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Global Challenges and Country-Specific Responses through Aid Financing of Global Public Goods

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Abstract

In this paper we revisit the impact of global public goods (GPGs) in Official Development Assistance budgets using panel data covering the DAC countries during the period 1973-2009. Our findings reveal a weak crowding-out effect of traditional aid and an increasing financing to weakest-link technology GPGs by rich countries aiming at avoiding sub-optimal levels of provision in strategic sectors. Searching for the determinants of GPG-related aid, we find a significant role played by variables expressing donors' public finance constraints, openness to the rest of the world and preferences for domestic expenditures.

Keywords: Official Development Assistance (ODA), Global public goods, ODA crowding-out, DAC donors, Global public goods financing

JEL Codes: H41, F35, H87

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1. Introduction

Globalization has made inescapable the problems connected to the production of goods and the prevention of bads affecting vast numbers of people for long periods of time: from greenhouse warming to ozone depletion, from terrorism prevention to the cure of contagious diseases. These goods (and the prevention of bads) whose impacts are globally spread, are generally known as global public goods (GPGs). They pose severe challenges to the global community as their effects are pervasive and resist the control of individuals and governments.

At the core of global public goods lies a complex problem of collective decision-making. Actions to provide global goods and to prevent global bads are often severely insufficient, because governments and private agents usually fail to fully consider the benefits/costs they impose on others and because these shared benefits/costs are often differently evaluated in different countries. Therefore, coordination mechanisms fail and there is "no market nor government mechanism that contains both political means and appropriate incentives to implement an efficient outcome" (Nordhaus, 2005). International institutions and treaties only partially solve the problem as they cannot coerce recalcitrant countries into binding agreements.

Proper decision-making would be eased by the knowledge of the financings globally devoted to GPGs. However, notwithstanding its relevance, it is very difficult to directly quantify the GPGs financing, as no separate accounting is generally provided in private and public budgets. An exception is the indirect financing of GPGs that can be detected in the Official Development Assistance (ODA) budgets of the Development Assistance Committee (DAC) donor countries. In fact, foreign aid supports core sectors of the developing countries (security, health, environment) and some of the financed activities (illicit drugs combat, contagious diseases prevention,..) yield global benefits.

The presence of lines of GPG financing inside aid funding have met both approval and criticism. On one hand, there is evidence of important complementarity relationships between aid to

development and GPGs provision (Zedillo and Thiam, 2006): limited development can hinder the provision of many GPGs that require sufficient capacity at national level. At the same time, some GPGs are critical for attracting private direct investment flows and for ensuring the effectiveness with which governments deliver national public goods[1]. On the other hand, some GPGs have dubious impact on development and, in some cases, they distort the whole structure of aid and reduce the resources available, as is the case for certain global security expenditures: "while domestic security in developing countries is a pre-requisite for development efforts, the current emphasis on global security could highjack aid as the Cold War did for decades" (Sagasti, 2005, p. 11).

Thus, criticisms (Anand, 2004) to aid financing of GPGs have been advanced on grounds of (i) ethics, as GPGs divert resources that should mainly be directed to poverty reduction; (ii) efficiency, as institutions for development may not be the most appropriate ones for GPG delivery; (iii) accountability, as GPG seem to be funded without prior assessment of needs. Particular attention has been attracted by the possibility that GPGs displace or crowd out traditional aid devoted to human development and poverty relief. A number of studies have searched for the presence and the size of the crowding-out effect and evidence has been found by te Velde et al. (2002) and Reisen et al. (2004) for the 1980s and 1990s. We complement these previous studies, by expanding the period of analysis to the years 1973-2009 and by comparing the effect of adopting different sets of GPGs on the crowding-out effect.

A related issue concerns the donor countries' preference for funding certain GPGs more than others. This preference is influenced not only by perspective benefits, but also by the GPGs' production (or aggregation) technology, which determines how the contributions of the different producers are combined. Linear and non-linear aggregation technologies influence the conditions for efficient provision by determining the number of contributors and their share in GPGs financing or production. For example, rich donors would seem not eager to finance those GPGs where they are

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[1] In this sense, the UNDP Office of Development Studies has stressed the importance of IPGs for achieving the Millennium Development Goals (MDGs), notably the objectives of reducing poverty (Kaul et al.,1999, UNIDO, 2008)

not the dominant (or the only) provider. They would rather finance those GPGs whose production requires stringent minimum standards for all countries and whose underprovision could pose a serious threat to their own country's security or well-being. Therefore, we expect that more financing is devoted to combating illegal drugs or the spread of infectious diseases like SARS than to the technological development of alternative fuels to slow climate change or the development of effective treatment against African AIDS or malaria. We search for evidence of patterns of GPGs financing and of trends towards GPGs whose production technology is less demanding and where the benefits of actions are perceived as highly significant.

In summary, this paper examines five facets of the issues related to global public goods. First we discuss the nature of global public goods (Section 2). We, then, examine the flows to GPGs that are accounted in the OECD Creditor Reporting System (CRS) and we construct three different aggregates of GPGs[2], according to the spatial dimension of the financed activities (Section 3). We then employ the GPG aggregates to provide some descriptive statistics and to test whether GPG financing crowds-out other more traditional aid spending (Section 4). We discuss the changes in GPGs composition over time, taking into account their different provision technologies. In particular, we inquire whether GPGs with weakest-link technologies have become increasingly important at the global level, as suggested by Sandler (1998). Finally (Section 5), we estimate the donors' commitments to aid funded GPGs and we evaluate the relevance of different set of explanatory variables in a panel analysis. Section 6 concludes.

2. Defining global public goods

By their own nature, GPGs provide benefits which are non-rivalrous and non-excludable in consumption for people in more than one country and across generations[3]. Non-rivalry implies that

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[2] We limit our attention to foreign aid allocations to global public goods, i.e. goods that generate multi-country benefits, thus excluding regional public goods, which have spillover effects into neighboring countries (cross-border roads, dams, gas pipelines, river development).

[3] Some of the first contributions to the GPG literature are Sandler (1992), Barrett (1993), Cornes and Sandler (1996). Kaul et al. (1999) provide a discussion of the definitions of GPGs and a survey of the main issues. Kaul et al. (2003)

the consumption of the GPG by one person does not reduce the quantity available for consumption by others, as in the case of the establishment and maintenance of tsunami warning systems. Non-excludability means that no person can be excluded from the benefits provided by the GPG (or that he can be excluded at a very high cost), as in the case of measures to reduce global warming. GPGs which are both non rival and non excludable are called 'pure', the others give rise to a rich taxonomy (Kaul et al., 1999)[4].

A third and often neglected dimension of GPGs is their aggregation technology (Hirshleifer 1983; Cornes and Sandler 1996; Kanbur, Sandler and Morrison 1999; Kanbur 2001; Sandler 1998), by which the single countries' contributions determine the overall level of provision.

A *summation/weighted sum*[5] *technology* implies that the contribution of each country determines, by simple/weighted addition, the aggregate level of provision, as in curbing air pollution or in reducing global warming. In this case, efficiency requires that every country contributes up to the point where private marginal cost equals social marginal benefit.

