovation and Trade", "3.3 - Responsible Resource Development, Conserving Canada's Natural Heritage, and Investing in Infrastructure and Transportation" and etc. As it can be predicted, by looking at the Budget, no one can see any detail either on R&D spending by individual government bodies (namely Ministries) or on government totals. On the other hand, a table at the end of the "Headline 3.2- Fostering Job Creation, Innovation and Trade" may give us an idea. Some expenditures on R&D are listed in this chart. Furthermore, we should notice that, there is no separate budget, brief or report on public R&D expenditure totals in Canada.

h. Australia

The main body of Australian General Budget consists of four "Papers", and there are annexes like "Economic Statement", Appropriation Bills", "Portfolio Budget Statements" etc. In the Budget Paper No:1, there are ten statements on "Budget Strategy and Outlook" for the relevant fiscal year, such as Statement 1: Budget Overview, Statement 2: Economic Outlook and so on. The actual "budgeting" part of the text is the Budget Paper No:2, which is composed of revenue, expenditure and capital measures of the government. In the second "Part" of this paper we see a function, the title of which is "Industry, Innovation, Climate Change, Science, Research and Tertiary Education". However, here we can see the size of R&D spending only for four institutions (Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education; National Health and Medical Research Council; Department of Health and Ageing; and Independent Hospital Pricing Authority). To watch the whole picture, we must scrutinize the "Appropriation Bill No: 1" (out of four). Here there is R&D appropriations ranked in accordance with institutional classification.

2.2. Situation in Turkey

In 2003, by abolishing "General Accounting Law (No:1050)" which had been in force approximately for a century, and by enacting a modern "Public Fiscal Administration and Control Law" (PFAC, No: 5018), Turkey has switched her budgetary system from Planning Programing Budgeting System (PPBS) to "Strategic Plan and Performance Based Budgeting" (PBS) with a new classification system that called "Analytical Budget Classification" (ABC).

The analytical budget classification (ABC) is compatible with ESA95 (European System of Accounts). The functional classification used in ABC is consistent with the United Nations Classification of Functions of Government (COFOG), and the economical classification is pursuant to the IMF Government Finance Statistics Manual 2001 (GFSM). Budgets are prepared in line with ABC (Catak and Cilingir, 2010: 21).

The PBS, groups spending authorities of central administration into three category: (1) institutions within the General Budget [(GB] legislative, executive and higher judicial organs], (2) those with Special Budgets [(SB) mainly universities and some other educational institutions], and(3) regulatory authorities (RA). The "Central Administration Budget" (CAB) consists of budgets of these three. By adding budgets of social security administrations (SSA) and local governments (LG) to the CAB, we obtain the "General Administration Budget" (GAB). The transition to countrywide full application of the system, including all these spending authorities (except form public banks, public economic enterprises and revolving funds), was completed in financial year 2006.

2.2.1. A Brief on The Budget Classification System

ABC has brought the use of a solid but complicated classification model that includes four classification types for public expenditures; institutional (IC), functional (FC) and economic (EC) classifications for outlays (EC is also used for revenue classification), and financing (FiC) classification for source of outlays; different levels of which are displayed altogether in the budget text. All of these classifications have numerical representations of institutions, outlay items and revenues. IC classifies spending authorities at four levels. In Level-I, there are institutions that included in GB (01-22), universities (38-39), administrations with SB (40-41), RAs (42), SSAs (43), provincial local governments (44-45), municipalities (46-47), and local government unions (48). Then, in each institution, we have lower and then lower hierarchical units that are represented in Level-II, III and IV. For example The code of Prime Ministry is (07), and that of its undersecretariat is 01 (out of 1-99) as a second level.

In Level I of FC, ten functions of the state are coded as (01) General Public Services, (02) Defense Services, (03) Public Order and Security Services, (04) Economic Issues and Services and so on. Then, in Level II, there are such sub-functions for each service (function) as (to illustrate for "04. Economic Issues and Services"); (1) General Economic Issues and Services, (2) Agriculture, Forestry, Fishery and Hunting Services, (3) Fuel and Energy Services …etc. Level III and IV make these services more precise.

FiC is a one level classification, that denotes the sources of outlays, including (1) GB , (2) SB, (3) RAs, …., (7) External Project Credits and (8) Donations and Aids.

Finally we have a four-level (only first two of which are displayed in the budget) EC in which the Level I encodes nine group of payments such as (01) Personnel Payments, (02) Premium Payments to SSAs, (03) Interest Payments and so on. In each new Level the precision of the allowance rises until reaching clear line-items. For example under (01) Personnel Payments, we see (1) Public Servants, (2) Contractual Personnel, (3) Workers etc. Here again, the higher Level means higher precision of items.

