

# UNITED NATIONS DEVELOPMENT PROGRAMME



## Quantifying the Efficiency Gains from Financing Tools

---

A UNDP/ODS Background Paper  
By Pedro Conceição, Ronald U. Mendoza and Sylvain Merlen

Prepared for the Book Project  
*The New Public Finance: Responding to Global Challenges*

Office of Development Studies  
United Nations Development Programme  
New York  
- 23 August 2005 -

*Note:* The views expressed in this paper do not necessarily reflect those of UNDP.  
Please send comments and suggestions to the following e-mail address: [ods@undp.org](mailto:ods@undp.org)

## INTRODUCTION

The book *The New Public Finance: Responding to Global Challenges* shows that there is a trend towards greater use and interest in several innovative financing tools that may enable governments to meet more efficiently and effectively global challenges. But how significant could those efficiency gains be?

This note outlines the steps taken to address the above-mentioned question. It provides preliminary estimates of the efficiency gains—broadly understood—from the application of six financing tools (in the order of the size of efficiency gains): guarantees, securitization of future flow receivables, advanced purchase commitments, GDP-indexed bonds, macro markets, and international pollution permit trading. Keeping in mind the different methodologies (as well as their varying underlying assumptions) one could nevertheless approximate very loosely a potential aggregate annualized gain of roughly \$360 billion—or about \$7 trillion in net present value terms.<sup>1</sup>

**Summary Table of Efficiency Gains  
In Billion U.S. dollars**

Tool	Application area		Estimated gains		
	Issue (challenge or opportunity)	Primary beneficiaries	(Annualized)	Base year	Net present value <sup>e</sup>
1. Guarantees issued by aid agencies <sup>a</sup>	Infrastructure investment needs	Developing countries	1.1	2003	22
2. Securitization of future flow receivables <sup>a</sup>	Improved access to conditions of external financing	Developing countries	1.5	1998	31
3. Advanced purchase commitments <sup>b,c</sup>	Malaria control	Malaria endemic regions, especially Sub-Saharan Africa	1.4	na	47
4. GDP-indexed bonds <sup>a</sup>	Public expenditure/debt repayment smoothing	Developing countries	30.0	2002	600
5. Macro markets <sup>b,c</sup>	Risk management	G7 countries	145.1	1985	2,902
6. International pollution permit trading <sup>a,d</sup>	Reductions in carbon dioxide emissions	Industrial countries	182.0	1995	3,640
Total			≅ \$360		≅ \$7,000

“na”: Not available.

<sup>a</sup> Cost savings to be realized if implemented.

<sup>b</sup> Monetized welfare gain if implemented.

<sup>c</sup> The gains from these tools are expressed as net of costs, given the availability of data.

<sup>d</sup> These efficiency gains do not include possible gains for developing countries that would be compensated under permit trading for providing industrial countries with the environmental service of emission abatement.

<sup>e</sup> The discount rate is 5 percent for all the tools, except for tool 2 (advanced purchase commitment). For the latter, \$1.4 billion is the annualized gain based on \$47 billion NPV and a discount rate of 3 percent. A slightly lower discount rate is commonly used in health-related cost-benefit analyses, to capture in part the wider expected social welfare gains from health-related policy interventions.

<sup>1</sup> These aggregates are approximate values for illustrative purposes, since the calculations for each application do not use the same base year.