For *best shot technology* GPGs, the level of supply is determined solely by the largest single contribution: for example, when researching a cure for an infectious disease, the country providing the largest effort is most likely to succeed. Efficiency would require that only the most efficient country (usually the rich countries or the U.S.) produces the good, to the point where its private marginal cost equals the social marginal benefit, while the other higher-cost producers should be inactive. However, when rich countries have no interest in a best-shot GPG (a cure for malaria or a disease that affects only poor countries), their incentives to contribute are poor.

For *weakest link technology* GPGs (e.g., pure public goods such as fighting international terrorism; club goods such as air traffic control), supply depends on the weakest link of the chain (the weakest

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contributed to the literature by discussing issues related to organization and governance. Kaul et al. (2006) discuss the problems of GPG financing.

[4] Impure IPGs (goods that are only partially non-rivalrous and non-excludable), club goods (non-rivalrous but excludable goods), global commons (rivalrous but non-excludable goods), joint products (some of them public or with different degrees of publicness) simultaneously yielded by one same activity.

[5] Weighted sum technologies are common for regional public goods, For example, the cleanup of sulfur emissions from power plants adheres to weighted sum, as location of pollution source makes a difference on the pattern of downwind deposits (Binger, 2003, p.12).

intelligence service, the weakest health system) and the smallest contribution determines the overall level of provision[6]. In this case, efficiency requires that all countries contribute equally, i.e. that all implement a minimum standard intelligence service or health system, so that that all countries are vigilant in tracking and treating criminal threats or contagious diseases.

As GPGs benefit a broad spectrum of countries and of the global population, they raise issues of collective action both in provision and in financing that prevent the application of market-based solutions. Differently from national public goods, the issues of governance and collective action cannot be solved by coercion from a global government. Whenever possible, international organizations and treaties frame these collective responses. However, the success of the collective action depends on how the single national contributions combine in the GPG production.

The production of summation GPGs, in fact, is subject to the well-known problems of free riding. Governance problems, in this case, can be partially solved by international treaties that set the countries' shares of financing or create the tradable property rights needed for providing the goods and that impose taxes and penalties to limit the free-riding problem. However, there is no international system which can coerce reluctant countries into cooperative behavior.

Best shot GPGs need coordination, to avoid duplication of efforts, and incentives to the dominant, and hopefully benevolent, provider and its private sector: public-private partnerships and regulations are then required to avoid underprovision. The problem is acute when the benefits of production are widely dispersed or perceived as insignificant by the dominant provider: for example, when searching for a cure for malaria or for a disease that affects only poor countries.

Finally, there are strong incentives for countries to cooperate and provide for weakest-link GPGs whose benefits are tangible: for example protection against terrorist attacks or contagious diseases. However, weakest link GPGs require identifying the country or the group of countries that provide

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[6] Income distribution among contributors is a further element that influences the supply of IPGs. In case of IPGs of a summation kind, the neutrality theorem applies (Warr, 1993; Cornes and Sandler, 1996) and the level of public good provision is indifferent to any change in income distribution among contributors. On the contrary, distribution matters and redistribution can be Pareto improving, when the provision technology is not of a summation kind (Jayaraman and Kanbur, 1999; Lei et al. 2007).

the smallest contribution and establishing whether they can afford to pay for it. Partnerships among the various contributors can solve this collective action problem.

3. Global public goods in the Official Development Assistance budgets

As mentioned before, attempts to estimate the countries' contribution to GPGs financing find a nearly insurmountable obstacle in the absence of specific line items in the national public and private budgets. Estimates are less arduous, when GPGs are financed through rich countries' aid budgets, in the form of either in-kind transfers (dispatching of peacekeeping forces or of medical teams) or of income transfers (Vicary and Sandler, 2002; Lei et al., 2007). Estimates of the shares of GPGs on aid vary a lot, ranging from 3.7 per cent (Anand, 2002) to 12.5 per cent (World Bank, 2001), to 16 per cent (Reisen et al., 2004) and to 25 per cent (Raffer, 1998). These differences are almost entirely attributable to differences in the definition of what *"global"* means.

The estimates of aid financing of GPGs provided in this paper are based on the Aid Activity database of the OECD-DAC, the CRS, which offers a sector allocation of aid based on common definitions agreed by all DAC donors. As in Reisen et al. (2004), to distinguish GPGs from regional public goods, we employ the OECD criteria, based on the donors' reports of the sectoral allocation of their annual commitments as regional or global public goods[7]: the choice suffers from an inescapable degree of arbitrariness and from "a certain willingness to overstate rather than understate support for regional (and global) programs" (Birdsall, 2005, p 392). Our aggregates cover just a fraction of the worldwide provision of GPGs, not only because ODA is a tiny share of world total resource flows, but also because the OECD-CRS does not include important donor countries, such as China or Russia, nor, until recently, the significant flows from private charities,

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[7] This implies excluding some activities that are "core" according to the World Bank, but which have a limited spatial dimension, for example, "post-conflict peace building of the United Nations peace operations" or "land mine clearance", which have national/regional spatial dimension. On the contrary, we include the expenditures for "narcotics control activities" that are functional to the provision of the global good 'Crime control', whose benefits have a global scale.

such as the Gates Foundation. However, we believe that our analysis can offer useful insights in GPGs provision and financing.

The 59 (out of 194) CRS selected sectors are aggregated into seven broad categories: (i) Knowledge generation and dissemination, (ii) Human rights, (iii) Communicable disease control, (iv) Global governance, (v) Crime control and global peace, (vi) Global commons and sustainability, (vii) Communications.

These categories are, then, employed to construct three aggregates of GPGs (Table 1). The first one (*gpgr*) is built according to Reisen et al. (2004) – OECD definition. The second aggregate (*gpgm*) includes those GPGs that are relevant for the Millennium Development Goals, as specified by the UK Department for International Development (Speight, 2002). The third aggregate (*gpge*), which will be the benchmark in our analysis, is the largest sectoral set: it expands the *gpgm* set adding the expenditures for Communications and those for Crime control. Both the *gpgm* and the *gpge* aggregates exclude activities related to the protection of Human rights, which is a permanent concern at international level, but whose benefits we deem to be basically national[8]. The three aggregates are expressed in 2008 constant USD and they include both loans and grants, as, in general, the GPGs financing is not peculiarly skewed towards grant-financing as compared to ODA (Anand, 2004, p. 231)[9].

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[8] The categories of GPGs we employ in the *gpgm* and *gpge* aggregates do not match perfectly those chosen by Reisen et al. (2004) as we have added or removed some sectors. Details are provided in Cepparulo and Giuriato (2009).
[9] On the contrary, Mascarenhas and Sandler (2004) argue that grants are the most appropriate form of aid for financing spillovers associated with IPGs. They test the hypothesis that the share of grants in aid reflects the importance of spillover effects and find that the mean grant share is highest for knowledge IPGs (95 per cent for bilateral donors) and health IPGs (90 per cent) and lowest for global governance (81 per cent) and environment expenditures (83 per cent).

