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BACKGROUND PAPER TO THE 2010 WORLD DEVELOPMENT REPORT

"Revenue Management" Effects Related to Financial Flows Generated by Climate Policy

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Abstract

This paper discusses possible macroeconomic implications for low-income countries of increased revenue inflows that may follow from implementing certain global greenhouse gas mitigation policies. Such revenue sources include revenue from emissions offset mechanisms, direct investments, and financial transfers that form parts of possible future mitigation treaties. In the short run such revenue will come mainly from offset markets and donor-sponsored programs, with some additional financial inflows due to foreign direct investments. In the longer run, comprehensive global cap-and-trade or carbon tax schemes could provide a potentially much larger revenue flow to many low-income countries. The author argues that the macroeconomic implications of such flows are manageable in the short run, but the larger revenues resulting from global emissions schemes could overwhelm this capacity and lead to a number of potential macroeconomic management problems.

"Revenue Management" Effects Related to Financial Flows Generated by Climate Policy
(Background Paper Written for the World Development Report 2010)

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1. Introduction

Some of the financing mechanisms suggested or anticipated as part of a future climate policy framework (mitigation and adaptation) are likely to lead to substantial net financial inflows to many low-income countries (LICs). First and foremost, this concerns financial transfer schemes related to international agreements on mitigation policy (involving either cap-and-trade or taxation schemes). International transfers may also be generated in response to a need for adaptation to climate change in lower-income countries, or to support energy-sector developments in such countries. The estimates of "necessary" *additional* financing to meet low-income countries' needs for adaptation expenditures, costs of mitigation, and energy technology transfers and development, are today highly uncertain, but could easily exceed the current level of Official Development Assistance (ODA), which is about US$100 billion annually. As more specific regional examples that illustrate the possible magnitude of these increased financial flows, calculations made by the IMF indicate that an aggressive global carbon trading scheme, were it instituted and implemented with a set of population-based emissions rights, could easily lead to a financial inflow of up to 10 percent of GDP for Sub-Saharan Africa, and up to 5 percent for India, from around 2020 on.[1] When mitigation in LICs would instead be based on greenhouse gas (GHG) emissions offset programs, lower-income countries are also likely to experience net additional financial inflows, although most likely of smaller magnitudes.

Some part of these additional funds will flow to the public sector, and some part to private-sector recipients. The distribution of flows by these two main categories is likely to depend on type of flow by financing purpose (whether it is related to mitigation, energy development, or adaptation). Any eventual distribution among public- and private-sector recipients is today unclear, but some likely basic principles can be identified. A high flow to the public sector is most likely under aggressive mitigation policies implemented by emissions taxes or cap-and-trade (c-a-t) schemes with widespread quota auctioning to emitters, and population-based distribution of international entitlements to emit GHGs. Under c-a-t with free entitlements, widespread use of offset markets, and widespread reliance on support to private-sector energy sector developments, more of the revenue is likely to flow to the private sector.

Such increased net inflows will create additional policy opportunities for low-income countries, but also challenges. Increased attention to a number of public management issues may be required, for the additional revenue to be put to its best use, and to prevent that disruptions and obstacles are caused to other aspects of the economy. The purpose of this paper is to discuss some of these effects, from a macroeconomic as well as microeconomics/incentives perspective.

The paper raises, and analyzes, a number of related economic and political economy factors.

First, as already stressed, it may matter whether disbursements flow to the *private or to the public sector*. For some effects (perhaps including exchange rate/interest rate effects) it may matter little whether the private or public sector is the primary beneficiary. For other effects (fiscal space, earmarking, rent seeking and corruption) it may matter much more.

Secondly, the *time frame for scaling-up of financial flows, and the consistency over time of the scaling-up* are likely to matter. Scaling-up may be problematic if executed quickly, but easier if phased in gradually over time. Very variable flows may also be problematic.

The financing mechanism may impact on these effects. It may matter whether international funds are disbursed as aid, as loans, or as foreign direct investment by outside private-sector parties. It may also matter whether financing is generated in response to a specific need or purpose (say, to finance specific energy-sector or adaptation projects); as part of a particular GHG emissions financing scheme

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[1] See IMF (2008a).

(as for most GHG emissions offset schemes today including CDM);[2] or as an unconditional disbursement to a country's Treasury. It also matters whether and how additional inflows are spent, saved or deposited by the receiving government; and whether transfers are unconditional, or tied to particular projects/programs (or provided in kind).

The paper also deals with a number of more specific themes, in part themes describing various macroeconomic effects, and in part issues that impede upon, interact with, and otherwise affect, the overall macroeconomic implications. These themes include the following:

A. Exchange rate and interest rate effects. For countries with flexible individual exchange rates, these rates are likely to play an equilibrating role, appreciating in response to increased net inflows of foreign funds. Interest rates are also likely to react, falling when the exchange rate appreciates, but such effects might depend on the degree and nature of capital market regulations. Effects may also differ by finance mechanism (such as flows related to c-a-t or international emissions taxes; offset markets; and energy and adaptation finance).

B. "Dutch disease" effects: To the extent that increased financial inflows lead to an appreciating exchange rate, productivity/profitability in export and import substitution industries are adversely affected, thus hampering their development. Such effects interact with those on the exchange rate, as well as "transparency" and rent-seeking effects, under point F below. Effects on the exchange rate are likely to be small when the primary implication of the capital inflow is to increase imports (as when climate-related aid is given in kind, say, as adaptation and energy development projects provided directly from abroad). The likelihood that an economy will be subject to "Dutch disease" is also related to the "*absorption*" and "*spending*" concepts noted above.

C. Effects on "fiscal space". By this we shall mean the need for additional budgetary room or leeway, so as to meet future, for the moment unforeseen, budgetary problems or crises. The need to establish extra fiscal space is likely to offset the degree of "Dutch disease" when needed either as a financial cushion (as when the increased financial inflow is deposited as currency reserves in the short run), or to be used to finance additional imports. Increased net inflows benefiting the public sector then generally increases fiscal space. Fiscal space is particularly important in the face of large temporary and unexpected budgetary needs, which may arise e g from extreme weather events.

D. The scope for tax substitution. The "problem" of managing increased financial inflows may for the public sector in principle be offset by lowering existing distortive taxes. This requires a study of the degrees to which the current tax burden causes distortions, and which taxes are most distortive, by country. The discussion also needs to be tied in with political economy factors, including the practical realism of changing tax policies in desired directions. Among the questions one needs to address are: When a current tax is particularly distortive, why has it not already been removed? And, do changed circumstances, created by increased financial inflows, increase of reduce the likelihood that political action to change taxes will be taken?

E. Implications of earmarking of climate finance-generated revenues. For climate-related finance, earmarking is particularly relevant in two contexts: First, for financial flows in direct response to, or directed at, specific adaptation needs. Secondly, for financial flows related to energy projects and energy technology developments. From an efficiency point of view, widespread earmarking is usually not an advisable option, as there is typically no guarantee that transfers that are earmarked to predefined projects will have maximum benefit for the receiving country or government. But it may be an acceptable "second-best" solution in many climate-related cases: in particular, when funding would not otherwise be forthcoming; and when the alternative is (more) wasteful spending by the receiver country.

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[2] CDM denotes the Clean Development Mechanism, which is established under the Kyoto Protocol as an offset mechanism whereby countries with mitigation responsibility under the Protocol (Annex B countries) can purchase GHG emissions quotas via projects carried out in countries outside Annex B.

F. Implications of and for transparency, rent seeking and corruption. This is a broad and difficult topic spanning the wide field of "political economy". In principle, both "cause" and "effect" issues are relevant: What are the implications of transparency, rent seeking and corruption for the effect of climate financing? And what are the effects of climate financing on the degrees and extent of transparency, rent seeking and corruption? Among specific questions to be answered are the likely rent-seeking/corruption effects arising under different types of financing noted above; whether some types of climate-related finance are likely to lead to more, or less, rent seeking/corruption than other finance; and how to minimize the ensuing resource losses in countries where such governance problems are severe.

G. Effectiveness of adaptation funding, and implications for the way funding is managed by donors and recipients. Results from the aid-effectiveness literature will here be used to draw lessons for the future set-up of adaptation funding. This includes issues related to donor harmonization and coordination, versus proliferation and fragmentation resulting in a bureaucratic burden on recipients; donors' (lack of) alignment on country strategies; distortive versus catalytic effects of 'vertical funding'; (un)predictable funding patterns with a bearing on planning functions; and broader institutional capacity issues in developing countries influencing their ability to absorb external funds.

H. Longer-term growth effects of climate finance. This analysis builds on the literature dealing with general aid effectiveness, and impacts of foreign direct investment on growth, which are discussed in relation to the more specific features of climate-related finance.

2. Overview of Climate-Related Financial Flows and Their Magnitudes

2.1 Introduction

The overall implications of increased financial flows, following from various forms of climate finance, are of course related to their magnitudes, as well as to the types of flows. Financial flows related to climate change (mitigation and adaptation) will be grouped as follows:

  a) Finance related to adaptation
  b) Finance of mitigation projects through offset markets including CDM
  c) Technology and energy development related financing
  d) Financial flows resulting from international quota trading, or tax revenue transfers between countries.

Such flows are today (2008) still modest, with offset market finance, notably CDM, currently the dominating item; see the discussion below. Other items are small and difficult to assess precisely, in particular as there is yet no good inventory of climate-specific finance.

Note that while items a and c, and in some measure b, describe *disbursements*, related to particular projects and financing needs generated by climate change, item d (and, possibly, b) has a different character, namely as *raised revenue*, in the execution of mitigation policy. Revenues raised under item d (and b) could thus in principle be used towards the financing requirements under items a and c. Also, it may make sense to add items a and c, but then not to necessarily to include figures under item d. An adding of all the items would make sense only if the financing of items a and c are covered by other types of financing than, thus being additional to, items b and d. Such additional finance would include ODA and FDI.