## CALCULATIONS

### A. Guarantees issued by aid agencies—\$22 billion in efficiency gains

1. Guarantee products could lower the price of capital, as shown by the difference in interest spreads (over United States treasury bonds) of long-term loans for infrastructure projects in selected developing countries without and with guarantees.
2. For a sample of developing countries for which data is available, on average, the reduction in spreads due to the use of guarantees was about 170 basis points (see Wormser and Babar 2001; reported as figure 2 in Griffith-Jones and Fuzzo de Lima 2006, p. 509).<sup>2</sup>
3. If we take the private sector investment flow in developing country infrastructure to be about \$64 billion per year (in 2003 dollars; average annual figure using data from 1990 to 2003 reported by Izaguirre 2004, p. 3) and multiply this by the 170 basis point reduction in spread due to the use of guarantees, the cost saving from this tool could be about \$1.1 billion (in 2003 dollars).<sup>3</sup> [ $\$64 \text{ billion} * 1.7\% = \$1.1 \text{ billion}$ ]
4. If we assume \$1.1 billion to be a rough approximation of the annual gain from this tool, the cost savings in net present value terms could be in the order of \$22 billion (assuming 5 percent discount rate). [ $\$1.1 \text{ billion} / 5\% = \$22 \text{ billion}$ ]

---

<sup>2</sup> The sample includes: Argentina, China, Côte d'Ivoire, Jordan, Lebanon, Morocco, Pakistan, Philippines and Thailand.

<sup>3</sup> This is a rough approximation because the \$64 billion figure in investment flow should be subject to at least two corrections before being multiplied by the reduction in spread. As will be indicated below, these corrections would tend to cancel each other out, since they run in “opposite directions” and preliminary work suggests that they would have approximately the same magnitude. Thus, the full \$64 billion figure was used, rather than introducing more “noise” in the estimate using incomplete information. The two corrections, which could be implemented as more information becomes available, are as follows:

- First, using the full \$64 billion in investment flows is certainly an overestimate, because private sector investment flows into developing country infrastructure projects includes both debt and equity financing. Recent trends show that debt financing is increasing in proportion and that many projects are highly leveraged. However, the leverage rates vary significantly across sectors and projects, from about 5% to about 50% (see for instance da Silva, Estache and Jarvela 2004). Without detailed knowledge about the distribution of leveraging rates, it would be meaningless to use summary measures of this distribution like the mean or median to adjust the figure downward. Conservatively, the magnitude of the correction would imply a reduction of the \$64 billion by half or so.
- A second factor implies that the figure is an underestimate—guarantees would apply throughout the entirety of the life of the debt, suggesting that the longer the payment period, the larger the cost savings from the guarantees. Again, maturities vary widely and using average measures would be meaningless. Still, in many cases maturities are very low (in some cases as low as 2 years or even less) which suggests that applying this correction would double, more or less, the debt portion of investment flows. Since this correction is likely to have a similar magnitude and runs in the opposite direction of the first, and given the lack of available information, it was decided to use the full \$64 billion figure at this stage.

## ***B. Securitization of future flow receivables—\$31 billion in efficiency gains***

1. Additional resources of about \$77 billion per annum could be mobilized by low- and middle-income countries through securitization (Ratha 2002, p. 3).
2. Securitization has an advantage over ordinary foreign borrowing—the terms secured are likely to involve lower premiums for developing countries. For instance, in late 1998, for example, Pemex Finance Ltd. issued oil-export-backed securities rated BBB by Standard and Poor's, three notches above Mexican sovereign and Pemex unsecured debt. Securitization saved Pemex anywhere from 50 to 337.5 basis points on what it would have had to pay on senior debt (yielding a median of about 200 basis points).
3. In addition, after the Mexican crisis of 1994-95, Argentina's oil company YPF (by then privatized) raised \$400 million at a 200 basis-point spread advantage through the securitization of future export receivables Kektar and Ratha (2001, p. 3).
4. Using the \$77 billion securitization with a 200 basis point spread implies about \$1.54 billion (in 1998 dollars) in cost savings over an unsecured debt float. [ $\$77 \text{ billion} * 2\% = \$1.54 \text{ billion}$ ]<sup>4</sup>
5. In net present value terms (assuming 5 percent discount rate), this translates to cost savings of about \$31 billion. [ $\$1.54 \text{ billion} / 5\% = \$30.8 \text{ billion}$ ]<sup>5</sup>

## ***C. Advanced purchase commitments—\$47 billion in efficiency gains***

1. It is estimated that a commitment in the range of \$3 billion (in net present value) would be required to encourage pharmaceutical companies to invest in developing a vaccine for a neglected disease (Kremer and Glennerster 2004, p. 89).