Table 1 – Definitions of Global Public Goods (GPGs)

Categories	GPGs according to Reisen et al. (2004) gpgr	GPGs for the Millennium Goals gpgm	Extended aggregate of GPGs Gpge
Knowledge generation and dissemination	√	√	√
Human rights	√		
Communicable disease control	√	√	√
Global governance	√	√	√
Crime control and peace building	√		√
Global commons and sustainability	√	√	√
Communications			√

4. Long-run trends in aid financing of global public goods: 1973-2009

While the 1970s and 1980s were characterized by stagnation in aid giving and the early 1990s by aid contraction, due to the re-thinking of development policies after the end of the Cold War, the subsequent years saw an encouraging rise in ODA, thanks to the impulse of the global debate on poverty reduction at the beginning of the new millennium (Millennium Summit, 2000) and to the pledges of aid scale-up, renewed at the Monterrey (2002) and Gleneagles (2005) summits. The largest part of aid is provided by bilateral financing (73 per cent on average), which is also the largest source of GPGs financing. Depending on the set adopted (Graph 1), GPGs cover 15-18 per cent of bilateral ODA at the end of the 2000s.The largest increase in the share of GPGs on aid can be observed for the benchmark aggregate, *gpge*: from 2.7 per cent on average in the 1970s to 13.9 per cent on average in the 2000s.

Graph 1 – Bilateral ODA and ODA financing of global public goods: 1973-2009 (USD million and %)
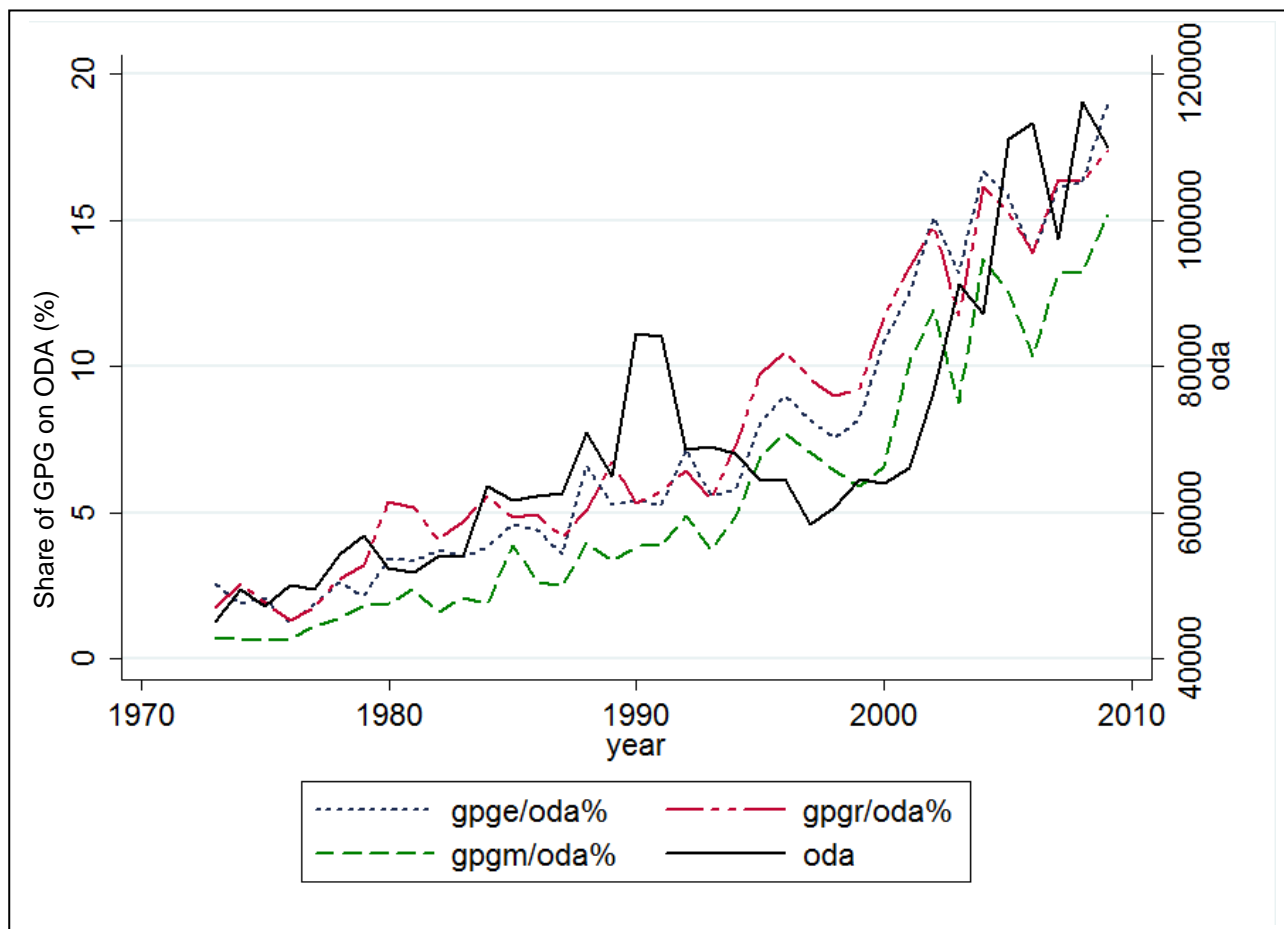
Source: authors' calculations based on OECD-CRS. Notes: the right-hand scale is referred to total ODA to GDP. The left-hand scale is referred to the shares of GPGs to ODA for the three aggregates.

Aid financing of GPG is very unevenly distributed among DAC countries: for brevity's sake and because there is no substantial loss of information, we present (Table 2) only the data for the benchmark set (*gpge*)[10]. In the 1970s the largest contributions to total GPGs came from Japan (32%), Germany (16%), Canada (12%) and France (11%). During the following four decades, all these countries reduced their shares in the aggregate financing, while the UK and the US became the largest contributors (9,6% and 44,2% respectively in the 2000s). Denmark, Finland, Norway, the Netherlands and Sweden have more or less kept unchanged their shares in total financing (3-4

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[10] Data for the other aggregates are available from the authors on request.

%). Some countries have, instead, decreased their participation to tiny values: Italy's contribution has fallen from 5 to 0.6 per cent of total financing to GPGs.

Table 2 – DAC countries' average share on total financing of Global Public Goods (*gpge*) out of bilateral ODA (%)

Country	1970s	1980s	1990s	2000s
Australia	0.69	0.20	3.57	2.86
Austria	0.14	0.11	0.23	0.34
Belgium	n.a.	0.07	0.87	1.22
Canada	12.26	6.32	4.78	3.12
Denmark	1.58	2.87	2.41	1.56
Finland	n.a.	0.96	1.20	0.84
France	11.39	13.70	7.65	4.78
Germany	16.21	6.32	5.14	6.37
Greece	n.a.	n.a.	n.a.	0.41
Ireland	n.a.	n.a.	n.a.	0.53
Italy	n.a.	5.35	2.93	0.64
Japan	31.97	25.12	18.72	6.21
Luxembourg	n.a.	n.a.	n.a.	0.12
Netherlands	3.00	3.31	5.88	4.31
New Zealand	n.a.	0.18	0.02	0.15
Norway	3.84	2.87	3.44	3.47
Portugal	n.a.	n.a.	0.15	0.50
Spain	n.a.	0.20	2.50	2.51
Sweden	3.68	8.03	4.40	2.81
Switzerland	0.62	2.45	1.68	3.46
United Kingdom	5.78	1.70	6.72	9.57
United States	8.85	20.23	27.71	44.21
Total	*100.00*	*100.00*	*100.00*	*100.00*

Source: own elaborations based on OECD-CRS data.