In ABC, revenues of the state are also classified in line with a four-level economic classification, but items are different as such: (01) Tax Revenues, (02) Social Security Revenues, (03) Enterprise and Property Revenues and so on. At Level II, for example, under (01) Tax Revenues, there are (1) Personal Income and Corporate Income Taxes, (2) Taxes on Property, (3) Domestic Taxes on Goods and Services etc. Needless to say, on the way to fourth level, the precision rises like that in expenditures. By the way, I should note that the budget text displays all levels of IC and FC, the single level of FiC and just first two levels of EC (see Table 2 below).

By conducting a survey on 40 administration, Catak and Cilingir (2010) had reached to interesting results on ABC praxis in Turkey with a case study by which they analyzed the problems faced by the public administrations -under the general budget- in their relations with the performance budgeting. Results have revealed that, the lack of a program classification in the ABC system is a problem for administrations, and has a negative effect on the performance programming processes of 54.2% of participant administrations. One result of this type is that the cost of a program, project or activity cannot be specified under a single item in the budget; instead, it is split as salaries, training, etc. Another - even more serious - problem is that it is not possible to specify the program, project or activity which an expenditure belongs to. Administrations are not able to relate their planned or actual expenditures and programs to each other within the analytical budget classification. Actually, 22.2% of administrations cannot link their expenditures to their performance targets at all, whereas 48.2% can partially link and 29.6% can totally link. Also, 61.5% of the administrations think that the ABC needs to be changed to enable the appropriate display of the cost of the activities.

2.2.2. R&D Expenditures in Budget Classification

In PBS; the ABC codification system and the Budget are parallel and complementary to each other. And when we come to R&D expenditures, we see that, these outlays are classified under FC at Level II. Here are two types of R&D activities classified and budgeted separately (in different pages): "Basic Research Services" (mainly associated to educational services and processes, for example universities) and "Research and Development Services" (on -for example- general public services, defense services, health services etc.).To make it a bit clear, here we put two pieces from the budget of The Scientific and Technological Research Council of Turkey (TUBITAK) in Table 2. The reason for taking this institution as an example is that, both

types of R&D expenditure ("Research Services" and "R&D Activities on Services) can be seen in budget of the Council.

Table 2: Display of Public R&D Spending in ABC in Turkey (from The Budget of TUBITAK)

INST. CLASSIF.				FUNC. CLASSIF.				FIN. CLASSIF.	ECON. CLASSIF.		EXPLANATION	ALLOWANCE (TL)
I	II	III	IV	I	II	III	IV	I	I	II		
40	08										**TUBITAK**	**1.890.467.000**
			2								**SECRETARY GENERAL**	**3.575.900**
				1							**GENERAL PUBLIC SERVICES**	**2.651.900**
					4						Basic Research Services	2.651.900
						1	00				Research services on natural sciences, engineering and technology	2.651.900
								2			Special Budgetary Institutions	2.651.900
									01		**PERSONNEL EXPENDITURES**	**2.300.000**
										1	Public Servants	451.000
										3	Public Workers	1.849.000
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
		37	00								**SPACE TECHNOLOGIES RESEARCH INSTITUTE**	**49.419.000**
				01							**GENERAL PUBLIC SERVICES**	**49.419.000**
					8						R&D Activities on General Public Services	**49.419.000**
						8	00				R&D Activities on General Public Services	49.419.000
								2			Special Budgetary Institutions	49.419.000
									01		**PERSONNEL EXPENDITURES**	**9.992.000**
										3	Public Workers	9.992.000

Source: 2014 Financial Year Central Public Administration Budget of Turkey, www.resmigazete.gov.tr/eskiler/2013/12/20131227M1-1-160.pdf (06.03.2014).

As it can be felt, there are two problems about this display one of which is technical and the other ontological. It must be emphasized -at the expense of reiteration- that the technical problem is the display of two different R&D expenditure group in FC. First one is the R&D seen in educational institutions and research centers. The other is R&D made by ministerial public institutions regarding their jurisdiction of service. According to me, this is a categorical problem, because it conceals to see whole picture of public R&D expenditures on institutional basis. In an age of information and technology, on which the economic development strategies are grounded to tempori servire, this praxis will stand as an obstacle on front of researchers' endeavor to understand the public sector emphasis on R&D. We should also accentuate that, there is no separate budget or report -on public R&D expenditures- out of GAB, and this worsens the picture.