---

<sup>4</sup> Similar to the estimated net gains from using guarantees, this estimate of the net gains from securitizing future flow receivables should be considered a rough approximation. The same type of “upward” correction described as the second correction in footnote 3 would have to be made to the \$1.54 billion figure here. However, information on average maturities is not available, and therefore, it is not possible to calculate the full cost of funds. Thus, the option was to use the \$1.54 billion which would certainly be a lower bound or more conservative estimate of the cost savings.

<sup>5</sup> It is important to note here that the costs of securitization deals have not yet been factored in. According to a study by the World Bank, the specialized skills needed to structure asset-backed deals involve legal costs of about \$2 to \$3 million a transaction (Ratha 2002, p. 3). However, there is, as yet, no available information on the number of securitization deals implied by the estimated total securitization value of \$77 billion per annum. In addition, one might consider that, as interest in securitization increases, policymakers might try and optimize the value of securitization transactions, while trying to keep the number of deals (hence legal and other costs) at a minimum. Further competition in this sector (e.g. private legal and other services for securitization deals) as well as “learning-by-doing” by policymakers could also tend to drive the costs of these deals downward.

2. The commitment is expected to bring the discovery of a vaccine forward by 10 years and to ensure that it is used at a rate at least as high as the current basic childhood vaccines in developing countries (Kremer and Glennerster 2004, p. 95).
3. In the case of malaria, a reasonably effective vaccine is expected to reduce about half the annual disease burden.<sup>6</sup> One study projects the average annual net benefit of reducing the malaria burden by half in Sub-Saharan Africa at about \$3-10 billion (Mills and Shillcutt 2004; 2005).<sup>7</sup> Thus, if we take the median, the vaccine could create gains of at least \$6 billion a year.
4. Using a 3 percent discount rate, the annual \$6 billion saved would equal \$200 billion in net present value at the time the vaccine is available. [ $\$6 \text{ billion} / 0.03 = \$200 \text{ billion}$ ]
5. If the burden of disease started to be saved only 10 years from now, that scenario would be valued today at \$150 billion. [ $(1-0.03)^{10} * \$200 \text{ billion} \cong \$150 \text{ billion}$ ] However, if the burden of disease started to be saved today, that scenario would be valued at the full \$200 billion (point 3).
6. Subtracting \$150 billion from the \$200 billion that would accrue if the burden saving started today would imply that bringing the timing of vaccine availability forward by 10 years (e.g. from ten years from now to today) offers \$50 billion in savings. Essentially, the value-added of this tool is in terms of accelerating the achievement of the policy goal at hand—in this case, the development of a vaccine against Malaria.
7. Subtracting the \$3 billion (net present value) needed to pay for the commitment (i.e. essentially the cost of this tool) implies net gains of \$47 billion (in net present value terms).
8. Annualized (and using the same 3 percent discount rate), this translates to about \$1.4 billion in gains per annum from using advance purchase commitments to speed-up the development of a Malaria vaccine. [ $\$47 \text{ billion} * 3\% = \$1.4 \text{ billion}$ ]

#### ***D. Growth- or GDP-indexed bonds—\$600 billion in efficiency gains***

1. Growth-indexed bonds have the advantage (over plain vanilla bonds) of restricting the range of variation of the debt to GDP ratio. These tools could help reduce the occurrence of debt defaults and financial crises (Council of Economic Advisers 2004; Borensztein and Mauro 2004).

---

<sup>6</sup> Kremer (2001, pp. 50-1) suggests that the delivery of a vaccine for malaria would save 17.6 million in DALYs each year. Given that malaria is estimated to cost about 39.3 million DALYs per year, about half of the costs would be saved with a vaccine.

<sup>7</sup> Net benefit represents the averted losses to GDP minus the costs of introducing preventive, curative, and child health measures. We could take the \$3-10 billion figure as a lower bound estimate since the introduction of a malaria vaccine could increase the effectiveness (hence the benefits) of malaria reduction interventions.