Donors can be divided into geographical and linguistic groups and we find that they display a certain degree of homogeneity in GPG financing (Table 3). Anglo-Saxon countries have lower than average contributions to aid, but in the 1990s and 2000s they exhibit the largest increase in the share of GPGs on bilateral ODA. The same above average share of GPGs to ODA in the 2000s is observed for Southern European countries, which have the lowest values for all variables in the

period. Northern European countries are more generous, having approximately more than twice the average share of GDP allocated to both ODA and GPGs: they also have a higher than average share of aid devoted to GPGs and the lowest dispersion in their pattern of financing. Central European countries and Japan are also generous in aid giving, but they contribute less to GPGs.

4.1 The composition of global public goods

The composition of the aid financing to GPGs has dramatically changed in the period, as shown in Table 4. The larger change is observed for GPGs provided by weakest-link technologies, in particular, Crime control and Communicable disease control. Disease control (e.g. infectious disease control and sexually transmitted diseases and HIV/AIDS control), which covered only 5 per cent of total expenditures in the 1970s, reaches 27.7 per cent in the 2000s, while Crime control (e.g. Narcotics control) jumps from 0.2 to 19.1 per cent. GPGs provided by summation or best-shot technologies (mostly included in the categories Communication, Knowledge generation and dissemination, Global commons and Global governance) display lower and sometimes negative trends. Communications (e.g. communication policies, telecommunication, free flow of information), which was the largest category in the 1970s and 1980s, shrinks to 2.5 per cent of total GPGs in the 2000s. Global commons, which include GPGs with dominance of summation technologies (e.g. biosphere protection, biodiversity protection, renewable resources) and which constantly increased until the 1990s, have substantially decreased (from 35.2 to 19.4 per cent) as a share on total GPGs in the last decade.

Table 3 - ODA spending on Global Public Goods by groups of DAC donors (*gpge,* %): 1973-2009 (Average, Av., and Relative Standard Deviation, RSD)

Countries		1970s			1980s			1990s			2000s		
		ODA/GDP	*gpge/GDP*	*gpge/ODA*	*ODA/GDP*	*gpge/GDP*	*gpge/ODA*	*ODA/GDP*	*gpge/GDP*	*gpge/ODA*	*ODA/GDP*	*gpge/GDP*	*gpge/ODA*
All	**Av.**	0.45	0.01	2.69	0.45	0.03	5.19	0.38	0.03	7.93	0.43	0.06	13.96
	RSD	60.02	112.95	97.58	56.16	126.61	93.92	68.29	95.67	79.19	71.13	91.81	63.40
Anglo-saxon	**Av.**	0.36	0.01	1.88	0.23	0.01	3.55	0.20	0.02	10.38	0.26	0.04	17.02
	RSD	32.41	134.55	115.50	44.66	114.77	102.05	39.29	96.28	88.48	37.36	52.44	41.32
North Europe	**Av.**	0.56	0.03	4.04	0.68	0.06	8.62	0.73	0.07	10.71	0.81	0.12	15.17
	RSD	49.51	84.70	83.54	27.73	86.02	80.01	34.17	46.44	48.49	38.50	53.98	25.64
Central Europe	**Av.**	0.53	0.01	1.77	0.53	0.02	3.97	0.45	0.03	5.46	0.52	0.05	10.86
	RSD	57.82	85.20	80.37	45.16	66.18	78.68	40.07	82.36	68.96	51.14	80.97	78.20
South Europe	**Av.**	0.04			0.28	0.01	3.52	0.13	0.01	5.74	0.15	0.02	15.72
	RSD	58.29			50.08	75.20	45.27	56.87	81.42	78.52	60.23	74.87	83.68
Japan	**Av.**	0.38	0.02	6.22	0.45	0.03	6.91	0.50	0.03	6.27	0.46	0.03	6.00
	RSD	20.88	23.47	26.77	16.67	49.03	35.13	7.19	24.62	21.38	14.57	36.35	29.22

Source: own elaborations based on OECD-CRS data

Table 4 - The composition of ODA spending on Global Public Goods by groups of DAC donors and categories (*gpge, %*): 1973-2009

	Knowledge generation and dissemination				Communicable disease eradication				Global governance			
	1970s	*1980s*	*1990s*	*2000s*	*1970s*	*1980s*	*1990s*	*2000s*	*1970s*	*1980s*	*1990s*	*2000s*
Countries												
All	9.8	12.9	9.7	8.2	5.1	5.1	8.3	**27.7**	16.6	17.9	23.6	23.1
Anglo-saxon	16.2	24.6	11.4	3.7	12.2	6.0	15.2	**37.5**	14.7	**37.9**	21.7	26.1
North Europe	6.5	9.8	11.0	19.2	9.6	14.0	9.1	14.3	14.6	9.1	12.6	16.9
Central Europe	5.1	7.4	18.8	18.2	1.8	2.7	7.5	15.7	34.7	10.2	11.3	20.7
South Europe		5.6	9.3	7.6		3.8	4.0	7.5		0.5	4.2	13.7
Japan	9.9	9.2	2.6	3.3	1.0	1.8	1.3	4.5	0.8	12.6	9.7	17.1

	Crime control and peace building				Global commons and sustainability				Communications			
	1970s	*1980s*	*1990s*	*2000s*	*1970s*	*1980s*	*1990s*	*2000s*	*1970s*	*1980s*	*1990s*	*2000s*
Countries												
All		0.2	4.1	19.1	17.9	**24.9**	**35.3**	19.4	**50.6**	39.0	19.1	2.5
Anglo-saxon			12.1	23.9	15.9	19.1	**32.3**	7.1	**41.0**	12.3	7.4	1.8
North Europe		1.1	3.5	14.2	**55.8**	**43.1**	**46.6**	**32.4**	13.4	22.9	17.2	3.0
Central Europe			1.6	10.8	10.6	16.9	**35.4**	**31.7**	**47.7**	**62.9**	25.4	2.9
South Europe			7.4	27.7		38.4	34.1	**41.0**		**51.7**	**41.0**	2.5
Japan			1.6	16.0	24.7	50.5	66.0	72.3	51.7	35.9	7.5	

Source: own elaborations based on OECD-CRS data.

Notes: The GPG aggregate of reference is the extended one (*gpge*). Data for lines sum up to 100,0 for the different sub-periods. In bold the highest average share in donors' GPG-related ODA for each decade.