Item b is special as it is not quite clear whether this item describes a financing need (similar to item c), or a source of funds related to the execution of mitigation policy (similar to item d). From the point of view of Annex B countries, it is most similar to (almost synonymous with) d. From the point of view

of non-Annex B countries where CDM projects are carried out, however, it may be viewed as funds directed at domestic energy efficiency and technology development, thus item c.

Most interesting for our discussion is the scope for future financing, where great uncertainties persist. In this section we will try to conceptualize the major flow types, with an indication of their future likely magnitudes.

2.2 Financing related to adaptation

Future financial flows related to adaptation are hard to predict. One reason is that adaptation costs are elusive, and will in part, perhaps mostly, be borne by the private sector. Private and public adaptation cost are likely to be broad substitutes, as more public adaptation investment is likely to reduce the private sector's need to incur such costs. There are also various ways of assessing adaptation costs, various time frames to consider, and different ways in which costs can be split and categorized: by foreign and domestic, and by private and public, sources.

Different approaches exist for assessing future adaptation cost. It is here useful to distinguish between "bottom-up" and "top-down" procedures. "Bottom-up" cost assessments start with the adaptation needs in individual sectors or even projects, and aggregate these up to a national and international level. Typically, such assessments will give adaptation finance need numbers at national levels. "Top-down" assessments start with considerations of likely total needs e g for adaptation investments as share of GDP, and in most cases consider global adaptation finance needs, or alternatively, regional needs, but will as a rule not give national numbers.

For our purposes, the "top-down" assessments appear to be the most useful, in particular, as our scope is largely macroeconomic, with an emphasis on macroeconomic effects. OECD (2008) provides a useful and fairly comprehensive survey of such studies to date. Table 2.1 below sums up these studies. While the table lists 6 studies, they are all based on only two fully independent estimates, namely the World Bank (2006) (WB) and the UNFCCC (2007) studies. The Stern (2007), Oxfam (2007) and UNDP (2007) studies all represent modifications of the WB study. The WB study accounts for three major types of financial flows or expenditures: official development aid (ODA) assessed at US$100 billion annually; foreign direct investment (FDI) in lower-income countries, assessed at US$160 billion, and gross domestic investment (GDI) in the same countries, assessed at US$1500 billion. 40 percent of ODA, 10 percent of FDI, and 2-10 percent of GDI are assumed to be "climate-sensitive" thus giving rise to a potential need for adaptation expenditure, and with a need for "climate-proofing"; which in turn is assumed to represent 10-20 percent of the financial exposure to potential climate effects for each of the three categories.

The Stern, Oxfam and UNDP studies represent relatively simple refinements of the WB study, with updated and more refined numbers. In particular, the UNDP study makes predictions up to 2015, for ODA (US$106 billion per year), FDI (US$281 billion) and GDI (US$2724 billion). Note that the UNDP study gives substantially higher numbers than the other studies, and has a much higher lower bound for adaptation costs. This is due to two factors: first, that a "target", rather than a lower bound, is set for climate-proofing; and secondly, that a specific cost estimate is here included for additional assistance for climate-related disaster response.

The main purpose of the WB study, and the follow-up studies discussed, was to get a hand on the need for public support to adaptation activity and replacement of damage caused by climate change, mainly from the public sector point of view, rather than as a comprehensive measure of adaptation costs for both the public and private sector. It should still be noted that the "climate-proofing" notion, used in all the above studies, is a very imprecise way of identifying adaptation costs.

The UNFCCC (2007) study deals with individual sectors in more depth, and in that sense is not a pure "top-down" study but rather one that combines both "top-down" and "bottom-up" elements. A

problem with this study is rather that a comprehensive view of adaptation costs is missing, as only for particular sectors have costs been explicitly calculated, and thus included.

Currently no pure "bottom-up" study exists for overall adaptation cost assessment. Such studies would be necessary to complement and refine the top-down studies, not least in giving more precise assessments for individual sectors.

Table 2.1: Overview of adaptation financing needs from top-down modelling routines.
Figures in US$billion.

Assessment conducted by	Annual adaptation financing need	Time frame	Countries included	Sectors included	Comments
World Bank	9-41	Present	LICs	Unspecified	Based on WB and OECD analyses of official flows
Stern	4-37	Present	LICs	Unspecified	Update of WB study
Oxfam	50 (min.)	Present	LICs	Unspecified	WB study including estimates from NAPAs and NGO projects
UNDP	86-109	2015	LICs	Unspecified	WB study, plus poverty reduction programmes and disaster responses
UNFCCC	28-67	2030	LICs	Agriculture, forestry, health, coastal zones, infrastructure	Detailed costing for water, infrastructure, coastal, less for ecosystems, infrastructure
UNFCCC	44-166	2030	Global	Agriculture, forestry, health, coastal zones, infrastructure	Infrastructure adaptation costs overlap with coastal zones, water costing
Project Catalyst	15-37	2030	Global	Capacity building, research, disaster management	Covers most vulnerable countries only; only public sector

Source: OECD (2008), World Bank (2009).

It is also a question how good these assessments are for indicating the magnitude of *international financial* flows to be generated by adaptation to climate change. In most cases little is said about the distribution of costs between outside assistance, and domestic costs and how these are to be borne by the public or private sector (the implicit assumption is in most cases that most of adaptation costs will be public and not private).

A further crucial issue is whether the funds in question will be additional to already disbursed flows such as existing ODA. When not, the (additional) effects of adaptation finance will be less or could vanish altogether. From that perspective, the numbers derived here should perhaps be considered as upper limits to the related international financial flows, given that the basic premises behind the stated adaptation cost needs are valid.

2.3 Financial flows to low-income countries resulting from offset markets

This type of financial flows is as noted the only among the four main flow types indicated above, that is currently of a substantial magnitude. Table 2.2 shows the current (2006-2007) level of these flows. Among the financial flows registered in this table, EU–ETS trading dominates; this is however not directly relevant in the context of this study as these represent c-a-t related financial flows (which should be grouped rather under category d), treated below). These flows also only take place between (relatively high-income) European Union countries.

As for net flows benefiting LICs, the Clean Development Mechanism dominates: The total volume of financial transactions in the CDM market to non-Annex I countries has grown rapidly, from 3.9 billion Euros in 2006, to 24.2 billion Euros in 2008.[3] Much of the transaction volume is however secondary trading of CERs. The primary trading in this market, representing basic revenue flow to lower-income countries (figures in parentheses), was much smaller in 2008, namely 6 billion Euros on a volume of 550 million tons CO_2e.[4]

Other offset market flows are much smaller. The two most important are those related to Joint Implementation under the Kyoto Protocol (JI), representing a trading value of about 0.7 billion Euros, on volume of about 70 million tons CO_2e, in 2008 (some of which, however, is secondary-market trading); and other offset markets representing a value of about 0.5 billion Euros.[5] Note that JI leads to some financial flows to LICs, but only to countries within Annex 1, all in East Europe or the former Soviet Union.

Table 2.2: Trading volumes, and values of trade, in emissions markets, 2006-2007. Volumes in million tons CO2, and values in Billion Euros.

Market	2006		2007		2008	
	Volume	Value	Volume	Value	Volume	Value
EU-ETS	1017	18.1	1643	28.1	3091	67.0
CDM (primary CDM)	562	3.9	947	11.7	1609 (550)	24.2 (6.0)
Other markets (JI)	51	0.4	86	0.5	195 (72)	1.2 (0.7)

Sources: Point Carbon (2008, 2009).

More interesting is the scope for such financial flows in the period to come. This is highly uncertain and will not be speculated on here. Its future magnitude will depend on general features of energy markets, on the overall aggressiveness of mitigation policy, and on the degree to which offset markets will be relied on also in the future. Importantly, offset markets will be relevant only when not all countries are subject to binding agreements on mitigation, such as through a comprehensive cap-and-trade regime or a comprehensive system of GHG emissions taxes. Most indications are today (spring 2009) that such a comprehensive agreement is unlikely to come about soon. Thus, GHG emissions offset markets are likely to be with us for a long time, perhaps on a large and increasing scale.

2.4 Financial flows to lower-income countries related to technology and energy development

Financial flows can be expected also in relation to energy developments that are not spurred directly by offset market finance such as CDM. Two types of such finance are publicly-sponsored projects on

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[3] Point Carbon (2008).

[4] Note that, while emissions trading prices held up reasonably well through October 2008, they have been reduced substantially more recently, in the EU-ETS from about 25 Euros/tCO$_2$e to about 13 Euros currently (March 2009), due to the current global economic recession.

[5] The largest market in the "other" group is the RGGI, which is the ten-state c-a-t scheme recently started up in the northeastern US, with compliance period starting in January 2009.

concessional terms, and foreign direct investment (FDI) in the energy sector in low- and middle-income countries. Other categories of finance under this label are international funds to promote clean technologies, and for renewable energy development. As of today, few such commitments have been made; see World Bank, chapter 6, for an overview of recent commitments.[6] Clearly, the current situation is inadequate; but may be changed following the December, 2009 Copenhagen meeting.

2.5 Finance to LICs resulting from international quota trading or tax revenue transfers

An international c-a-t scheme, with free quota trading and allocation of emissions rights by population, could lead to rather massive financial transfers between major groups of countries. For the foreseeable future, current high-income countries are likely to retain a per capita GHG emissions level that is (far) higher than that of most current low-income countries. This will lead to financial flows out of high-income countries to lower-income countries, as rights to the former group's excess GHG consumption need to be purchased from the latter group.

Allocating emissions rights by population is a "radical" mechanism that is likely to be resisted by countries that are currently high per-capita emitters (the OECD). An alternative principle, namely allocating emissions rights in proportion to the "initial baseline" (in proportion to relative emissions in some baseline year, or to some hypothetical "business-as-usual" emissions path) is more attractive to these, in particular as it is likely to lead to a smaller financial outflow from this group of countries.

