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Discussion Paper

Risk-Informed Finance for Development

Can GDP-linked official lending to emerging economies and developing countries enhance risk management and resilience?

July 2015

United Nations Development Programme

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1. INTRODUCTION

Mobilizing financial resources for development and sound management are dual and interrelated tasks of development policy making. Development requires continued investment by both the public and the private sectors to drive capital accumulation, technological innovation, structural transformation and productivity growth. With large off-market and non-monetized sectors, low tax revenue collections, limited financial depth and underdeveloped financial markets, developing and emerging economies often have to resort to international sources of financing to fund their investment needs. Increasingly, many of these countries are able to raise finance in international capital markets.¹ However, an important share of their financing still comes in the form of official public finance, both concessional and non-concessional, provided by international multilateral agencies, bilateral donors and other official creditors. This is the case even for more advanced, middle-income, emerging market economies, some which continue to rely in part on this type of external financing.

Managing international financial flows poses a number of well-known challenges for developing countries. Financial markets are typically fraught with market failures, especially those of an informational nature (Stiglitz, 1994), and are often driven by speculative dynamics (Minsky, 1986; Shiller, 1981). This makes private international financial flows susceptible to large swings that do not necessarily reflect changes in debtor countries' underlying economic fundamentals. They are also not responsive, when attached to fixed-income instruments, such as loans or bonds, to changing economic conditions faced by recipient countries and which determine their ability to service their debt. This can lead to debt crises and even sovereign debt defaults, which require costly and socially taxing debt restructuring processes, for both debtor countries and creditors. It also tends to favour the pro-cyclicality of fiscal policy: during good times credit flows at favourable rates, but when market conditions turn, countries faced with falling tax revenues are forced to cut back government expenditure to service their debt, precisely at a time when a more expansive fiscal policy stance would be desirable and there are growing needs to fund social protection.

This paper considers whether GDP-linked official external public debt can help address some of the challenges that developing countries face when managing international financial flows. GDP-linked official debt are financial instruments that make debt repayments contingent on economic conditions in the debtor nation. The paper builds on a growing body of research examining how state-contingent borrowing can help governments better manage their debt commitments and contribute to improved welfare outcomes, by linking debt repayment to their ability to pay, which is often shaped by external factors that are beyond their control. It argues that starting with a focus on external official lending, as opposed to other forms of sovereign debt involving private sector creditors (e.g. sovereign bonds), might offer a better chance of making inroads towards more widespread adoption of state-contingent financing, eventually extending to financial markets more broadly. It suggests doing so by involving actors (i.e. governments) that are in a position to take steps in this direction. In this regard, the paper asks whether governments of

¹ For instance, according to the IMF (2015a) sovereign bond issuances in sub-Saharan Africa increased from \$6.5 billion in 2013 to \$8.7 billion in 2014, with countries such as Ethiopia, Kenya and, more recently, Ivory Coast issuing sovereign bonds for the first time. There has also been increased interest in Islamic finance, with the Ivory Coast currently preparing to issue a \$490 million '*sukuk*' bond with support from the Islamic Development Bank (Bloomberg, 2015). Still, much of this interest may be driven by an international context of very low policy interest rates and investors searching for yield, with important risk lurking on the horizon (te Velde, 2014).

both lending and borrowing countries would consider this type of development finance modality, as a way of contributing to improved debt sustainability and debt management.

The analysis presented in this paper comes as the new Post-2015 International Development Agenda is being finalised. An important part of these discussions revolve around how to ensure that financial resources, both public and private, are available for sustainable human development and are supportive of the transformational paradigm of the Post 2015 agenda. Over the last 15 years, as the international community has pursued the MDG-agenda, it has had to cope with several national, regional, and even global shocks, of varying natures. There is a growing awareness, in this sense, of the importance of pursuing risk-informed development policies, especially as the costs of dealing with protracted crises around the world as well as with unexpected shocks such as the recent Ebola outbreak, mount. In this regard, the paper contributes to this Post 2015 debate by proposing risk-informed financing options as a way of increasing resilience to shocks.

The paper is organized as follows. Section 2 reviews the academic and policy research literature on state-contingent financing, including the literature examining GDP-linked lending to advanced economies and developing countries. This is followed in Section 3 by an overview of official lending to developing countries, defining this financing modality, analyzing historical patterns and trends of this type of development financing and, finally, examining its impact in developing economies. Section 4 then proceeds to present the results of a simple simulation exercise that serves to illustrate the potential benefits that this type financing could yield to both borrowing countries and official creditors. Finally, Section 5 concludes with a summary of key findings.

2. REVIEW OF THEORIES AND EXPERIENCES WITH GDP-LINKED DEBT

2.1. State-contingent financial instruments and GDP debt indexation in perspective

The idea of indexing debt instruments to real economic variables and making debt repayments contingent on economic conditions first emerged as a major academic and policy proposal in the late 1970s and early 1980s, in the context of the multiple debt crises afflicting developing and emerging economies at the time.