These trends convey the idea that GPGs with weakest-link technologies have become increasingly important at the global level: they are connected to global health emergencies (the SARS or the Avian Flu), terrorism (after September 11, 2001) and narco traffic control. At the same time, the contributions from poorer countries, which are usually also the weakest-links in provision, have probably fallen behind the level desired by DAC donors. To avoid suboptimal provision, donor countries have increased their participation in the financing of those weakest-link GPGs which represent a priority for them, also by targeting aid flows to their provision in the developing countries. This observation supports Sandler's (1998) anticipation of the increase in the sub-optimality of provision levels of weakest-link GPGs, "unless the richest countries either subsidize the poorest countries' provision or else step in and provide the public goods for these poor countries" (Sandler, 1998, p. 235).

Table 4 shows the composition of the GPG-related ODA for the same groups of countries employed in Table 3. Anglo-Saxon countries have experienced the most decisive shift from summation to weakest link GPGs: activities related to Crime control and Communicable disease control, which amounted to tiny of total *gpge* in the 1980s, have reached respectively 23.9 and 37.5 per cent in the last decade. At the same time, expenditures for Global commons, Communication and Knowledge have substantially decreased in the last decades.

North European countries have increased their financing to Crime control in the period (from 1,1 to 14,2 per cent of their total *gpge* financing), but in the 2000s they still keep most of their GPG budget on summation goods, such as Global commons (32,4 per cent) and Global governance (16,9 per cent). Communicable disease control present, instead, a lower share of financing (14,3 per cent). Central European countries tend to conform to the pattern of expenditures of the North European countries: however, they have first increased their financing to Global commons and then kept it stable, while increasing their spending on Knowledge and Global stability, at the expenses of Communications activities. Southern European countries and Japan concentrate their GPG budget on Global commons. They have drastically decreased their expenditures on Communications, while

increasing those on Global Governance and weakest-link GPGs, such as Crime control (27,7 per cent for the South European countries) and Communicable disease eradication.

A first impression from Tables 3 and 4 is that no clear pattern is respected in the financing of GPGs. This complements Mascharenas and Sandler's (2005) finding that neither aid allocation follows clear financing patterns. A host of considerations involving perspective benefits and genuine altruism probably drives the donors' decision on how much aid to allocate to GPGs: donor-specific gains from other aid spending (geo-political considerations, trade and political ties), satisfaction from altruistic giving to alleviate poverty or to contribute to the solution of world-wide problems and non-rival/non-excludable benefits from GPGs. For example, Nordic countries, which seem to be less driven by the search for donor-specific gains from aid (Gates and Hoeffler, 2004), have kept a generous level of financing to poor countries over time, while not renouncing to redirect part of it to global issues: are they just becoming less generous or are they leaving behind the 'old school' development assistance patterns (Severino and Ray, 2009) in search for greater coherence between aid and other dimensions of their international economic policies? The same caution must be applied to the Anglo-Saxon countries. Their shift towards weakest-link GPG financing could be the attempt to buy an insurance against risky and disruptive events, even in the absence of cooperation from other countries. Alternatively, it could be the consequence of the strict pursuit of their geopolitical and security interest, whose complementary with poor countries development is doubtful (Sagasti, 2005). Section 5 of this paper will provide some tentative answers.

4.2 Does GPG-related ODA crowd-out other forms of aid expenditure?

Concerns for coherence in aid programs and the fear that GPGs crowd-out aid devoted to poverty reduction have been growing since the 1990s. Displacement seems all the more harmful when there exist complementarities between global and national public goods, as it could weaken developing countries' ability to provide GPGs themselves (te Velde et al. 2002, p. 142). A number of studies have searched for the presence and the size of the crowding-out effect and evidence has been found

both in a strong (te Velde et al., 2002) and in a soft version (Reisen et al., 2004) for the 1980s and 1990s.

As Reisen et al. (2004) claim, "there is no straightforward way to test for crowding-out" (p. 28). Borrowing from te Velde et al. (2002) , we regress (equation 1) the share of GPG on ODA (gpg_{ji}/oda, j represents each of the three definitions adopted), ODA (oda) and a dummy $country_{n,}$ with n indicating the groups of countries already presented in Table 3[11]. The regression analysis is performed for decades and for all definitions. A positive value of the coefficient β implies that an increase in ODA is associated with an increasing GPGs to ODA ratio.

$$(1) \quad gpg^{j}_{it}/oda = \beta \, oda_{it} + country_n + \varepsilon_t$$

Table 5 presents the results. For all groups of countries, the coefficient for oda is significant and it increases in time. Confirming the results of Reisen et al. (2004), a soft substitution effect can be detected only for the $gpge$ and $gpgr$ aggregates. This latter aggregate is also the best performing. The substitution effect is absent for the $gpgm$ definition, probably because it includes expenditure items, which are more complementary to traditional aid. However, we deem that a larger aggregate, as $gpge,$ is in general preferable, as its broader coverage catches deeper information of donors' choices in time.

The results of Table 5 confirm the significance of the coefficient for the *country* dummies and the homogeneity of GPG financing for groups of countries. North European countries have the largest values for the dummy, which smoothly increase in time. On a lesser scale, the same holds true also for Anglo-Saxon donor countries, while the effect is less marked for Central European countries These results complement the descriptive statistics of Table 3, suggesting that for some countries GPGs have become an increasingly important chapter of the ODA budget, to a certain extent also at the expenses of traditional aid.

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[11] Differently from te Velde et al. (2002, we do not include temporal dummies, but we prefer dummies for homogeneous groups of donors.

5. **What determines aid financing of global public goods?**

We finally examine the factors that determine the donors' decision on GPG-related ODA. We adapt the hybrid models on aid allocation (for a survey, see McGillivray and White, 1993), focusing on the donors side, separating the two stages, *how much to give* and *how to allocate*, and concentrating on the first one. The determinants of the financing flows are searched among the more or less explicit interests of donors, their preferences and constraints. Recipient countries are considered as an *unicum*, which is consistent with our interest in global goods financing, where benefits of GPGs are potentially equal for all countries and the relevant role is that of the financer/producer.

The variables considered are selected following Reisen et al. (2004) but their number has been enlarged and they have been grouped into four headings: i) indicators of openness to the rest of the world (*OUTW*); ii) indicators of preferences for domestic public expenditure *(DPE)*; iii) an indicator of potential direct benefits from GPG provision, the donors' population *(Pop)*, as in Barrett (2007); iv) indicators of financial constraints *(FC)*. Table 6 shows that the statistical significance of the variables, averaged over the period 1997-2001 for each of the 22 donor countries and examined with respect to averaged GPGs share on GDP, for the three definitions.