2. Based on empirical estimates by Detragiache and Spilimbergo (2001), Borensztein and Mauro (2004, pp. 168-69) note that a 10% increase in the debt-to-GDP ratio is linked to a 20% increase in the probability of a debt crisis occurring. GDP-indexed bonds could thus lower the probability of financial crises by helping to prevent sharp increases in the debt-to-GDP ratio.
3. Based on a study of financial crises in 8 developing countries from 1995 to 2002, the total estimated GDP loss (the cumulative difference between projected potential output and actual output) was \$1.25 trillion, or about \$150 billion per annum (in 2002 dollars) (Griffith-Jones and Gotthschalk 2005, p. 5).
4. Assuming that widespread use of GDP-indexed bonds could lower the probability of crises by 20%, and based on the annual estimated cost of financial crises in developing countries of about \$150 billion, the gains from this tool could be about \$30 billion (in 2002 dollars) per annum in cost savings.<sup>8</sup> [ $0.20 * \$150 \text{ billion} = \$30 \text{ billion}$ ]
5. An efficiency gain of \$30 billion per annum translates to about \$600 billion in net present value terms (assuming 5 percent discount rate). [ $\$30 / 5\% = \$600 \text{ billion}$ ]

***E. Macro markets—\$2.9 trillion in efficiency gains***

1. Macro markets could enhance risk sharing across different countries. One way to facilitate the creation of these markets would be to create contracts representing claims on linear income combinations (CLICs) of individuals in different countries. Using simulations involving the respective populations of the Group of 7 (G-7) industrialized countries, Athanasoulis and Shiller (2001) showed how representative individuals in each of the seven countries could enhance their welfare by buying this new type of security.
2. With 1 contract created, a person in Canada, for example, would experience an increase in welfare equivalent to a \$75.60 increase in her endowment. If 6 contracts were to be created (the optimal number), her gains would increase to \$688.60. (The gains of representative individuals from each of the seven countries studied are reported in the first two columns in the table below.)
3. Multiplying the gains of each individual by the 1992 population numbers provides a measure of each country's aggregate gains.
4. The results for each of the seven countries studied are presented in the last two columns of table 2. For Canada, that country's gains could range from \$2.1 billion

---

<sup>8</sup> We could also take this as a rough estimate of the net gains from using GDP-indexed bonds. A study by the International Monetary Fund suggests that the insurance premium that countries would have to pay in order to use GDP-indexed bonds would likely be small—around 0.4 percent (Borensztein and Mauro 2004, p. 181).

to \$18.9 billion, depending on the number of contracts created. [ $\$75.6 * 27.4$  million people = \$2.1 billion] [ $\$688.6 * 27.4$  million people = \$18.9 billion]

5. Aggregating the gains for the seven countries studied, the total gains from this tool could range from \$194.3 billion to \$419.4 billion (in 1985 dollars) per year. [ $\$2.1 + \$101.7 + \$61.4 + \$6.3 + \$9.2 + \$7.9 + \$5.7 = \$194.3$ ] [ $\$18.9 + \$107.8 + \$120.1 + \$40.5 + \$46.8 + \$44.8 + \$40.3 = \$419.4$ ]
6. Using the standard deviation from the estimates, we could establish the lower and upper bounds of the estimated range of efficiency gains—from \$145.1 billion to \$465.7 billion. [ $\$194.3 - \$49.2 = \$145.1$ ] [ $\$419.4 + \$46.3 = \$465.7$ ]
7. Using the lower estimate of \$145.1 billion, this translates to a \$2.9 trillion gain in net present value terms (assuming 5 percent discount rate). [ $\$145.1 \text{ billion} / 5\% = \$2.9 \text{ trillion}$ ]