A study by the IMF (2008a) has attempted to assess the magnitudes of such future flows, under specified paths for mitigation policy, and growth paths for the global economy. These calculations, the main results from which are given in Tables 2.3-2.4 below, are based on the MiniCAM model as applied to global mitigation policy up to 2100, assuming complete participation in the c-a-t scheme, and under two long-run targets for the atmospheric CO2 concentration, namely 450 ppm (in Table 2.3), and 550 ppm (in Table 2.4).[7]

The tables show, as expected, that finance is generally expected to flow from high-income countries (HICs) and to LICs, more so in the 450 ppm alternative (when mitigation policy is more aggressive), and more when emissions rights are allocated by population. We see however that there could be some slight modifications of this pattern: even with population-based allocation, both China and Latin America will need to purchase emissions rights, later in the century.

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[6] The most important category of committed funds of this type are the multilateral Climate Investment Funds, with commitments of US$6.3 billion for the 2009-2012 period.

[7] These model runs were developed for the Climate Change Science Program sponsored by the U.S. Department of Energy. For more information about the MiniCAM model and these model runs, see U.S. Department of Energy (2007).

Table 2.3: Net Financial Inflows Resulting From Emissions Trading US$billion, 2000 Prices. Long-run concentration target 450 ppm CO2.

Region	Emissions rights depending on population			Emissions rights by baseline		
	2020	2060	2100	2020	2060	2100
Africa	64	278	211	-1	-9	-28
China	14	-14	-29	15	89	22
Former S. U.	-18	-16	16	6	22	31
East Europe	-6	12	19	-1	25	18
India	62	210	244	1	147	250
Japan	-18	-39	-29	-2	-5	-15
Latin America	20	-37	-149	-3	-118	-175
United States	-25	-236	-333	-20	-61	-109
Western Europe	-36	-58	10	-5	13	50
OECD	-83	-415	-383	-29	-64	-101

Source: IMF (2008a)

Table 2.4: Net Financial Flows From Emissions Trading US$billion , 2000 Prices. Long-run Concentration Target 550 ppm CO2.

Region	Emissions rights depending on population			Emissions rights by baseline		
	2020	2060	2100	2020	2060	2100
Africa	15	193	269	0	4	-8
China	0.5	-30	-21	-1	0	-4
Former S. U.	-5	-25	4	0	1	-23
East Europe	1	8	1	0	9	16
India	15	58	103	1	11	163
Japan	-3	-26	-29	0	0	-1
Latin America	5	36	-86	0	-6	-105
United States	-19	-115	-143	-1	-7	-50
Western Europe	-7	-56	-46	-1	-8	-2
OECD	-30	-203	-223	-3	-17	-74

Source: IMF (2008a).

Table 2.5 presents an alternative calculation of net cumulated trading volumes (non-discounted), up to 2100, using a different modeling framework developed by IIASA, and utilized in a study by WBGU (2003). Also here the basis is population-related emissions rights, but in a less absolute sense than the calculations in Tables 2.3-2.4, using now a "contraction and convergence" assumption whereby allocations converge only gradually over

time, to population-based ones by two particular time lines assumed, namely 2050, and 2100. The C&C 2050 alternative implies the more drastic redistribution in favor of low-income and low-emission countries, as is also seen from the table. But since low-income countries are phased into the carbon trading scheme more rapidly under the C&C 2050 alternative than under the C& C 2100 alternative, the average implementing carbon price per ton C is higher in the latter alternative (as mitigation needs to be stronger in those countries that actually mitigate). We see that, in the C&C 2050 alternative, substantial finance flows from the OECD area to low-income countries. Under the (more realistic) 500 ppm target, we see that the net revenue outflow (2020 to 2100) is US$8.2 trillion, or close to US$100 billion annually (but starting at a far lower level in 2020, for two reasons: mitigation starts out as being less strict; and the starting point is one with much less interregional transfers). Among gainers, Asia (being the largest emitting area) is seen to gain less than the rest. In the C&C 2100, Asia in fact has a net liability in particular as incomes, and baseline emissions, keep growing at a rapid pace in this region.

Table 2.5: Net volumes (in GtC), values (in US$trillion), and average GHG emissions prices (US$/ton C) up to 2100, by major regions, under two C&C convergence alternatives and two carbon concentration targets.

Scenario alternative	Trading levels	OECD	Asia	LA, Africa, ME	Former SU, East Europe	Carbon price
C&C 2050, target 500	Volume	-37	6	31	0	225
	Net value	-8.2	1.6	8	-0.2	
C&C 2050, target 450	Volume	-42	10	31	0	300
	Net value	-12.5	4.0	8.5	0	
C&C 2100, target 500	Volume	-8	-7	5	10	350
	Net value	-3.0	-2.5	1.8	3.6	
C&C 2100, target 450	Volume	-23	-1	18	6	365
	Net value	-8.3	-0.4	6.7	2.2	

Source: WBGU (2003).

An uncertain factor not touched upon here is how much of climate-related finance we are indicating, is truly additional, in the sense that it would not have been forthcoming in the absence of climate change or threats.

3.   Short-Run Macroeconomic Effects of Additional Climate Finance

3.1 Preliminary considerations

When considering the technical options available to an economy facing increased financial inflows, any fundamental analysis will need to be modified and supplemented when considering the specifics of climate-related finance. Four issues will be focused on here:

1. To what degree does the effect of climate-related finance differ by *fund source* (such as public versus private) or *type* (such as pure financial transfers versus financing of particular projects or goods purchases)?

2. To what degree do effects differ by *type of financial-fund recipient*, distinguishing in particular between public and private recipients?

3. Can climate-related financial flows be considered as *stable*, or are they more likely to *fluctuate over time*, and by how much?

4. To what degree are climate-related financial flows truly *additional*?

In considering **question 1**, the source of funds in terms of public versus private is, *per se*, unlikely to be important for receiving countries, all other factors being equal. On the other hand, all factors are not likely to be equal: in particular, private funds, at least those taking the form of corporate investment, are likely to be disbursed for profit and often accompanied by an outgoing profit stream, in contrast to public funds where the profit motive is much less central. A more important distinction is still likely to be that between financial transfers, investment projects, and goods purchases.

For **question 2**, when the recipient is the public sector, complete public spending of the transferred amount is then in particular possible. When instead the private sector is the recipient, no public revenue is immediately generated; the principal effect is rather that the capacity of the private sector to spend in foreign currencies increases. The public sector may still capture parts of this revenue, such as when private-sector recipients are taxed on the amounts received.[8]

Considering **question 3**, most standard discussion around the stability issue (such as in IMF (2005)) is based on the premise that "aid" is not necessarily stable but may be cut off after a certain time; the recipient country's optimal response will then be a function of the degree of stability of funding; e g the "save" alternative. For various items of climate-related finance, revenue may perhaps be expected to be more stable. But this is likely to depend e g on the nature and strength of any international agreements to limit GHG emissions and fund climate-related projects.

Question 4 can be raised for public as well as private payments. For publicly sponsored payments, a question is whether "donor fatigue" will set in, and reduce other ODA in response to increased climate-related payments. While there will be no way to directly observe any such "donor fatigue", its plausibility can be inferred from observations of donor ODA non-climate shares over time.

Also for privately sponsored payments there may be offsetting factors. One is possible reductions in private emergency relief forthcoming to countries struck by extreme weather events or catastrophes already today. Yang (2008), in studying international responses to damage from hurricanes in the poorer Caribbean countries, shows that foreign aid, remittances, and other private financial flows increase substantially in response to a hurricane, on average replacing four-fifths of the estimated damages within three years. Yang and Choi (2007), studying remittance patterns to the Philippines, show that negative income shocks (to agricultural productivity) lead to substantial increases in remittances (so that the hypothesis that income is fully replaced cannot be rejected). The overall indication of these studies is that private flows generally rise in response to an adverse climate- or weather-related situation for a country's population. This may imply that risk that private funding will decline in response to increased climate-related donor funding to a country experiencing adverse climate developments.

3.2 Basic analysis: Spending and absorption

We will start the substantive analysis with some basic notions and concepts from macroeconomics. The point of departure here is that the macroeconomic effects of financial inflows will to a large extent be determined by their overall net effects on the balance of payments, and on the government budget balance. In IMF (2005), discussing aid inflows to a low-income country government, the following definitions are considered.

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[8] Note one interesting example, from the discussion of the CDM mechanism as applied to HFC-23 abatement projects in China, in Wara (2008). CDM financing of such projects is highly profitable. In recognition of this, the Chinese government has enacted a 65 percent profit tax on such CDM projects, which so far (by July 2008) has netted about US$2 billion.

- The financial inflow is *absorbed* if it leads to an equivalent increase in net imports, leaving the balance of payments unchanged. This can be achieved through a direct imports increase, or through a reduction in export production.
- The inflow is *spent* if it leads to an equivalent increase in government spending, leaving the government budget balance unchanged.
- The inflow is *saved* if it is neither absorbed nor spent. In effect, international reserves are then accumulated, and macroeconomic effects are likely to be small in the short run, apart from effects through strengthening of the country's currency, interest rate policy, or international credit worthiness.

The short-run macroeconomic implications of such increased financial inflow are determined by the combination of absorption and spending chosen. These responses are in turn determined by the country's macroeconomic policy response. Spending is affected by *fiscal policy*. Full spending will occur if government expands its overall budgets equivalently to the financial inflow increase.

For given spending, absorption depends on exchange rate policy and monetary policy, which are usually in the hands of the country's central bank. But as the central bank has only one basic instrument (the money supply) at its disposal, only one variable (the exchange rate, or the money supply alternatively the country's interest rate) can be determined through this policy. Under a *fixed exchange rate regime*, the exchange rate is managed directly, and must typically, for effective absorption to take place, be changed (appreciate) in response to an increased financial inflow. Under a *flexible exchange rate regime*, the exchange rate will be endogenous and the interest rate typically managed by the central bank, to allow for a strengthened exchange rate.

The classical "textbook" response to increased aid is to *absorb and spend fully*.[9] This is in particular the case when aid is given in kind, or the aid is used directly to finance additional imports. The short-run macroeconomic effects of aid will then be small. Some appreciation of the exchange rate is typically necessary to achieve this outcome, leading to an increase in net imports (increased imports, and reduced output in export sectors). In particular, it will entail some reallocation of productive resources, away from producing export goods, and with more production of domestic goods. But this is just the desired outcome, "necessary" for a full short-run utilization of the initial aid.