Table 5 – ODA spending on Global Public Goods and the crowding-out of other forms of aid expenditure by groups of DAC countries: 1973-2009

	gpge/oda					*gpgr/oda*					*gpgm/oda*				
	1970s	1980s	1990s	2000s	1973-2009	1970s	1980s	1990s	2000s	1973-2009	1970s	1980s	1990s	2000s	1973-2009
oda country$_i$	3.4E-07	7.6E-07	9.8E-07	3.7E-06*	3.2E-06*	1.6E-07	1.7E-06*	2.4E-06**	5.0E-06*	4.4E-06*	-7.2E-07	-9.6E-06	-4.5E-06*	-5.4E-06*	-3.5E-06**
Japan	0.06*	0.06*	0.05*	0.006	0.03*	0.05*	0.07*	0.04**	0.006	0.02*	0.02*	0.1**	0.1*	0.13*	0.07*
Central Europe	0.01*	0.03*	0.04*	0.09*	0.04*	0.01*	0.02*	0.04*	0.07*	0.03*	0.01**	0.06*	0.1*	0.14*	0.08*
South Europe	-1.0E-04	0.03*	0.04*	0.14*	0.08*	-6.6E-05	0.04*	0.03*	0.06*	0.04*	0.0003	0.06*	0.05*	0.15*	0.09*
Anglo-Saxon	0.01*	0.03*	0.08*	0.15*	0.07*	0.02*	0.03*	0.07*	0.13*	0.06*	0.01*	0.15	0.08*	0.24*	0.12*
North Europe	0.03*	0.08*	0.1*	0.14*	0.09*	0.04*	0.09*	0.12*	0.14*	0.1*	0.05*	0.08*	0.19*	0.22*	0.14*
No.	119	164	203	218	704	119	179	208	218	724	119	170	209	220	718
R^2	0.525	0.562	0.600	0.752	0.518	0.412	0.499	0.603	0.891	0.592	0.273	0.064	0.209	0.397	0.161

Source: own elaborations based on OECD-CRS data.

Note: LS dummy variable estimation with robust standard errors.   * $p<0.05$, ** $p<0.1$

Table 6 –Correlation coefficients for the ratio of Global Public Goods to GDP: 1973-2009

Indicators		Spearman correlation											
		gpgm/ gdp	*gpgr/ gdp*	*gpge/ gdp*	*gpgm/ gdp*	*gpgr/ gdp*	*gpge/ gdp*	*gpgm/ gdp*	*gpgr/ gdp*	*gpge/ gdp*	*gpgm/ gdp*	*gpgr/ gdp*	*gpge/ gdp*
		1970s			**1980s**			**1990s**			**2000s**		
Openness to rest of world	Current account balance	0.09	0.11	0.15**	0.32*	0.32*	0.39 *	0.37*	0.34*	0.37*	0.61*	0.67*	0.62*
	FDI outflow	0.43*	0.57*	0.50*	0.47*	0.31*	0.30*	0.56*	0.49*	0.49*	0.42*	0.57*	0.56*
Preference for Domestic expenditure	Public expenditure on Health				0.01	0.13*	0.12*	0.09	0.14*	0.14*	-0.13**	-0.20*	-0.18*
	Public expenditure on Education										0.53*	0.48*	0.51*
	General government final consumption expenditure	0.40*	0.58*	0.47*	0.28*	0.33*	0.33*	0.50*	0.55	0.56	0.34*	0.31*	0.38*
	Military expenditure				-0.03	-0.05	-0.02	-0.12**	-0.22*	-0.21*	-0239*	-0.01	-0.12**
	Government Intramural Expenditure on R&D				0.23*	0.12**	0.12**	0.10	0.27*	0.19*	0.03	0.06	0.01
	Health+Education+Military + R&D expenditure										0.26 *	0.27*	034*
Potent. benefit	Population	0.14**	0.12	0.11	-0.33*	-0.07	-0.07	-0.01	0.11*	0.08	-0.63*	-0.29*	-0.26*
Financial constraints	General Government financial balance							0.19*	0.23*	0.17*	0.68*	0.58*	0.55*
	General government gross financial liabilities	-0.02	0.07	-0.14	-0.03	0.01	-0.01	-0.14*	-0.04	0.02	-0.55*	-0.54*	-0.44*
	Net government interest payments	-0.34*	-0.20*	-0.36*	-0.08	-0.34*	-0.31*	-0.38*	-0.37*	-0.29*	-0.62*	-0.51*	-0.41*

Source: author's calculations based on OECD-CRS data.

Notes. All variables but population are expressed as a percentage of GDP. * p<0.05, ** p<0.1

The statistical significance of the variables included under the heading *Openness to the rest of the world* (*OUTW*) conveys the idea that donors more present on international markets are more globalized and thus more interested in GPGs. This result is all the more interesting if considered in comparison of the poor level of correlation between ODA financing and FDI expenditure showed by Alesina and Dollars (2000). *Preference for domestic public expenditure (DPE),* as expressed by the general government final consumption expenditure and by the sum of main lines of expenditures (health, military, R&D, education), is significantly and positively correlated with the three aggregates of GPGs. The single items of public expenditure present, instead, different correlations with GPGs, both positive and negative, and changing along the decades. We interpret this result in the sense that, in time, some types of expenditure have become more *globalized* than others and are now more influenced by global factors, all the more if the donor country is outward oriented. Therefore, depending on donors' perception of global emergencies in the sanitary or security field, expenditures on health and crime control GPGs can be seen as alternative to expenditures on corresponding domestic goods: this explains the negative sign of the correlations in the 2000s, for the three GPG definitions. Domestic public expenditures on education are not a *globalized* item of expenditure and cannot be considered as alternative to knowledge GPGs. Instead, a preference for domestic education can be a motive for financing the same good at the global level: in fact, the correlation between education expenditure and GPGs (all definitions) is positive. These results are different from those found by Reisen et al. (2004, p. 25), where these same variables are significantly correlated only with the ratio of ODA to GDP.

The donors' population *(Pop)* catches the *potential benefits* from GPG financing. It is weakly correlated in the first three decades, but it becomes significant for all GPGs definitions in the 2000s. The negative sign could be explained by a number of factors: big donors' misperception of the benefits linked to GPGs; the fact the small countries are also more open and globalized; or the fact that a larger population puts stronger pressure on the solution of domestic problems.

Among the variables related to the *state of the public finances (FC),* the most significant are the interest expenditure and the budget balance, which show the expected signs. In the 2000s, when public finance constraints became tighter in the EU countries participating in the EMU and in Japan, all public finance variables are significant and with the right sign: the relationship is positive for the budget balance, as in Reisen et al. (2004), and negative for the general government gross financial liabilities and interest expenditure. This suggests that part of the generosity in GPG financing is explained by the availability of public saving: countries undergoing a period of public finance distress or reform tend to cut all more flexible budget items, including the support to international programs.

Using the three definitions of GPGs and one variable for each group of determinants reported in Table 6, we estimate an individual fixed-effect model[12] with Driscoll and Kraay (1998) robust standard error[13] for the unbalanced dataset of 22 countries[14], observed for 37 years (1973-2009). In the estimated equation (2),

$$(2) \qquad Gpg^j{}_{it}/gdp = \beta_1\, FC_{it} + \beta_1\, Pop_{it} + \beta_1\, DPE_{it} + \beta_1\, OUTW_{it} + \varepsilon_{it}$$

the upscript j refers to the definition of GPGs, the subscript i denotes the donor and the subscript t denotes the year. The disturbance term is given by two error components, $\varepsilon_{it} = \alpha_i + u_{it}$ with α_i representing the country effect, which we assume a fixed effect, including cultural and historic aspects, by assumption correlated with the regressors. The term u_{it} is the stochastic error.