**Table of Welfare Gains from the Creation of Macro Markets  
In 1985 U.S. dollars unless otherwise stated**

	Welfare gains per capita		Population (1992, in million people) <sup>c</sup>	Welfare gains per country (in billions)	
	1 contract <sup>a</sup>	6 contracts <sup>b</sup>		1 contract	6 contracts
Canada	75.6	688.6	27.4	2.1	18.9
United States	398.9	422.9	255.0	101.7	107.8
Japan	495.0	969.0	124.0	61.4	120.1
France	109.1	706.1	57.4	6.3	40.5
Germany	141.9	719.0	65.1	9.2	46.8
Italy	135.9	775.3	57.8	7.9	44.8
United Kingdom	99.3	697.0	57.8	5.7	40.3
				194.3	419.4
				(49.2)	(46.3)
			<b>Total</b>	<b>Lower bound: 145.1</b>	<b>Upper bound: 465.7</b>

Note: Standard deviation reported in parentheses.

<sup>a</sup> Athanasoulis and Shiller (2001, table 2, column 1, p.1046)

<sup>b</sup> Athanasoulis and Shiller (2001, table 2, column 3, p.1046)

<sup>c</sup> Athanasoulis and Shiller (2001, table 1, column 1, p.1045)

### ***F. International pollution permit trading—\$3.6 trillion in efficiency gains***

1. Permit trading markets with global scope, involving a diverse pool of trading countries, could help reduce the cost of emissions abatement, relative to the no-trading scenario.<sup>9</sup>

<sup>9</sup> Alternatively, carbon market trading could take place through the use of emission reduction credits, whereby countries could receive credits toward their emission abatement targets by investing, for example,

2. These efficiency gains do not yet include possible gains for developing countries that would be compensated under permit trading for providing industrial countries the environmental service of emission abatement.
3. Predicted cost savings from using international pollution permit trading depend on the modeling assumptions and parameters (e.g. period of study, targeted level of emissions reduction, participating countries, population and economic growth rates, etc.), as well as the specific types of emissions being targeted.
4. McKibben and Wilcoxon (1999, p.22-5) report that international pollution permit trading could cut the gross national product (GNP) cost of meeting the Kyoto Protocol commitments of “Annex 1”<sup>10</sup> countries by about \$182 billion (in 1995 dollars) in 2010.
5. If we assume that \$182 billion approximates the annual gains from this tool, this corresponds to a net present value gain of \$3.6 trillion (using a 5 percent discount rate).

## REFERENCES

- Athanasoulis, Stefano G. and Robert J. Shiller. 2001. “World Income Components: Measuring and Exploiting Risk-Sharing Opportunities.” *American Economic Review* 91 (4):1031-1054.
- Borensztein, Eduardo and Paolo Mauro. 2004. “Reviving the Case for GDP-Indexed Bonds.” *Economic Policy* 19 (38):165-216.
- Council of Economic Advisers. 2004. “Growth-Indexed Bonds: A Primer.” Washington, D.C. [[www.whitehouse.gov/cea/growth-indexed-bonds-white-paper.pdf](http://www.whitehouse.gov/cea/growth-indexed-bonds-white-paper.pdf)]
- da Silva, Luis Correia, Antonio Estache and Sakari Jarvela. 2004. “Is Debt Replacing Equity in Regulated Privatized Infrastructure in Developing Countries?” World Bank Policy Research Working Paper 3374. Washington, D.C. [[http://wdsbeta.worldbank.org/external/default/WDSContentServer/TW3P/IB/2004/08/30/000009486\\_20040830110018/Rendered/PDF/wps3374.pdf](http://wdsbeta.worldbank.org/external/default/WDSContentServer/TW3P/IB/2004/08/30/000009486_20040830110018/Rendered/PDF/wps3374.pdf)].
- Detragiache, Enrica and Antonio Spilimbergo. 2001. “Crises and Liquidity: Evidence and Interpretation.” IMF Working Paper 01/2. Washington, D.C. [[www.imf.org/external/pubs/ft/wp/2001/wp0102.pdf](http://www.imf.org/external/pubs/ft/wp/2001/wp0102.pdf)].

---

in emission reduction initiatives in other countries. However, the focus of the estimates provided here is on emission permit trading.