Saving the aid (implying that it is neither absorbed nor spent) may be a relevant response in some cases, in particular, when the country has an acute initial balance-of-payments deficit, or when the aid is temporary or volatile so that precautionary reserves may need to be built up. It may also be relevant when there is a fear that loss of competitiveness, following from a real exchange rate appreciation, is viewed as a long-term structural problem, hampering key export sectors in need of high initial growth. Note, however, that the "saving" alternative, if maintained indefinitely, effectively amounts to foregoing any possible direct benefits from the financial inflow.

The above analysis, presented in IMF (2005), is based on the assumption that the international financial flows fully benefit the public sector. In the case of climate-related finance, some part of additional finance will flow to the private sector, and some to the public sector. While the issue of absorption is similar in this case, the spending issue is slightly different. In this case, of course, government budget balance requires that government spending increases by only the government's share of the increased inflow. Full spending of this inflow then requires that the private sector at the same time fully spends its inflow share. To achieve this, somewhat different fiscal policy instrument are required. While a direct increase in government purchases of goods and services may be sufficient in the former case, also changes in tax policy will usually be required when the private sector is the primary beneficiary of the financial inflow. The government can also use tax policy to capture parts of these inflows (and, perhaps, subsequently spend them).

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[9] See IMF (2005).

Absorption but not spending is a possible option in the short run, and simply substitutes financial inflows for domestic financing of the government deficit. This can be a useful strategy when the initial level of government deficit, and current deficit spending, is high, as it contributes to a stabilization of the debt level and consequently the economy.

Spending but not absorbing is a more problematic response, and is similar to a fiscal stimulus in the absence of the financial transfer. Note here again that, in its nature, a transfer of international financial buying power to the receiving country is equivalent to a transfer of (or the right to purchase) international goods. When these goods are not purchased, the transfer is not made effective, at least not for the "time being". Two different types of monetary policy can accompany this strategy. First, the central bank can leave the increased spending non-sterilized, thus leading to an increase in the money supply. An increase in the inflation rate is then a likely outcome. Secondly, the central bank can sterilize the primary money increase by sales of treasury bills. A typical outcome of the resulting monetary contraction is increased interest rates. This will typically reduce investment and then perhaps the economy's long-run growth potential.

Box 1: Macroeconomic effects of scaling-up of aid in selected African economies

Effects of some of these policy combinations discussed in the text, have been illustrated in a detailed IMF (2005) study of five African economies (Ethiopia; Ghana; Mozambique; Tanzania; and Uganda), for the years 1998-2003. See also Berg et al (2007) for further elaboration of some of the results.

During this period all five economies experienced "aid surges", with general increases in aid by from about 3 percentage points of GDP (Tanzania), to about 10 percentage points (Ethiopia). Among these, Ghana neither spent nor absorbed; Ethiopia did not spend and only partly absorbed (20 percent); Tanzania spent but did not absorb; Uganda mostly spent (75 percent) and partly absorbed (27 percent); and Mozambique spent and mostly absorbed (66 percent).

Given the countries' spending patterns, the effects of the "aid surge" in these countries were largely as expected, based on the analysis above. In Ethiopia and Ghana, where the aid on the whole was neither spent nor absorbed, aid had very little impact over the period of study. The only major impact was on reserves, which increased; pointing to positive future benefits. The three other countries largely spent their increased aid. None of them fully absorbed, but Mozambique most so. Inflationary pressure was still greatest in Mozambique, where the increased spending was accompanied by an increased money supply. In Tanzania and Uganda, monetary authorities increased the supply of government bonds to reduce liquidity, thus containing inflation. But this at the same time lead to a tighter money market, higher interest rates, and lower local investment. In all countries, concern for competitiveness of local industry was decisive for the decision not to absorb fully.

Surprisingly from the initial perspective of those conducting the study, in none of the five countries did the aid surge lead to a substantial real currency appreciation, and neither to a "Dutch disease" problem; these problems would have been expected to occur in the normal case of "spend and absorb". The main reason, of course, was that in none of the five countries was this the chosen policy. Mozambique's policy was closest to this pattern; but not even here was full absorption allowed, while excessive liquidity led to inflationary pressures and exchange rate depreciation. But it was clear that the very threat of a Dutch disease problem, together with an anticipation that the aid surge might be only temporary, was a driving motivation behind the choice not to spend nor absorb, but rather to save.

The relevance and application of this analysis to increased climate-related financial flows depends on a number of factors. One is the permanence of the flow scale-up. A study by the IMF (see Box 1 below) indicates that most of the low-income African countries covered by this study are very careful about scaling up spending when financial inflows (ODA) are scaled up, in particular when it is not clear that the increase is permanent. This main conclusion was supported in more recent IMF studies. The first is by the Independent Evaluation Office (2007), which found that programmed absorption and spending in Sub-Saharan African countries, with Poverty Reduction and Growth Facility programs sponsored by the IMF, is generally low. The second is by Aiyar and Ruthbah (2008), who found that absorption and spending in Sub-Saharan African countries (with our without a PGRF program) is low in the short run, but somewhat greater in the longer run. Thirdly, Farah et al (2009), studying possible scaled-up aid (from 10 to 15 percent of GDP) to Niger, find that such scale-up appears to be easily manageable and will lead to an acceleration of growth (thus leaving GDP at a level 12.5 percent higher by 2020).

A further factor is that when a large fraction of increased inflows benefits the private sector in the first instance (as is typical for FDI), only the "absorption" (and not the spending) issue is relevant, and perhaps even this not fully as FDI can lead to subsequent counteracting profit expatriation to the investing countries later. Finally, when increased aid or funding is given in kind, as directly imported goods or investments, the "absorption" issue need not be a concern.

A more recent IMF study, Berndt et al (2008), provides additional data on the absorption and spending issues, studying aid disbursement under the IMF-sponsored "Poverty Reduction and Growth Facility" (PRGF) program. They find a generally stronger tendency for low-income countries to absorb and spend additional aid, with tentative long-run absorption and spending ratios of between 0.6 and 0.9. This is however a long-run effect, in the sense that absorption and spending of additional external income is smoothened so as to minimize the negative effects of non-reliable disbursement. This paper also finds that the degrees of absorption and spending do not depend on whether the country in question has a PRGF program or not.

3.3 The need for "fiscal space"

The discussion above has focused on traditional macroeconomic factors, basically assuming that the country in question is in a "normal" situation, with no pressing short-term "needs". One possible "need", to be sure, could be a precarious financial or debt situation for the government which may constrain it in international financial markets or in its ability to attract direct foreign investment (FDI). Indeed, we pointed to such needs as one main reason why the standard option of spending-absorbing was not followed by many countries, in particular in the cited IMF study. Another possible "need", however, is related to "fiscal space". In its broadest sense, fiscal space can be defined as "the availability of budgetary room that allows a government to provide resources for a desired purpose without any prejudice to the sustainability of a government's financial position".[10] In the context of increased financial flows as discussed here, the main idea is that such flows, in particular if they flow to governments (directly, or indirectly e g via increased tax revenue), may create additional "fiscal space" which makes it possible for the government to fulfill fiscal spending targets that would otherwise be difficult to fulfill. In particular, aiming to fulfill the Millennium Development Goals implies that a number of spending targets, otherwise out of reach for the respective governments, may need to be fulfilled. Some of these goals (such as those related to child mortality and infectious diseases) relate to immediate, short-term, spending; others (including educational and environmental sustainability goals) to longer-run spending issues.

A key question here is whether additional, climate-related, financial flows create additional fiscal space for governments. One here again needs to understand that increased international financial inflows imply, essentially, that the *international* buying power of the respective economy is

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[10] See Heller (2005b), page 3.

equivalently improved. As a result the answer to this question is an unambiguous *yes*, when the respective fiscal needs can be fulfilled through a direct increase in imports; without needing to resort to policies that weaken domestic exports or otherwise strengthen imports.

More typically, however, increased domestic spending will in the first instance be, to a substantial degree, directed toward the domestic market. Attempting to create fiscal space on the basis of financial inflows is then likely to involve tradeoffs between spending goals and the need to support the domestic export industry, at least in the short run. It must be recognized that an increase in the relative price of domestic goods, or a real appreciation of the exchange rate, will necessarily result.

One important avenue whereby "fiscal space" is effectively improved, at least in the long run, is where such "space" is needed, and the respective financial inflow used, for domestic investments, which in turn serve to expand the economy's productive capacity or relieve infrastructure bottlenecks that otherwise would stifle growth, thus leading to increases in output, exports, incomes, and domestic buying power.[11] It is true that one also here will have a short-run trade-off whereby the domestic export (or import substitution) industry will be weakened. But as long as the longer-run effects are an increased overall production capacity, and income, such a relative weakening should not be seen as much of a problem.

3.4 "Dutch disease" effects of increased financial flows

A key effect, focused by many observers and related to the discussion above, is the possibility that increased financial inflows may cause "Dutch disease" effects. This effect can be understood in the context of an open market economy with two sectors where one sector produces internationally traded goods, and the other sector produces sheltered goods (that are sold and consumed domestically). The increased international revenue tends to increase net general demand in this economy, with increased demand being directed at both traded and sheltered goods. The increase in traded-goods demand can be met through an increase in imports. The increase in sheltered demand must by contrast be met through an increase in the domestic production of such goods, which necessitates a transfer of resources (notably, labor power), away from the exposed and onto the sheltered sector. As a result of this resource transfer, output must drop in the traded sector. The way this is typically implemented in a market economy, is by letting the domestic exchange rate appreciate in response to the increased financial (currency) inflow. Such appreciation tends to lead to the desired effects: namely, to discourage export production, and instead encourage more imports (which have now become cheaper through the exchange rate appreciation), leaving the country with a smaller export sector than before the aid. This export contraction effect is here what is typically termed the "Dutch disease".