We first estimate a general model in which we consider all single items of domestic public expenditure *(DPE)* and one variable for each other heading. The results (Table 7- model A) show that, for all definitions of GPGs, the effect of the donor's size *(pop)* is significant but tiny and that

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[12] We need to take under control unmeasured characteristics of the states which can influence the GPG financing decision.
[13] Standard errors are robust to general forms of cross-sectional and temporal dependence provided that T is larger than N, as in our case.
[14] Ireland, Luxembourg, Greece and New Zealand are omitted because of missing values.

only the net interest expenditure (*net_interest),* as a proxy of the financial constraints, is a significant determinant, with the expected sign. The balance of payments (*bp_balance*), as a proxy of openness to the rest of the world, is significant only for the *gpgm* aggregate. Out of single items of domestic expenditure, defense (*milit*) is almost always significant with a negative sign, which, as already said, can be explained by the *globalized* character of this type of expenditure, at least in recent years. When significant, the same interpretation can be applied to health and R&D. Domestic expenditure on education (*edu*) is always significant and with a positive for the *gpgm* aggregate, i.e. which includes GPGs that are relevant for the Millennium Development Goals.

We repeat the analysis by substituting the single items of domestic expenditure with a variable representative of the preference for aggregate domestic expenditure public. The two natural candidates are: the general government final consumption expenditure (*consump*) and the sum of the single items of expenditures previously considered (*hemg*). Final consumption (Table 7 – model B) is significant and positive for all definitions and in combination with whatever other determinant. In model B both financial balance and net interest expenditure are significant and we observe an improvement in the relevance of both variables expressing openness to the rest of the world (foreign direct investment, *fdi*, and the balance of payments, *bp_balance*). Not reported results for *hemg* show no improvement in the regression with respect to model B.

6. Concluding remarks

The descriptive analysis of the paper shows for all three definitions of GPGs adopted, that an increasing share of bilateral aid is devoted to GPGs in the period 1973-2009 and that some groups of countries (the Anglo-Saxon and the Northern European countries) tend to display a certain degree of homogeneity in their patterns of GPGs financing.

Table 7 – Determinants of GPG financing: panel data results (1973-2009)

	Model A								
	Gpge/gdp			*Gpgr/gdp*			*Gpgm/gdp*		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
milit	-0.0003*	-0.0003	-0.0001	-0.0004*	-0.0005*	-0.0004*	-0.001*	-0.0008*	-0.0009*
health	6.28E-05	5.90E-05	-0.0002*	0.0001*	9.40E-05*	-9.93E-05*	-0.0003	-0.0004	-0.0006*
r&d	-0.00101	-0.00102	-0.002*	-0.0003	-0.0003	-0.0008*	-0.003**	-0.003**	-0.003*
edu	-0.0002	-0.0001**	4.11E-05	-0.0001	-0.0001*	3.34E-07	0.000457*	0.000641*	0.0007*
pop	0*	0*	0*	0*	0*	0*	1.09E-10*	1.05E-10*	1.00E-10*
bp_balance	9.38E-06	1.00E-05		1.96E-06	3.32E-06		1.92E-05	3.13E-05**	
fin_balance	-6.79E-09			1.16E-05			-3.59E-05		
fdi			4.33E-06			4.73E-07			-6.55E-06
fin_liabilities		-7.82E-07			-1.21E-06			-1.61E-05**	
net_interest			-0.0002*			-0.0002*			-0.0002*
Constant	0.0004	0.0005	0.001	-0.0002	0.0001	0.0008**	-0.002*	-0.002*	-0.002**
Obs.	133	133	132	133	133	132	133	133	132

[continue]

Source: author's calculations based on OECD-CRS data.

Notes: Fixed effects estimation with Driscoll and Kraay (1998) robust standard error. * $p<0.05$, ** $p<0.1$

[continue]

	Model B								
	Gpge/gdp			*Gpgm/gdp*			*Gpgo/gdp*		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
pop	0*	0*	0*	0*	0*	0*	0*	0*	0*
fin_balance	4.89E-05*			2.83E-05*			4.12E-05*		
bp_balance		4.34E-05*	4.83E-05*		2.74E-05*	3.70E-05*		3.18E-05*	3.44E-05*
fdi	-1.43E-07			-1.52E-06			-1.29E-07		
net_interest		-4.76E-05*			-4.46E-05*			-4.28E-05**	
fin_liabilities			-2.70E-06**			-1.86E-06			-2.15E-06*
consump	0.0001*	4.04E-05*	5.25E-05*	0.0001*	4.80E-05*	7.30E-05*	9.90E-05*	3.27E-05**	4.05E-05*
Constant	-0.002*	-0.0008*	-0.001*	-0.002*	-0.0007*	-0.001*	-0.002*	-0.0006**	-0.0008*
Obs.	511	592	587	496	563	562	506	581	580

Source: author's calculations based on OECD-CRS data.

Notes: Fixed effects estimation with Driscoll and Kraay (1998) robust standard error. * $p<0.05$, ** $p<0.1$

The increase in GPG-related ODA has been accompanied by a process of goods' selection by donors, who thus express their changes in priorities, as remarked also by te Velde et al. (2002). In particular in the last decade, some GPGs with weakest-link technologies, notably Crime control/peace building and Communicable disease control, have received larger shares of financing through aid flows. This could be explained by the rich countries' fear of an insufficient provision by poor countries, which, increasingly, cannot afford to pay for them. Rich countries are therefore stepping in to avoid sub-optimal levels of provision, as foreseen by Sandler (1998). Further research could be conducted on these aspects, trying to include, the role of spatial correlation as an additional explanatory variable, endogenously deriving homogeneous groups of donors.

The econometric part of the paper has been conducted to estimate whether GPGs financing crowd-out other aid spending, as claimed by te Velde (2002) and Reisen et al. (2004). The analysis confirms the presence of a weak, but statistically significant crowding-out effect for the broader definitions of GPGs (*gpge* and *gpgr*). The crowing-out is not uniform among donor countries and along the period analyzed. In fact, it is larger for North European and Anglo-Saxon countries and smoothly increasing in time. Differences in the crowding out effect could be explained by future item-specific research on donor's expenditures and on the composition of the GPG bundles.

The presence of a displacement effect between GPGs and other aid spending, should suggest to separate national accounting and budgeting systems for GPG and development financing, so to guarantee that funding for GPGs be a complement and not a substitute to development aid. As suggested for the first time in Raffer (1999), the OECD statistics should also track expenditure on GPGs by introducing a line item for them, including contributions that are not accounted as ODA. These statistics should also include a larger number of countries than the traditional DAC donors, as contributions to GPGs are increasingly coming from the major developing economies. Finally, the international goals should be separated: the famous UN 0.7 % target should be applied only to expenditures related to the promotion of human welfare and the reduction of poverty, while another target should be set for GPGs (Severino and Ray, 2009).