Typically, countries face a fixed schedule of payments as they service their debt, paying fixed interest and, depending on the debt contract, also amortizations of principal. When facing an unexpected slowdown in economic growth – often as a result of a terms-of-trade shock, natural disaster, disease outbreak, or conflict – government revenues drop, at a time when social needs increase, putting the government under fiscal pressure and making it difficult to pay fixed interest. In the extreme, it may force countries to restructure or default on their debt. There is evidence that unexpected growth slowdowns can explain to a large extent increases in public debt to GDP ratios (Ho and Mauro, 2014). Countries that face shocks sometimes have creditors extend debt relief, as happened, for instance, recently with the IMF and the three countries in West Africa struck by the Ebola outbreak: Guinea, Liberia and Sierra Leone (IMF, 2015b). State-contingent debt instruments would imply that a country facing a shock affecting its economic performance would have the burden of servicing its debt temporarily reduced. However, rather than have this done in an ad-hoc and arbitrary manner, under a state-contingent debt arrangement, these debt service reductions would happen in a systematic and predictable way.

Early contributions in the field of state-contingent development financing focused on the case of commodity-linked bonds, work which provides much of the theoretical foundations for the analysis of GDP debt indexation. Commodity-linked bonds are defined as ‘a bond whose redemption value is linked to the price of a commodity. Typically, issuers whose income stream is closely tied to commodity earnings issue these bonds.’ (IMF, 2014a: 188). Unlike conventional bonds, which pay a stated fixed coupon during the life of the bond and a fixed principal redeemable at maturity, the principal of a commodity-linked bond is paid either in physical units of a reference commodity (e.g. ‘x’ bales of cotton, ‘y’ ounces of gold) or its equivalent money value, with the possibility of also linking coupon payments in a similar way.

Atta-Mensah (2004: 1-2) distinguishes between two types of commodity-linked bonds: Forward-type bonds, also referred to as commodity-indexed bonds, where the coupon and/or principal payments are linearly related to the price of a reference commodity; and option-type bonds, where coupons are paid in the same manner as with conventional bonds, but the bearer receives at maturity the face value of the bond plus an option to buy or sell a predetermined quantity of the commodity at a specified price.

Early experiences with commodity-linked bonds can be traced back to the 19th century, during the American Civil War period, when the Confederate States of America issued bonds payable in bales of cotton, the so-called Cotton Bonds (O’Hara, 1984). A century later, a number of countries and large corporations started considering the use of commodity-linked bonds in response to the high output and price volatility experienced in global commodity and financial markets that followed the breakup of the Bretton Woods international monetary system in 1971, and the several oil shocks that hit the world economy during the 1970s and early 1980s. Commodity-linked bonds were seen, in this context, as a useful financial instrument for hedging against commodity price volatility and transferring a substantial proportion of output price risk to financial markets through commodity backed securities (Schwartz, 1982; O’Hara, 1984). Since then, commodity-linked bonds have been issued on a number of occasions against a variety of commodities, such as gold (by the French government in 1973 and the Canadian Echo Bay Mines Ltd. company in 1981), silver (by the US Sunshine Mining Company in 1980 and 1985), or oil (by the government of Mexico in 1979 and the 1990s, the government of Venezuela in the 1990s and the Petro-Lewis Corporation of Denver in 1981) (Schwartz, 1982; Atta-Mensah, 2004; IADB, 2007). Commodity-linked bonds make them particularly relevant for commodity-dependent developing economies with export structures highly concentrated around a small number of commodities, given that it would provide them with an opportunity to hedge against fluctuations in export earnings. There have been frequent advocates for this kind of issuance in commodity-dependent countries.²

The mid 1980s saw the extension of the ideas underlying commodity-linked bonds to the indexation of debt securities to real economic variables, such as export earnings or output production. Some of the first proposals in this direction were from analysts with close links to the investment banking and financial worlds, indicating that investors viewed state-contingent financing instruments as a way of reducing the likelihood of costly sovereign debt defaults. In a highly influential and cited article in *Business Week* ‘A Safety Net for Foreign Lending’, Norman A. Bailey (1983), a senior official at the time with the US National Security Council but previously an investment banker, suggested linking debt amortization to countries’ foreign exchange earnings. A similar case was presented by Richard S. Weinert, also an

² See, for instance, Caballero (2003), for the case of Chile and copper.

investment banker, in an equally well-cited article for *Foreign Policy* magazine published only a few months later: '*Banks and Bankruptcy*', in which he argued for a debt swap programme for LDCs in which interest payments on new bonds would be indexed to take into account variables determining a country's ability to pay back its debt, such as export volumes, terms of trade, relative import prices and other macroeconomic variables (Weinert, 1983: 149).³ This was followed by a more formal treatment of these ideas within academia (e.g. Lessard 1985; Helpman 1988; Krugman, 1988; Sachs, 1989; or Froot, et al 1989) and, to some extent, reflected in the debt restructuring deals of countries taking part in the Brady Plan, such as Mexico, Costa Rica, Bulgaria or Bosnia Herzegovina (Borensztein and Mauro, 2004; IADB, 2007; Sandleris, et al 2011). Yet, while state-contingent lending to LDCs was a key policy proposal for dealing with debt sustainability issues in developing countries emerging from the 1980s debt crisis academic literature, it did not gain immediate traction in the more applied policy literature on development finance (e.g. by the World Bank or the IMF), nor much attention in policy circles.