The "Dutch disease" term was coined by the Economist in 1977, to describe the decline in the manufacturing sector in response to such exchange rate shifts, in the Dutch economy in the early 1960 and 1970, in response to increased oil and gas export revenues.[12] In much of the ensuing literature, Dutch disease has been considered as an outcome of resource abundance, with accompanying abundance of international buying power. See e g van Vijnbergen (1984) and Krugman (1987) for early theoretical expositions, and Gelb (1988), Karl (1997), and Auty (2001) for empirical work. In this context, "Dutch disease" should however not automatically be viewed as negative; it is instead a necessary implication of increased aid finance, at least in cases where aid is effectively utilized by the receiving country. It is, simply, the mechanism by which the receiving country allows for spending, and absorbing, the additional international currency revenue, through a combination of an increase in imports, and a reduction in exports.[13]

On the other hand, many observers have noted that resource-abundant economies often seem to be worse off than less "fortunate" economies. This phenomenon is related to the Dutch disease effect, but

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[11] This avenue is stressed in particular by Heller et al (2006).
[12] See the Economist (1977).
[13] For such positive views on the "Dutch disease", see e g McKinley (2005), and Barder (2006).

is not identical co it, and has been associated with a related term, the "resource curse". It is typically due to a combination of resource abundance and governance problems that make the related revenues difficult to manage. See e g Mehlum, Moene and Torvik (2006) who test, and confirm, the hypothesis that in countries that have "grabber friendly" regimes, more resources lowers income; while in countries with producer friendly regimes, a greater amount of natural resources increases income. It seems difficult, at least for some economies, to get rid of the problem through standard policy measures. We will come back to interactions between governance issues and wasteful use of aid or other external financing, in section 5 below.

When concentrating for the time being on economies where governance problems are minor, a discussion of Dutch disease in relation to increased international financing needs to distinguish between short- and long-run effects. Considering first the short run, it is then also of consequence whether the economy in question operates at capacity or not. If it operates at capacity, the only viable option for absorbing additional currency inflows in the short run is through a combination of an increase in imports and reduction in exports, and in such a way that the freed-up resources (labor) from the export sector exactly matches the increased demand from sheltered goods. Since export reduction is at the heart of a definition of Dutch disease, the latter is inevitable given that foreign funds are used efficiently and not wasted.

Focusing instead on long-run growth issues (to be elaborated more in Section 6 below), and given that aid is not wasted, a certain amount of "Dutch disease", taken to mean that the economy's growth rate is lower with a large amount of natural resources than without them, can still be shown to be optimal. Matsen and Torvik (2005) study a model of "learning by doing" whereby production in the export sector leads to technical progress.[14] They show that it is then generally optimal for an economy with abundant resources to consume some but not all the net amount of foreign currency earned. Some should be held back, retaining a larger export sector than otherwise, so as to exploit the productivity-enhancing effect from production in this sector. The country should thus accumulate some foreign exchange reserves, and let its exchange rate appreciate but not as much as in the "optimal" static case.

The seriousness of the Dutch disease problem clearly depends on the form that a financial transfer takes. If the transfer is in the form of goods or aid to carry out particular investments, the likely appreciating effects on the exchange rate are small, and it is likely that the export-discouraging effect is small. Again, also, the effect is small when the economy in question chooses not to absorb the increased financial inflow, as considered in Section 3.b above.

4. Using Climate Finance Revenue to Reduce Tax-related Deadweight Losses

When additional finance flows to the public sector, directly (via direct international transfers) or indirectly (via more revenue generation by domestic public enterprises or a greater tax base in the private sector permitting more taxes to be raised), the possibility opens that such additional finance may be used as a substitute for existing tax revenue; that is to say, to reduce rates of already imposed taxes. It is well known that standard forms of taxation are distortive, by driving wedges between private and social profitability of economic activity. In standard cases these distortions can be described by so-called Harberger triangles, and tend to be proportional to the square of the tax rates; this implies that particularly high tax rates may be particularly damaging. In lower-income countries (more than in high-income countries) we have the additional or complementary problem that economic agents often can choose whether to allocate their economic activity (business, or own work input) to the regular market sector, or to the "hidden" sector where taxes are evaded and productivity typically lower. This can be shown to add to the value of distortions relative to a simple Harberger analysis.[15]

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[14] For other models using similar assumptions, see Sachs and Warner (1997, 2001) and Gylfason et al (1999).
[15] See e g Feldstein (1999) for an analysis of the distortive effect of US income taxes when effects similar to those arising under "hidden" markets are accounted for. In the US, these are the differential tax treatment of

Important questions are then: What is the deadweight loss associated with taxation in low-income countries; and what is the scope for reduction in existing taxes? And, what would the income distribution effects of such tax reductions be? Note here first that when the tax substitution option is chosen, the government essentially foregoes the resulting potential income gain, and hands this over to the private sector. Apart from its effect via reduced distortions, this may or may not be desirable; in particular it may matter which population and business segments then stand to benefit from tax reductions. Note that such a tax swap policy automatically removes the "spending" issue discussed in Section 3.b above: the revenue is already "spent" in the form of tax reductions elsewhere.

Ideally, the most burdensome or distortive taxes ought to be reduced. But this may be difficult in practice, as there are likely to be many types of motivations behind the various taxes, some of which are not governed by pure efficiency considerations (which, of course, may help to explain why different taxes, leading to highly different levels of deadweight loss, can exist in the first place).

Estimating the marginal cost of public funds (MCPF) for different tax types in different countries is no trivial matter. The common rule of thumb is however to assume that MCPF increases more or less linearly with the tax rate, so that countries with higher rates of tax also have higher MCPF levels.[16]

Table 4.1 sums up a number of studies estimating MCPF for various tax types, in some high-income and some low-income countries, made at various points of time. For HICs with relatively low tax levels such as the United States, Australia and New Zealand, we find estimated MCPF levels largely in the range 1.1-1.4 (implying, roughly, that the efficiency loss related to collecting one tax dollars is 10-40 cents). In a high-tax country such as Sweden, MCPF levels are considerably higher.

For the referred studies from LICs here, the numbers are quite dispersed, and have been assessed basically only for sales and import taxes, and are seemingly highly distortive in some major countries (China and India) but less so in others. A weakness of these studies is however that they seem not to be able to separate distinguish between the distortive effects of different taxes; and thus give less of a recipe for what taxes to reduce.

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housing versus other expenditures, and non-taxable versus taxable benefits for wage earners. According to Feldstein, such factors may raise the distortive effects of taxes by a factor of 10.

[16] This also generally implies that the total distortion loss related to taxes increases with the square of the tax level (as both the tax level and the marginal damage as function of level increase linearly). This is the famous Harberger triangle loss; see Harberger (1964); see Hines (1998) for a wider discussion.

Table 4.1: Estimates of the marginal cost of public funds (MCPF), different countries and tax types

High-income countries			
Country	Tax type	MCPF estimate	Study
Australia	Labor	1.19-1.24	Campbell-Bond (1997)
Australia	Labor	1.28-1.55	Findlay-Jones (1982)
Australia	Capital	1.21-1.48	Diewert-Lawrence (1998)
Australia	Capital	1.15-1.51	Benge (1999)
Canada	Commodity	1.25	Campbell (1975)
Canada	Labor	1.38	Dahlby (1994)
Canada	Labor	1.39-153	Fortin-Lacriox (1994)
New Zealand	Labor	1.18	Diewert-Lawrence (1994)
Sweden	All taxes	1.69-2.29	Hansson-Stuart (1985)
United States	All taxes	1.17-1.33	Ballard et al (1985)
United States	All taxes	1.47	Jorgenson-Yun (1990)
United States	Labor	1.21-1.24	Stuart (1984)
United States	Labor	1.32-1.47	Browning (1987)
United States	Labor	1.08-1.14	Ahmed-Croushore (1994)
Low-income countries			
Bangaldesh	Sales	0.95-1.07	Devarajan et al (2001)
Bangaldesh	Import	1.17-2.18	Devarajan et al (2001)
Cameroon	Sales	0.48-0.96	Devarajan et al (2001)
Cameroon	Import	1.05-1.37	Devarajan et al (2001)
China	Sales	2.31	Laffont et al (1997)
India	Excise	1.66-2.15	Ahmad and Stern (1987)
India	Sales	1.59-2.12	Ahmad and Stern (1987)
India	Import	1.54-2.17	Ahmad and Stern (1987)
Indonesia	Sales	0.97-1.11	Devarajan et al (2001)
Indonesia	Import	0.99-1.18	Devarajan et al (2001)

Sources: Various (see references in right-hand column).

Our more specific concern here is the MCPF in developing countries, its level and how it varies with tax type. The lower part of Table 4.1 gives some indication on this. Although the numbers are rather widely varying (and, in some cases, somewhat untrustworthy, as when they are substantially below unity), they seem to indicate that excise, sales and import taxes all imply substantial deadweight losses at least in some cases. It is however difficult from this table to distinguish clearly between tax types, in terms of which of these taxes ought, if possible, to be reduced.

A comprehensive study of African economies, Warlters and Auriol (2005), is summed up in Table 4.2. Virtually all the African economies are included in this study (numbers included in the table are only for the subset of most significant countries), and with indications of marginal distortions for all five major categories of taxes: indirect domestic taxes, including sales taxes, excise taxes and VAT; export taxes; import taxes; and taxes on factors of production: capital, and labor. The general result of this study is that domestic taxes and import taxes appear to be relatively non-distortive, while capital and labor taxes are more distortive. One reason why capital taxes (in the study, largely represented by formal corporate tax rates) are highly distortive is high capital mobility implying that tax competition factors are significant for this loss. The main reason for high deadweight losses due to labor taxes is rather the existence of an informal sector (with, typically, labor productivity substantially below that of the formal sector), to which labor would move when taxes are set too high.

These results might, possibly, give some guidance for future policy; in particular, they may provide arguments that governments in lower-income countries, when receiving additional financial flows, ought to relieve the marginal tax burdens on capital and labor whenever this is technically and politically feasible.

Table 4.2: Estimates of MCPF for major countries in Sub-Saharan Africa, by tax type and total. Various years 1990-2000.