The econometric analysis has also tried to detect potential determinants of the donors' choice of GPGs financing. In a panel data analysis, we observe the relevant role played by public finance constraints, openness to the rest of the world and donor's size. Preference for domestic expenditure, as expressed by aggregate general government final consumption, is also a significant determinant. The single items of public domestic expenditure (defense, R&D, education, health) seem to influence GPG-related ODA according to their being more or less sensitive to global events. In the 2000s, this sensitivity largely increases for defense and health expenditures, whose financing at the domestic level seems alternative to financing at the global level.

Two caveats must be made before concluding. First, GPGs are not the sole responsible for the change in the patterns of aid that have been experienced since the 1990s. Other factors have played a relevant role as well: the identity crisis experienced by official development assistance after the fall of the Berlin Wall (Severino and Ray, 2009), changes in donors' ideologies (Hjertholm and White, 2000) and in the development paradigm, the acknowledgment of the limits in aid effectiveness, the combination of evolving strategic and trade interests, geo-political considerations and political alliances. A second caveat concerns a fundament limit of this research: the picture of GPGs financing would need to be completed with the consideration of flows from non-DAC countries (China and Russia) and of explicit, non-ODA financing through the national budgets, which complement and/or substitute for the share of GPGs that are funded through the ODA channels.

References

Alesina, A. & Dollar D. (2000). Who Gives foreign Aid to Whom and Why?. *Journal of Economic Growth, 5* (1), 33-63.

Anand, P. (2002). *Financing the Provision of Global Public Goods*. UN University, Discussion Paper, 110.

Anand, P. (2004). Financing the provision of global public goods. *World Economy*, *27*(2), 215-237.

Barrett S. (1993). *Convention on climate change: Economic aspects of negotiations.* Paris: OECD.

Barrett S. (2007). *Why cooperate? The Incentive to Supply Global Public Goods*. New York: Oxford University Press.

Binger, A. (2003). Global *public goods and potential mechanisms for financing availability*. Paper prepared for the Fifth Session of the Committee for Development Policy meeting.

Birdsall, N. (2005). Overcoming coordination and attribution problems. Meeting the challenge of unfunded regionalism. In Kaul, I., & Conceição, P. (Eds.). *The New Public Finance: Responding to Global Challenges*. New York: Oxford University Press.

Cepparulo, A., & Giuriato, L. (2009). *Aid Financing of Global Public Goods: an Update*. Unpublished, Dipartimento di Economia Pubblica, Sapienza Università di Roma.

Cornes, R., & Sandler T. (1996). *The theory of externalities, public goods and club goods*. Cambridge: Cambridge University Press.

Driscoll, J.C., & Kraay A. (1998). Consistent co-variance matrix estimation with the spacially dependent panel data. *Review of Economics and Statistics*, *80*(4), 549-60.

Gates, S., & Hoeffler, A. (2004). *Global aid allocation: Are Nordic donors different?*. Oxford University, Centre for the Study of African Economies, Working Paper, 34.

Hirshleifer, J. (1983). From Weakest-Link to Best-Shot: The Voluntary Provision of Public Goods. *Public Choice*, *41* (3), 371–86.

Hjertholm, P., & White, H. (2000). *Survey of foreign aid: history, trends and allocation.* University of Copenhagen, Department of Economics, Discussion Paper, 04.

Jayaraman, R. & Kanbur, R. (1999). International Public Goods and the case for foreign aid. In I.Kaul, I. Grunberg, & M.A. Stern (Eds.), *Global public goods*. New York: Oxford University Press.

Kanbur, R. (2001). *Cross-Border Externalities, International Public Goods and Their Implications for Aid Agencies*. Cornell University, Department of Applied Economics and Management, Ithaca, N.Y., Working Paper, 03.

Kanbur, R., Sandler T., & Morrison, T. (1999). *The Future of Development Assistance: Common Pools and International Public Goods.* Washington, D.C.: Overseas Development Council.

Kaul, I., Grunberg I. & Stern M.A. (1999). *Global public goods*: *International Cooperation in the Twenty-First Century*. New York: Oxford University Press.

Kaul, I., Conceição, P., Le Goulven K., & Mendoza, R. (2003). *Providing Global Public Goods: Managing Globalization.* New York: Oxford University Press.

Kaul, I., & Conceição, P. (2006). *The New Public Finance: Responding to Global Challenges*. New York: Oxford University Press.

Lei, V., Tucker, S., & Vesely, F. (2007). Foreign aid and weakest-link international public goods: An experimental study. *European Economic Review, 51*(3), 599-623.

McGillivray, M., & White, H. (1993). *Explanatory Studies of Aid Allocation Among Developing Countries: A Critical Survey*. The Hague, Institute of Social Studies, Working Paper, 148.

Mascarenhas, R., & Sandler, T. (2004). Donors' Mechanisms for Financing International and National Public Goods: Loans or Grants?. *The World Economy*, *28*(8), 1095-1117.

Raffer, K.,(1999). *ODA and Global Public Goods: a Trend Analysis of Past and Present Spending Patterns*. United Nations, ODS Background Papers.

Reisen, H., Soto, M., & Weithöner, T. (2004). *Financing Global and Regional Public Goods Through ODA: Analysis and Evidence from the OECD Creditor Reporting System*. OECD, Development Centre, Working Paper, 232.

Sagasti, F. (2005). *Official Development Assistance: background, context, issues and prospect.* Paper presented at the G-20 Meeting. Petra, Jordan.

Sandler T. (1992). *Collective action: Theory and applications*. Ann Arbor: University of Michigan Press.

Sandler, T. (1998). Global and Regional Public Goods: A Prognosis for collective Action. *Fiscal Studies*, *19* (3), 221-247.

Sandler, T. (2004). *Global Collective Action.* Cambridge: Cambridge University Press.

Severino, J.M., & Ray, O. (2009). *The End of ODA: Death and Rebirth of a Global Public Policy*. Center for Global Development, Working Paper, 167.

Speight, M. (2002). *How Much Should DFID Allocate to Global Action and Funding*. London: Department for International Development.

Te Velde, D.W., Morrissey, O., & Hewitt, A. (2002). Allocating Aid to International Public Goods. In M. Ferroni, & A. Mody (Eds.), *International Public Goods. Incentives, Measurement and Financing* (pp.81-118). Washington, D.C.: Kluwer.

UNIDO (2008). *Public goods for economic development.* Vienna: UNIDO Publications.

Vicary, S., & Sandler, T. (2002). Weakest-link public goods: Giving in-kind or transferring money. *European Economic Review, 46* (8)*, 1501-1520.

Warr, P. (1993). The Private Provision of a Public Goods is Independent of the Distribution of Income, *Economic Letters, 13,* 207-211.

World Bank (2001). *Global Development Finance 2001*. Washington, D.C.: World Bank.

Zedillo, E., & Thiam, T. (2006). *Meeting Global Challenges: International Cooperation in the National Interest.* Report of the International Task Force on Global Public Goods, Swedish Ministry of Foreign Affairs.

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