<sup>10</sup> The industrialized countries listed in this annex to the UN Framework Convention on Climate Change sought to return their greenhouse-gas emissions to 1990 levels by the year 2000 as per Article 4.2 (a) and (b). They have also accepted emissions targets for the period 2008-12 as per Article 3 and Annex B of the Kyoto Protocol. They include the 24 original OECD members, the European Union, and 14 countries with economies in transition. (Croatia, Liechtenstein, Monaco, and Slovenia joined Annex 1 at COP-3, and the Czech Republic and Slovakia replaced Czechoslovakia) See [http://unfccc.int/essential\\_background/glossary/items/2639.php](http://unfccc.int/essential_background/glossary/items/2639.php).

- Griffith-Jones, Stephany and Ana Teresa Fuzzo de Lima. 2006. "Mitigating the Risks of Investing in Developing Countries: Currency-Related Guarantee Instruments for Infrastructure Projects." In Inge Kaul and Pedro Conceição, eds. *The New Public Finance: Responding to Global Challenges*. Forthcoming Oxford University Press. [[www.thenewpublicfinance.org](http://www.thenewpublicfinance.org)].
- Griffith-Jones, Stephany and Ricardo Gottschalk. 2004. "Costs of Currency Crises and Benefits of International Financial Reform." Background Paper. United Nations Development Programme, Office of Development Studies. New York.
- Izquierre, Ada Karina. 2004. "Private Infrastructure: Activity Down by 13 Percent in 2003." Public Policy for the Private Sector Note 274. World Bank, Washington, D.C. [<http://rru.worldbank.org/Documents/274izquierre.pdf>].
- Ketkar, Suhas and Dilip Ratha. 2001. "Securitization of Future Flow Receivables: A useful tool for developing countries." *Finance and Development* 39 (1). [[www.imf.org/external/pubs/ft/fandd/2001/03/ketkar.htm#author](http://www.imf.org/external/pubs/ft/fandd/2001/03/ketkar.htm#author)]
- Kremer, Michael and Rachel Glennerster. 2004. *Strong Medicine: Creating Incentives for Pharmaceutical Research on Neglected Diseases*. Princeton and Oxford: Oxford University Press.
- Kremer, Michael. 2001. "Creating Markets for New Vaccines Part I: Rationale". In Adam B. Jaffe, Josh Lerner and Scott Stern, eds. *Innovation Policy and the Economy*. Cambridge, Mass. and London: National Bureau of Economic Research and The Massachusetts Institute of Technology.
- McKibbin, Warwick J. and Peter J. Wilcoxon. 1999. "Permit Trading Under the Kyoto Protocol and Beyond." Brookings Discussion Papers in International Economics 150. Washington, D.C.:Brookings Institution. [[www.brook.edu/views/papers/bdp/bdp150/bdp150.pdf](http://www.brook.edu/views/papers/bdp/bdp150/bdp150.pdf)].
- Mills, Anne and Sam Shillcutt. 2005. E-mail communication. August 19, 2005.
- \_\_\_\_\_. 2004. "Communicable Diseases." In Bjørn Lomborg, Ed. *Global Crises, Global Solutions*. Cambridge: Cambridge University Press.
- Ratha, Dilip. 2002. "Financing Development Through Future-Flow Securitization." PREMnote 69. Washington, D.C.: World Bank. [<http://www1.worldbank.org/prem/PREMNotes/premnote69.pdf>].
- UN (United Nations). 2001. "Greenhouse Gas Market Perspectives: Trade and Investment Implications of the Climate Change Regime." New York and Geneva: United Nations. [[http://r0.unctad.org/ghg/publications/ghg\\_mktpersp.pdf](http://r0.unctad.org/ghg/publications/ghg_mktpersp.pdf)].
- Wormser, Michel, and Suman Babbar. 2001. "Leveraging Private Finance in Frontier Markets." Presentation at the World Bank Guarantee Program Infrastructure Forum, May 2–4, Washington, D.C.