Country	Tax type					
	Domestic	Exports	Imports	Capital	Labor	Average
Cameroon	1.10	1.08	1.07	1.53	1.27	1.14
DRC	1.01	1.02	10.1	1.43	1.38	1.10
Ethiopia	1.13	3.14	1.23	1.75	1.60	1.31
Ghana	1.03	1.17	1.10	1.50	1.26	1.17
Kenya	1.02	1.20	1.06	1.30	1.11	1.08
Madagascar	1.13	1.16	1.11	1.58	1.32	1.17
Mozambique	1.04	1.17	1.07	1.60	1.22	1.11
Nigeria	0.99	1.02	1.02	1.30	1.19	1.08
South Africa	1.09	1.02	1.00	1.29	1.11	1.12
Sudan	1.09	1.92	1.23	1.87	1.57	1.26
Tanzania	1.17	1.59	1.20	1.76	1.73	1.27
Uganda	1.10	0.82	0.97	1.40	1.30	1.11
Average, all of Africa	1.09	1.32*	1.08	1.52	1.42	1.17

* = average value for countries with positive export taxes (20 countries in total).
Source: Warlters and Auriol (2005).

5. Rent Seeking, Corruption, and the Hidden Economy

5.1 Introduction

A ubiquitous issue in developing countries is the imperfect rule of law, one aspect of which is individuals' and firms' ability to escape taxes, and the widespread presence of rent seeking and corruption. By rent seeking we here mean that private effort and resources are devoted to seeking private gains which are not accompanied by social gains. By corruption we mean the use of public office for private gain.[17] Systematic tax evasion leads to the existence of an unregulated and untaxed "shadow economy", which often absorbs a large fraction of economic activity.

Rent seeking and corruption can take a variety of forms. One is talented labor directed at socially low-productive activities; another is intra-governmental haggling and disputes over budgets and responsibilities; a third private-sector bribe payments to public sector officials in returns for favors. Our objective here is not to go through all these cases and their implications, rather to point out some implications of the overall phenomenon, and its extent, for the effectiveness of climate-related finance.

5.2 Evidence on extent of the shadow economy and corruption

Table 5.1 below shows the average shares of the shadow economy in overall economic activity, for some wide groups of countries, and the developments of these shares over the period 1999-2003. We see that the shadow economies on average comprise much smaller fractions of countries' GDP in

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[17] See Gray and Kaufmann (1998).

OECD countries than in other parts of the world. Among these "other" regions, Asian countries have the lowest shadow economy shares, while they are of similar magnitudes in transition economies, Latin America, and Africa. Note also that, over the years in question, the shadow economy shares have been increasing for all regions except the OECD, where the share has been (slightly) falling.

Table 5.1: The average size of the shadow economy, as share of official GDP, for major regions. Percent.

Region	1999/2000	2000/2001	2002/2003
OECD	16.8	16.7	16.3
Transition economies	38.1	39.1	40.1
Asia	28.5	29.5	30.4
Latin America	41.1	42.1	43.4
Africa	41.3	42.3	43.2

Source: Schneider (2006).

These averages mask great individual country differences, in particular in Latin America, where the fractions range from 20-25 percent in Chile and Argentina, to 60 percent or more in Peru and Bolivia.[18] In Asia, the shadow economy shares vary from a low of 13 percent in China and Singapore, to more than 50 percent in Cambodia and Thailand. In Africa the shares vary somewhat less, but also here one finds countries, such as Nigeria, Tanzania and Zimbabwe, with shadow economy shares close to the world's highest, around 60 percent.

One factor here is the relationship between corruption and the size of the "shadow economy" not subject to ordinary taxation. This issue is discussed by Schneider (2006), who hypothesizes that the shadow economy and corruption are complements in lower-income countries. The reason is a tendency, in countries, for even quite large enterprises to operate totally outside of the formal economy – which is effectively feasible only if government officials are corrupt (accepting bribes or participating in the illicit activity).[19] In such countries a large hidden sector thus tends to "feed" corrupt government officials. Similar predictions are made by Johnson et al (1997, 1998) and by Hindricks et al (1999).

These issues are studied empirically by Dreher and Schneider (2006), for a panel of 70 countries from 1994 to 2002. The stated hypothesis is here largely confirmed by the authors (albeit, with a wide margin for uncertainty), in the sense that perceived corruption tends to be higher in countries with larger shadow economies; and shadow economies correspondingly tend to be larger when there is more corruption. Schneider (2006) finds, in particular, that variables measuring the burden of indirect taxation, and state regulation, have a large positive impact on the size of the shadow economy in developing countries. The effect of direct taxation is also positive but smaller (and only barely significant). The rate of unemployment has a large positive, and GDP per capita a similarly large negative, effect on shadow economy size. There is still substantial individual variation in the sizes of the shadow economies, for given levels of these variables.

These results might indicate that climate-related finance, were it to be used to lower the general burdens of taxation in lower-income countries, could give the additional benefit of reducing the size of

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[18] De Soto (1985), in an interesting analysis of the Peruvian shadow economy, provides a defense of this sector and it activity, mainly by pointing to the absence of alternative livelihoods for a majority of the Peruvian population. This is in our opinion largely beside the point: Had there been no taxation, the whole economy would have been one, "shadow" or not; the main (regrettable) point is that labor (and total factor) productivity tends to be lower in the "shadow" economy than in the official one.
[19] In high-income countries, by contrast, the relationship could easily be the opposite, as hypothesized by Choi and Thum (2004) and Dreher, Kotsigiannis and McCorriston (2005a), and shown empirically by Dreher, Kotsigiannis and McCorriston (2005b).

the shadow economy, in some or all of these countries. The effects of such tax reductions on the extent of corruption in the same countries is less clear. To the extent that high taxation goes together with high degrees of corruption, however, gains could be had on this front as well.[20]

Table 5.2: Relationships between indicies for the size of shadow economies and for corruption. HICs and LICs separately.

Region	Shadow economy on corruption			Corruption on shadow economy		
	ICRG* index, IV (1)	ICRG* index, IV (2)	DKM** index, IV (1)	ICRG* index, OLS	ICRG* index, IV	ICRG* index, panel
High-income	-0.09	-0.11	-0.32	-0.84	-1.85*	0.09
Low-income	-0.01	-0.01	0.10**	1.88	5.14	0.10

Source: Dreher and Schneider (2006).\
Notes:
* = significant at level 90 percent
** = significant at level 95 percent
ICRG = Based on International Country Risk Guide measure of corruption
DKM = Corruption measure based on Dreher, Kotsigiannis and McCorriston (2005b)

5.3 Implications of extent of the shadow economy and tax evasion

What is the implication of these results for climate finance? A key issue here is: what does the size of the shadow economy, and the level of rent seeking and corruption, imply for effectiveness and use of climate-related funds?

In this section we will discuss implications of extent of the shadow economy and of tax evasion. These two issues are closely related, in the sense that economic agents operating in the "shadow economy" engage in systematic tax evasion or avoidance. Tax evasion is usually taken to mean activity of individual agents (individuals or firms; within a frame where not entire sectors evade or seek to evade taxes).

One then first needs to remember that activity in the shadow economy is, quite generally, less efficient than activity in the formal economy, for a variety of reasons. One may perhaps argue that this fact in itself should not necessarily have implications for the effectiveness of climate-related finance and financial disbursements, insofar as the latter are made to individuals and firms that operate in the regular, tax-paying, part of the economy, report their activities and revenues, and actually pay their required taxes.

5.4 Implications of rent seeking and corruption

Secondly, funds spent on corrupt activities (embezzled by local public officials, or paid as bribes to these or other actors) are can easily have even more perverse effects and can in many cases be viewed as "lost" at least from a wider social perspective.[21] Thirdly, a high level of rent seeking and corruption implies a generally high level at which any financial-fund value is dissipated through inefficient private- and public-sector behavior.

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[20] The evidence on relationships between corruption and tax levels is less compelling. One may, however, potentially visualize that the scope for corrupt activity by bureaucrats to be greater when private agents face greater tax and fee "hurdles".
[21] Such funds are of course not "lost" in the narrower sense that they, after all, accrue to somebody (after subtracting the transaction cost which of course can be hefty). But consumption of the individuals who depend on corrupt incomes often has, and probably ought to have, a low weight in society's welfare function.

All these three channels should imply that a larger shadow economy, and more rent seeking/corruption, reduce the effects of climate-related financing. The effect via the first and third channel is that such financing is less efficient than otherwise; while the effect via the second channel is to simply dissipate part of the financed funds.

Note that most rent seeking and corruption takes place either within the public sector or via interactions between the private and public sectors. The effects are presumed to be less important within the private sector (in particular, as the desire of firms to maximize profits at least in principle ought to represent a check against excessive rent seeking/corruption. Since the shadow economy itself is basically private-sector based, all inefficiency here can be viewed as confined to this sector.

5.5 The "resource curse"

A particularly important issue for the relationship between rent-seeking and corruption on the one hand, and international financial inflows on the other, is the possibility of a "resource curse". This issue was mentioned briefly in Section 3.d above. The "resource curse" means, in short, that an economy does not benefit, but may instead lose, from the access to substantial international finance (in most relevant cases where the "curse" is observed, this additional finance stems from resource exports). Following Mehlum, Moene and Torvik (2006), the "curse" applies to countries dominated by what they call "grabber-friendly" institutions, but not to countries dominated by, in their terms, "producer-friendly" institutions. In "grabber-friendly", and at the same time resource-rich, countries, entrepreneurs tend to specialize on grabbing and not on production, which is harmful as it diverts valuable productive resources away from their efficient uses, and can make a country worse of than in the case of no exportable natural resources whatsoever. In "producer-friendly" countries, by contrast, additional foreign revenue can be (and typically is) a blessing, essentially in line with the arguments put forth in Section 3.d (and as presented e g by Matsen and Torvik (2005)).