The ontological problem is about the place of R&D outlays in ABC. As explained above, due to its sui-generis character, R&D activities shouldn't be identified as a "function" of the state along with other functions. R&D activity is a reflection of economic gambling behavior, because each project throughout R&D process, carries the risk of failure (the idiosyncratic risk) and other turbulence risks. In other words, it is not a "fiscal" phenomenon, rather it is economical. For this reason, to sum up, R&D expenditures should be

classified under economical classification. Under next headline, I have made needed technical work as a recommendation to solve these problems. First, I've brought two types of R&D activity together, and then transferred this incorporated group of outlays to the EC.

3. A Recommendation for Turkey on Classification of R&D Expenditures in The Public Budget

R&D expenditure is a "sui-generis" type disbursement as well as being an economical phenomenon. It is not a function of the government service especially in an age of neo-liberal transformation in which the "minimal state" approach to the size of public sector is often being glorified. Thus, spending on R&D is not "functional" for the state, it is economical, and it must be classified under economic classification in the budget as a separate entity beginning at the Level I. Indeed, it is a hard job to work on codes in classification systems, since numerical and decimal structure or (if there is no empty code in numerical or decimal system) the line-item load of the system may frustrate the researcher to do this.

I was lucky in this sense, because both the structure and the load of Turkish budget classification system have made it possible to mutatis mutandis juggle with codes, to identify new ones, and to change the place of outlays with newly identified codes. At first place, to eliminate disarrangement of R&D expenditures, I've incorporated two types of R&D activities identified by Turkish budgetary system into a single separate item that begins at Level I and gains precision when it moves to other levels. Then, I have needed an empty first level code. To obtain this code, I've transferred all levels of the "(02) Premium Payments to Social Security" item into the "(01) Personnel Payments" by recoding them at their new place. Fortunately codes (7) and (8) were empty at Level III of personnel payments. I have assigned "Payments to Unemployment Insurance Fund" and "Premium Payments to Social Security Institution" items to these codes respectively, and also I've identified a new code as"(10) Personal Insurance Premium Payments". Rest of the work was easy: I've identified a "(02) Research and Development Services" at the Level I. At Level II, now, there was "(1) Basic Research Services" and "(2) R&D Services Concerning Public Services". Other items took place respectively under these as Level III and IV as they were before. The result was as seen in Table 3 below (changes are written in italic):

Table 3: Needed Changes in Economic Classification to Display R&D Spending Precisely

BEFORE				AFTER			
ECONOMIC CLASSIFICATION OF EXPENDITURES				ECONOMIC CLASSIFICATION OF EXPENDITURES			
I	II	III		I	II	III	
01			**PERSONNEL PAYMENTS**	**01**			**PERSONNEL PAYMENTS**
01	**1**		**PUBLIC SERVANTS**	**01**	**1**		**PUBLIC SERVANTS**
01	1	1	Base Salaries	01	1	1	Base Salaries
01	1	2	Salary Rises and Compensations	01	1	2	Salary Rises and Compensations
01	1	3	Allowances	01	1	3	Allowances
01	1	4	Social Rights	01	1	4	Social Rights
01	1	5	Overtime Working Payments	01	1	5	Overtime Working Payments
01	1	6	Grants and Bonuses	01	1	6	Grants and Bonuses
				01	*1*	*8*	*Premium Payments to Social Security Institution*
01	1	9	Other Personnel Payments	01	1	9	Other Personnel Payments
01	**2**		**CONTRACTUAL PERSONNEL**	**01**	**2**		**CONTRACTUAL PERSONNEL**
01	2	1	Wages	01	2	1	Wages
01	2	2	Wage Rises and Compensations	01	2	2	Wage Rises and Compensations
01	2	3	Allowances	01	2	3	Allowances
01	2	4	Social Rights	01	2	4	Social Rights
01	2	5	Overtime Working Payments	01	2	5	Overtime Working Payments
01	2	6	Grants and Bonuses	01	2	6	Grants and Bonuses
				01	*2*	*7*	*Payments to Unemployment Insurance Fund*
				01	*2*	*8*	*Premium Payments to Social Security Institution*
01	2	9	Other Personnel Payments to Contractual Personnel	01	2	9	Other Personnel Payments to Contractual Personnel
01	**3**		**WORKERS**	**01**	**3**		**WORKERS**
01	3	1	Wages	01	3	1	Wages
01	3	2	Severance Payments to Workers	01	3	2	Severance Payments to Workers
01	3	3	Social Rights of Workers	01	3	3	Social Rights of Workers
01	3	4	Overtime Working Payments to Workers	01	3	4	Overtime Working Payments to Workers
01	3	5	Grants and Bonuses	01	3	5	Grants and Bonuses
				01	*3*	*7*	*Payments to Unemployment Insurance Fund*
				01	*3*	*8*	*Premium Payments to Social Security Institution*
01	3	9	Other Personnel Payments to Workers	01	3	9	*Other Personnel Payments to Workers*
01	**4**		**TEMPORARY PERSONNEL**	**01**	**4**		**TEMPORARY PERSONNEL**
01	4	1	Wages	01	4	1	Wages
				01	*4*	*8*	*Premium Payments to Social Security Institution*
01	**5**		**OTHER PERSONNEL**	**01**	**5**		**OTHER PERSONNEL**
01	5	1	Wages and Other Payments	01	5	1	Wages and Other Payments
				01	*5*	*8*	*Premium Payments to Social Security Institution*
				01	*5*	*10*	*Personal Insurance Premium Payments*
01	**7**		**Members of Parliament**	**01**	**7**		**Members of Parliament**
01	7	2	Salary Rises and Compensations	01	7	2	Salary Rises and Compensations
01	7	3	Allowances	01	7	3	Allowances
				01	*7*	*8*	*Premium Payments to Social Security Institution*
01	7	4	Social Rights	01	7	4	Social Rights
01	**8**		**Presidential Payments**	**01**	**8**		**Presidential Payments**
01	8	1	Presidential Payments	01	8	1	Presidential Payments
01	**9**		**Intelligence Personnel**	**01**	**9**		**Intelligence Personnel**
01	9	1	Intelligence Personnel Payments	01	9	1	Intelligence Personnel Payments
				01	*9*	*8*	*Premium Payments to Social Security Institution*
02			**PREMIUM PAYMENTS to SOCIAL SECURITY INSTITUTIONS**	***02***			***RESEARCH and DEVELOPMENT (R&D) SERVICES***
02	**1**		**PUBLIC SERVANTS**	***02***	***1***		***BASIC RESEARCH SERVICES***
02	1	6	to Social Security Institution	*02*	*1*	*1*	*Basic Research Services on Natural Sciences, Engineering and Technology*
02	**2**		**CONTRACTUAL PERSONNEL**	***02***	*1*	*2*	*Basic research Services On Social and Humanitarian Sciences*
02	2	4	to Unemployment Insurance Fund	*02*	*1*	*3*	*Multidisciplinary Research Services*
02	2	6	to Social Security Institution	***02***	***2***		***R&D SERVICES CONCERNING PUBLIC SERVICES***
02	**3**		**WORKERS**	*02*	*2*	*1*	*R&D Services on General Public Services*
02	3	4	to Unemployment Insurance Fund	*02*	*2*	*2*	*R&D Services on National Defense*
02	3	6	to Social Security Institution	*02*	*2*	*3*	*R&D Services on Public Order And Security*
02	**4**		**TEMPORARY PERSONNEL**	*02*	*2*	*4*	*R&D Services on Economic Activities*
02	4	6	to Social Security Institution	*02*	*2*	*5*	*R&D Services on Environment Protection*
02	**5**		**OTHER PERSONNEL**	*02*	*2*	*6*	*R&D Services on Inhabitation And Social Welfare*
02	5	3	Personal Insurance Premium Payments	*02*	*2*	*7*	*R&D Services on Health Services*
02	5	6	to Social Security Institution	*02*	*2*	*8*	*R&D Services on Rest, Culture and Religious Services*
				02	*2*	*9*	*R&D Services on Education*
02	**7**		**MEMBERS OF PARLIAMENT**	*02*	*2*	*10*	*R&D services on Social Security and Social Aids*
02	7	6	to Social Security Institution				
02	**9**		**INTELLIGENCE PERSONNEL**				
02	9	6	to Social Security Institution				

Now, it will be possible for a researcher to see R&D expenditure sum of a spending authority at one page and by one look. Via this reorganized classification structure, also one can overcome the ontological inconsistency that has been explored throughout the earlier parts of the study. In an information and innovation age, R&D activities and expenditures of the state couldn't have been lost at bowels of the budget classification system. And, if applied, the new organization of the system will also make it easier to make cross-country comparisons, because reading the total of R&D disbursements of an institution will take just seconds.

On the other hand, even if this reorganization of classification system is not realized, and because there is no separate budget or off-budgetary report on R&D expenditures, there are second and third alternatives to display R&D appropriations in the budget. As a second alternative, at least, an annexed table to the Central Administration Budget which gives data on R&D spending of public institutions in accordance with the institutional classification, may help to understand the whole picture of public R&D activities. Or, as third alternative, a separate R&D budget or report can be prepared (by the Ministry of Finance or of Development), like in US. Actually the best way is to achieve all these alternatives together and simultaneously. This will give the actual value and emphasis to R&D endeavors that they deserve.