This dichotomy between "grabber-friendly" and "producer-friendly" regimes, and their economic performance, seems to be well reflected in the international evidence; see Gelb (1988), Karl (1997), Gylfason (2001), Papyrakis and Gerlagh (2004), Robinson et al (2004). Table 5.3 presents two concepts of savings rates, for countries in each of these two groups: (standard) net savings rates, in terms of net regular capital accumulation; and what is termed "genuine savings rates", an arguably superior measure of savings, corrected for three main factors: net human capital accumulation; environmental degradation or improvement; and net resource extraction of build-up. A characteristic of "grabber-friendly" regimes is their low (and very often negative), and sub-optimal, genuine savings rates; this leads to inefficient dynamic development paths with low growth and, gradually over time, low output per capita. Genuine savings rates are far higher in "production-friendly" countries. At least this is quite evident from the numbers in Table 5.3, where none of the "producer-friendly", resource-rich, economies have positive (and some very high positive) savings rates, while all the "grabber-friendly" economies (except Mexico) have negative genuine savings rates (and some, including Nigeria and Saudi Arabia, with very large negative rates).[22] This is identified in some of the related literature, by Abidin (2001).

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[22] One might here perhaps argue that these "genuine savings" rates give a skew picture for some countries, including Saudi Arabia, that rely very heavily on natural resource extraction for their exports and overall output: it is unreasonable to demand that such countries leave their resources in the ground forever (as would be required for resource extraction not to give a negative contribution to "genuine savings", by this definition). It may also be argued that the World Bank's concept of "genuine savings" is incorrect as it does not consider the impact of Hotelling's rule stating that the value of a given and finite exhaustible resource in the ground increases at the rate of interest; retaining the resource value intact over time then is consistent with an extraction rate which also equals the interest rate. But one might of course also argue that countries with very large net resource revenues need to counteract their natural resource depletion through investments, in production capital or education.

Table 5.3: Net and genuine savings rates, in "producer-friendly" and "grabber-friendly" countries. Percent of GDP, year 2000.

"Producer-friendly" countries			"Grabber-friendly" countries		
Country	Net savings rate	"Genuine savings rate"	Country	Net savings rate	"Genuine savings rate"
Australia	16.1	4.3	Algeria	29.9	-7.3
Botswana	29.8	34.4	DRC	-11.5	-14.6
Canada	11.5	12.7	Ecuador	18.1	-5.5
Chile	11.3	7.0	Mexico	10.4	8.4
Ireland	17.6	22.7	Nigeria	17.3	-33.9
Malaysia	28.3	20.5	Saudi Arabia	19.5	-26.5
New Zealand	6.8	11.8	Sierra Leone	-3.7	-7.1
Norway	20.7	18.5	Trinidad and Tobago	16.3	-11.4
Thailand	15.9	16.3	Venezuela	21.3	-2.7
USA	5.7	8.2	Zambia	-3.9	-4.8

Source: World Bank (2006b).

A wider question here is however whether the insights gained from the "resource curse" literature are useful to have in mind when discussing the effects of international climate finance for target countries. The natural inference to make from this literature is that countries with poor governance (which are "grabber-friendly") are not able to productively utilize their given levels of ODA or FDI; and that any planned scale-up of climate-related financial flows in such countries will not be very useful for the receiving countries. This would be diametrically opposite to the situation presumed to face good-governance ("producer-friendly") countries, where climate-related funds can be expected to be put to good use, and have substantial growth effects.

6. Specifically on Macroeconomic Implications of Adaptation Finance

Effectively adapting to climate change is a key issue for the countries that will be hardest hit by such change. Many of these countries belong among the world's poorest nations, with a correspondingly low capacity for adapting in the absence of outside assistance to do so. Substantial additional aid inflows may this be required to accomplish such adaptation. We will in this section indicate some likely consequences of finance directed at adaptation activity or expenditure, with basis in the discussion above. These effects will, as for other finance, to a large degree depend on their source, and on how they are spent.

As for likely sources of adaptation finance, one needs to distinguish between expenditures related to immediate, autonomous, adaptation, and those related to anticipatory or planned adaptation, in the presence of longer-run (already occurring, and anticipated) climate change. The costs related to autonomous adaptation needs are for the most part placed directly on private-sector agents who must bear these. The degree to which these costs are actually borne by the private sector will clearly depend on their financing ability. A key viewpoint here is that such capacity is low in many (or most) low-income countries, and that the adaptive response will suffer seriously as a result.

Anticipatory adaptation expenditures are much more likely to be borne by the public sector. Since capacity to respond is likely to highly dependent on the country's development level, we will also here expect a deficient response given that substantial foreign inflow of funds will not be forthcoming. it then in turn seems likely that most of these funds will need to come from concessional sources including ODA. As opposed to for mitigation, for adaptation there currently (nor in the foreseeable

future) exists no general mechanism for generating private-sector finance; such mechanisms exist for mitigation, namely those working via offset markets.

Some limited general financing schemes have however been proposed. One is a two percent levy on Clean Development Mechanism transactions, to go into a general international adaptation fund. Such a fund is estimated to raise in the range UD$1-2 billion annually by 2020. Note however that such a financing mechanism has weaknesses as it leads to distortions in the CDM mechanism itself, discouraging projects that are otherwise viable.[23] Thus this is not an advisable mechanism for revenue raising in this context.

The main option then seems to be either a sustained scaling-up of concessional finance (ODA and highly concessional loans) to address climate impacts and adaptation; or alternatively, simply a reallocation of existing ODA for a given vulnerable economy. The macro implications of a general aid scale-up are, on the whole, likely to mirror those of a regular, sustained scale-up of ODA itself, as discussed in sections above. Implications, in particular those for absorption and spending, will here depend in part on whether the funds are disbursed in the form of project spending (spent on purchases of goods and services related to particular projects), or disbursed directly to the respective governments. In the former case, the rate of absorption of such spending is likely to be high even in the short run, as procurement financing typically will imply that most of the respective contracts, in typical cases, are made with foreign providers. With direct disbursements to governments, e g to provide buffers for weakened export revenue resulting from climate damage, the absorption-spending pattern is likely to more closely mirror those found in the studies cited in Section 3 above. But, note, a long-term sustained increase in such financing is highly likely to raise both absorption and spending almost equivalently, as also noted in these cited studies.

As of today, however, little revenue is raised in this way. Only about US$2 billion are yet pledged by donor governments for direct adaptation purposes, a trite amount relative to the projected needs from some of the recent studies cited in Table 2.1 above (up to more than US$100 billion annually by 2015).

A full analysis of these issues requires a detailed breakdown of anticipated adaptation finance figures, by source, public and private, and by type of expenditures they will cover, long-term versus short-term investments, infrastructure versus production capital, and capital versus other financing need, such as insurance, short-run support, etc. Such an analysis is beyond the scope of this paper, but remains a task with high priority.

7. Climate-related Financial Flows and Economic Growth

7.1 Introduction

The additional financing that may result from climate-related funding has, potentially, profound implications for long-run developments. Indeed, addressing climate change in low-income countries cannot be separated from these countries' more general development; thus such general aspects must be considered.

The relationship between additional, climate-related, financing and economic growth in low-income countries can as a first cut be approached by considering effects of more general finance flows, of two different types. The two main types of finance that stand out in this context, and will be discussed in

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[23] See Martin and Prichard (2008). The deadweight loss, as percentage of the finance raised, is here assessed at about 1-7 percent, which may not seem high. Note however that if the tax rate is increased to raise more substantial revenue, the deadweight loss will increase at a rate equal to the square of the tax rate, and thus be proportionally much higher. The loss of revenue from CDM itself will also be higher, probably in the neighborhood of 25 percent for a two percent tax; and proportionately more for higher tax rates.

the following, are development aid (in particular aid coming directly from governments, ODA); and foreign direct investment (FDI). ODA should here perhaps be expected to have the greater effect on growth as its basic premise and purpose is usually to promote economic development in the receiving countries. FDI is motivated much more by profit seeking of the international corporations making the investments, and a substantial fraction of the return to FDI is likely to flow out of the country of investment to owners. On the other hand, FDI involves investment that typically increases output in the target country.

7.2 Foreign aid

A variety of views and results on the effects of FDI on long-run economic growth have recently been formed, and it is fair to say that no very strong general consensus on causal relationships has been formed. In analyzing such effects, one first needs to separate between main categories of finance, principally two types: cash transfers to governments, versus in-kind support (directly in the form of goods, investments or technical assistance, or as full or partial financing of such goods and services). Arguably, aid provided "in kind", in particular for investments, should "safer" in their long- run positive effects on receiving country governments.

The earlier empirical literature, prior to around year 2000, on the relationship between aid and growth, was on the whole weak. Most studies report small or weak general aid-growth relationships; see Mosley et al (1992), Boone (1996) and Hadjimicael et al (1995); and more recently, Easterly (1999, 2003), and Easterly, Levine and Roodman (2004).

Three main arguments have been offered to explain the lack of a strong effect of aid on GDP growth: a) aid is misallocated by donors, as these pursue largely non-developmental objectives; b) aid is misused by receiving governments, as these pursue non-developmental agendas; and c) GDP growth is not the proper measure of development.

Some of this literature however does purport to indicate positive (general, and unconditional) growth effects of aid; examples are Hansen and Tarp (2000, 2001), and Dalgaard, Hansen and Tarp (2004).

A more recent wave of literature has however provided new insights into these relationships. Its main contribution is to analyze and throw light on the relationship between the growth effects of aid, and governance issues, distinguishing in particular between "good" and "bad" governance receiving countries. Particularly important has been work by Burnside and Dollar (2000, 2004), who find convincing evidence of such effects.[24] The definition of "good governance" is here, as in most of this literature, taken from the World Bank's own governance index, ranking countries with respect to corruption and rule of law. Note that only the second of the explanations offered above is directly relevant for explaining the difference between good and poor governance regimes; while the two other explanations are generic. Overall, the three explanations thus indicated that the aid-growth relationship may be quite fragile, even for good-governance countries.

A closely related issue is the effect of aid in "weak" or "fragile" economies, versus more robust ones. As a first cut, being an IDA country signals "weakness" and is an obvious target for analysis. Ruhasyankiko (2005), studying long-run effects on growth of aid for IDA and non-IDA countries separately (with sample period 1984-2002), finds substantial differences between the two groups in the impact of ODA on growth. He finds in particular that a 1 percent increased aid share in GDP raises the growth rate by 0.12 percentage points in IDA countries; and by 0.47 percentage points in non-IDA countries. Thus, the marginal growth effect of aid transfers is thus four times as great in non-IDA

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[24] See also subsequent related work by Collier and Dollar (2001, 2002) and Collier and Hoeffler (2004). .

versus IDA countries.[25] This is likely to be due to a variety of reasons some of which are spelled out in other sections above; including the composition and purpose of aid in different country groups; the likely degree of diversion of aid disbursements away from their primary purposes due to bureaucracies, corruption and rent seeking.

More recently, McGillivray and Feeny (2008) have studied aid to "fragile" versus "non-fragile" states, where fragile countries (32 in number) are defined as the bottom two quintiles of the World Bank's Country Policy and Institutional Assessment (CIPA) index.[26] Using this, widely accepted, definition, these authors find no discernable difference between growth of fragile versus non-fragile states. In some estimations, however, they also apply a more restrictive fragility definition, namely, belonging to the bottom quintile of the CIPA index distribution. They still find that aid has a positive impact on growth also in the "fragile" group; but now growth effect is less than for less fragile countries. More precisely, in the absence of aid, the average rate of economic growth would have been 1.5 percentage points lower in the "fragile" group, while it would have been 2.4 percentage points lower in the "less fragile" group. Another conclusion from this work is that some (10) "fragile" countries appear to be over-aided (in the sense that their economies are not able to meaningfully absorb all aid for growth and development purposes), while a majority are under-aided (meaning that their growth rates would have been higher with more aid).

A recent and critical study is Rajan and Subramanian (2005a), who consider effects of aid on growth in cross-sectional and panel data when correcting for selection bias in donor behavior, whereby more aid goes to countries with poor performance. A main innovation relative to most of the other literature here is (instead of more standard OLS or 2SLS procedures) to use panel GMM regressions, either the Arellano and Bond (1991) difference estimator, or the Blundell and Bond (1998) system-GMM estimator. Even after such correction they find little evidence that aid affects growth positively. The only (weak) indication is that aid defined as "economic" (as disbursements to governments or as investment projects) seems to affect growth positively, while short-run emergency aid seems to have a negative effect; these effects are however found not to be very robust. While the authors do not dismiss the possibility that aid may have significant and systematic growth effects, no such effects are discerned in their data; possibly, due to excessive noise.

Various explanations can be offered for the lack of growth effects of aid. Rajan and Subramanian (2005b), in summing up such arguments, consider several of them. Two factors, that are considered particularly critical, hampering the potentially positive effect of aid on growth, are a) the possibility of Dutch Disease whereby aid leads to currency appreciation and, in various ways, undermines the production potential of other sectors; and b) the depressing effect of food aid on food prices which serves to undermine domestic food production.

A further recent paper by Clemens, Radelet and Bhavnani (2004) (see also related work by Radelet, Clemens and Bhavnani (2005)) groups aid into three types: a) short-run relief; b) aid with an explicitly long-run perspective (such as that affecting the environment or democratic reform); and c) aid directed at more immediate growth effects (such as industry or infrastructure investments). Their conclusion is that basically only the latter type of aid has growth effects, which are quite large: a one percentage point increase in the GDP share going to such aid increases, on average for the studied sample, growth by 0.31 percentage points. This amounts to (even when assuming a whopping overall discount rate of 35 percent annually) a return of 1.64 dollars in terms in increased country output, per dollar increase in aid.

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[25] The total aid effect on growth is however about the same for both groups: with aid comprising an average of 8.3 percent of GDP in IDA countries, and 2 percent of GDP in non-IDA countries, the total GDP effect is roughly one percentage point in either group.

[26] An alternative definition of fragile, also widely used, is that the country is low-income and at the same time has a CIPA score below 3.0; see Branchflower (2004).

The bottom line thus seems to be that aid does affect growth positively, or at least has the clear potential to do so; but the effect is not unconditional. Aid effects on growth are most discernable when aid is given to states well suited to manage it; and when given in the form of productive (infrastructure or industry) investments. This is of course not a surprising conclusion.

7.3 Effects of foreign direct investment on growth

A number of studies have attempted to find relationships between the level of foreign direct investment (FDI), and growth in the target country. Much of the evidence, in particular from studies focusing on possible technology spillovers from foreign to domestic firms, is however quite negative. In particular, several studies with a microeconomic orientation, from the early seminal study by Mansfield and Romeo (1980), to more recent work by Haddad and Harrison (1993) and Aitken and Harrison (1999), find no such effects. Carcovic and Levine (2002), applying a further refined empirical methodology, also find no independent, robust influence on GDP in the investment country. This rather pessimistic result seems to hold at all levels of development and education level of the public.

Some even more recent work, by Alfaro (2003) and Alfaro et al (2006), however points to some avenues for FDI to influence growth. In particular, Alfaro (2003) finds that FDI directed toward the manufacturing sector exhibits growth effects, while FDI in primary sectors does not: here FDI seems instead to have a negative effect on growth.[27] Service-sector FDI seems to have much less of a positive growth effect, than manufacturing FDI; this may seem logical in particular as relatively few technological spillovers can be anticipated from service-sector investments.

A related but separate issue is the relationship between FDI and governance factors such as political stability and the absence of corruption. An early study, by Schneider and Frey (1985), found substantial positive effects of "positive governance" factors on the level of FDI inflow (using data from 1976 to 1980), defined here by stability of government, real per capital GDP growth, and surplus in the balance of payments. Results on this issue for later literature is however mixed; e g Wheeler and Mody (1992) find no strong effect of governance factors on FDI by country for US firms; and Bevan and Estrin (2004) likewise for European firms. More recently, these relationships have been reevaluated by Méon and Sekkat (2007), who again find positive effects on FDI inflows for countries with stronger rule of law, lack of political violence, and better government efficiency. Admittedly, however, these relationships are not very strong, when correction is made for possible simultaneity bias (whereby FDI and governance variables may be simultaneously determined).

Of course, the fact that a country attracts a lot of FDI is no guarantee that FDI will have good growth effects on that country. Being able to attract FDI is however an indication that investing firms find the country interesting as a growth prospect for their business; this is in turn is likely to correlate positively with the growth effects of the FDI in the target country.

Two other factors that may impact on the effect of FDI on growth are the initial level of human capital among the population in the investment country, and the country's level of financial development. Borensztein, De Gregorio and Lee (1998), and Xu (2000) find that technology brought by FDI translates into higher rates of growth when the host country has a minimum level of human capital stock, thus, presumably, being able to better process and exploit the technologies implied by the foreign investment. Durham (2004) and Alfaro et al (2006) find positive effects of more advanced financial development on the ability of FDI to influence growth.

The bottom line from this literature seems to be that economic development impacts of FDI are far from automatic and are dependent on a set of strong conditions. This closely mirrors the effects of ODA on growth, as discussed in the previous section. Among the reasons for this are, first, that growth

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[27] A decisive factor here could be that heavy FDI in the primary sectors leads to "feudalist" relationships whereby progressive and innovative ways of thinking and working is discouraged and suppressed.

benefits from FDI are achieved mainly (or from some studies, only) as a result of investments in the manufacturing sector (which, presumably, includes the energy sector). Two further important requirements from the literature for positive growth effects to result are 1) that the labor force must be sufficiently skilled at the outset so as to effectively utilize any new technology transferred by the FDI; and 2) that the host economy must be at a "high level" of financial development.

8. Conclusions

This paper has addressed a number of issues related to how an economy is likely to respond to an increased financial inflow that is somehow related to climate policy, or to other types of responses by the world community to climate-related distress. A basic danger, that we here seek to evaluate, is that such inflows may "overwhelm" or in other ways damage the receiving country, given a limited ability to absorb such inflows. Such damage could be of a general macroeconomic character (such as leading to currency appreciation or inflation), to making the economy overly dependent on imports, and to unwanted consequences such as increased rent-seeking and corruption.

Our overall assessment is that for most countries where this problem may be relevant, it is not grave over the short or medium term (up to, say, 10 years), as the size of flows is expected to be modest. Over the longer term, when flows related to climate policy could in principle be scaled up substantially (as might be the case under comprehensive global cap-and-trade or carbon tax schemes; but conditional on higher-income countries willingness to scale up overall aid outflows), this danger could conceivably be greater. But, one may argue at least in principle, if the additional financial inflows can be allocated largely to additional investment instead of to additional consumption, such flows could serve as a blessing by further enhancing the countries' economic growth. One will then also, arguably, have plenty of time to facilitate and implement these flows in benign ways, so as to avoid adverse consequences. Another benign factor, pointed out in section 4 of this paper, is that such additional financial inflows can to some extent substitute for taxes in the receiving countries, thus reducing the deadweight loss and disincentive effects of these taxes, and in that way spurring economic growth and development.

The final section of the paper deals with potential implications of increased financial inflows on economic growth in low-income countries. The common thread from the studies on additional LIC financing, through ODA or FDI, on receiving countries' growth, is that such effects can be found; but that positive growth effects are not universal. Almost unanimously, positive growth effects are found if financing is concentrated to the manufacturing or infrastructure sectors; and when the countries in question are already at a relatively advanced stage of development (in terms of their labor force and financial sector). Governance issues are also important. At least when considering the effects of ODA, growth effects in many studies appear to be significant only for "good governance" countries (as in the seminal Burnside-Dollar (2000) study). For FDI the evidence is here perhaps less convincing, but at least mildly supportive of a similar relationship. Moreover, ODA in most cases should have a greater effect than FDI on host country growth, which also seems to be the case. After all, the basic motivation of ODA is just such development; while the basic motivation of FDI is investor profits.

Considering specific climate-related finance items, growth effects are most likely when the external finance is fully concessional, and spent on investment, infrastructure and industrial development. Such finance items are likely to become most heavy for foreign-financed mitigation-related investments, and for adaptation finance in infrastructure that also has a substantial industrial component.

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