CONCLUSION

Due to risk factor inherited in and spillover effects of R&D, market may fail, and in this situation the public sector may or should take a role to pioneer or encourage the market to make R&D and innovation. Despite crowding-out based objections to the public R&D activities, it is a reality that, public sector is a vital denominator of national R&D intensity via direct R&D activities, partnerships with private firms and subsidization of R&D and innovation endeavors of private sector. The "risk factor" that we mentioned above is –of course- relevant also for the public sector. Furthermore, the public sector has an additional risk of "wasting public money" by breaching tenets of New Public Management what strictly emphasizes the "efficiency" and "accountability". For these reasons, the common man should easily access state's R&D activities and their costs. In other words, the state budget must reflect ad litteram data on R&D activities of the state and appropriations that devoted (or allocated) for these activities.

The main thesis in this study is that, because of its sui-generis character, public R&D activity must be handled as a separate "economic activity", and hence, it should be displayed in the budget as a distinct "item", "program" or "economic class" whatever the budgetary system is used. Or totals of R&D disbursement per spending authority should be able to be read from a consolidated chart that is annexed to the budget. If these are not possible, as a least endeavor, a report or a distinct budget that prepared by a public institution and includes total R&D expenditure per spending authority is a sine qua non measure. When we look at different practices in some OECD countries, we face divergent applications on the issue.

While in US federal budget R&D expenditures are displayed under "Contractual Services and Supplies" item within object classification as well as a separate off-budgetary and non-legislative "R&D Budget"; in UK, they

aren't displayed under the government budget, but under "General Public Services" program in the "Public Spending Statistics" -prepared by the Treasury- with no other separate R&D report. In Germany we see display of R&D expenditures three times: First, under the budget of each ministry (say Health) as the "R&D on Health"; second and mainly within the budget of Ministry of Science and Research, and third as annexed tables derived from functional classification of public expenses including R&D. French budget has a "Research and Higher Education" function with different responsible ministries. Budget of Italy has a R&D "function" as seventeenth missione. In Spain, R&D expenditures can be read from the Budget of Ministry of Economy and Competitiveness as 14th volume of the general budget. There is also a report by the "Undersecretariat of R&D and Innovation" of the Ministry of Economy and Competitiveness, that gives public R&D expenditures in totals with their relations to the General Budget and spending authorities. In Canada, there is no display of R&D spending, however there is a table at the end of the Headline 3.2- Fostering Job Creation, Innovation and Trade. In Australia, in the second "Part" of Budget Paper No:2, there is a title as "Industry, Innovation, Climate Change, Science, Research and Tertiary Education". On the other hand there are information on R&D expenditures of only four ministries. In US, Germany and France we see separate reports on public R&D spending, in which it is possible to follow R&D expenditures by ministries and other governmental bodies. In all these countries (except US, UK and Canada) R&D expenditures are classified under functional or de facto functional classification. According to me, this situation is a natural consequence of misevaluation on R&D activities and of not taking the sui-generis character of these activities into consideration in budgeting.

This misevaluation is also valid for Turkish Analytic Budget Classification System. Here R&D expenditures are classified within Functional Classification beginning at Level II. There are two types of R&D activities classified and budgeted separately: "Basic Research Services" (mainly associated to educational services and processes, for example universities) and "Research and Development Services" (on -for example- general public services, defense services, health services etc.) at second level. This dual display is the first problem in the system. The second and ontological problem is the display of R&D expenditures under functional classification which is incompatible with sui-generis economic character of R&D activities. According to me, due to this "character", they must be classified under economic classification within the budget as a separate entity beginning at the Level I. I have made this change on the classification system, and the result was very adaptable by no disturbance to the classification structure and by reflecting the sui-generis feature of R&D activities. When this change is applied, then one can read total R&D spending of any public institution. Here, I should note that, this fine tuning won't be suffice to grasp total public performance on R&D. To reveal this, a brief chart should be annexed to the budget as well, or a separate report may be helpful.

ACKNOWLEDGEMENT

This study is exclusively dedicated to my master, Professor Dr. Kâmil TÜĞEN (Dokuz Eylul University, Faculty of Economics and Administrative Sciences, Dept. of Public Finance – Izmir/Turkey), who has succeeded to

create a Public Finance PhD. from a bachelor of Political Science and Public Administration.

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