In parallel to the academic work and policy experiences with debt indexation of the 1970s and 1980s, the 1990s saw the emergence of a new strand of literature on Macro Markets, which has also exerted considerable influence in the practical conceptualization of GDP-linked debt. Led by Nobel Prize Laureate Robert J. Shiller, this literature advocates for the creation of a new set of Macro Markets, conceived as financial markets trading on the evolution of national macroeconomic aggregates. The idea behind these proposals is that such markets would allow both individuals and organizations to hedge and insure themselves against risks posed to their standards of living, or standards of operation, in the case of firms.

Macro markets could take the form of international securities, futures, options or swaps markets for claims on major income components, including perpetual claims. As argued by Shiller (1993), settlements in these markets could be referenced to national income or other related aggregates, such as occupational incomes, or prices that value income flows, for instance regional real estate prices. Ultimately, such markets could contribute to smooth international economic fluctuations and reduce income inequality. One specific proposal that has received significant academic and media attention has been the proposal of issuing US government securities with a coupon tied to the United States' current dollar GDP value, the so-called Trills (Shiller, 2006; Kamstra and Shiller, 2009). These securities would pay dividends to investors in perpetuity, or until the government bought them back on the open market, dividends defined as a specified fraction of GDP. For instance, a coupon of one-trillionth of the value of GDP. Hence, the Trills denomination.

Drawing from these various strands of the literature and the incipient experience of developing countries with this type of lending, the early 2000s saw greater interest and work around GDP-linked debt. Initially focused on GDP-linked bond instruments, both the International Monetary Fund (IMF) and the United Nations have been instrumental in reigniting interest in this type of financial instruments. At the IMF, the work by Borensztein and Mauro (2002 and 2004) and Chamon and Mauro (2006) has helped define an applied analytical framework for the analysis GDP-linked lending, which have helped build the case for this type of debt instruments. Meanwhile, the UN's work, organized around a number of expert group meetings in 2005 and 2006 comprising market participants, government officials and representatives from

³ See also Griffith-Jones (1986) for a detailed discussion of this earlier literature.

multilateral organizations,⁴ has contributed to the policy debate around this type of development finance modality and to shed light on the practicalities of adopting this type of financing by developing countries (See UN, 2005 and 2006; Griffith-Jones and Sharma, 2006; Kaul and Conceição, 2006).

The last decade has seen a growing body of academic and policy research examining different aspects of GDP-linked lending. Part of this work has focused on developing the modeling framework for the analysis of GDP-linked debt (e.g. Atta-Mensah, 2004; Hatchondo and Martinez, 2012), looking into issues of pricing and optimal contract design (Chamon and Mauro, 2006; Miyajima, 2006; Ruban et al, 2008; Sandleris et al, 2008; Schinckus, 2013); risk sharing and externalities (Gondo, 2014); and moral hazard and market power issues (Miller and Zhang, 2013). Other authors have extended the analysis of GDP-linked debt to financial instruments other than sovereign bonds. Tabova (2005), for instance, has examined the feasibility and desirability of GDP-indexed concessional lending, such as that provided by the International Development Agency (IDA), the concessional lending branch of the World Bank. Missale and Bacchiocchi (2012), on the other hand, undertake a similar exercise, extending the analysis to different type of multilateral loans and different forms of indexation: GDP, inflation and the dollar value of exports. The recent EU debt crisis has also sparked renewed interest in GDP-linked financing instruments, in this case applied to advanced economies, as a way of addressing the debt and macroeconomic management challenges currently faced by Greece (see, for instance, Barr et al, 2014; Brooke et al, 2013; Fratzscher et al; 2014). Much of this literature includes practical applications of findings through model simulations using real country-level data (e.g. for Argentina). The French Development Agency (Afd), meanwhile, has piloted a variation on this theme in five Heavily Indebted Poor Countries (HIPCs). Under its 'counter-cyclical' loan instrument, debt service is allowed to fall or become zero for up to five years when a major shock occurs (such as a terms of trade shock or extreme weather event). Griffith-Jones (2010) has explored the feasibility and desirability of expanding this financing instrument to small states which are vulnerable to frequent and severe shocks.

Beyond this growing body of academic and policy research literature on GDP-linked debt, there have been a number of countries which have experimented with this type lending. Argentina and Greece are some of the most notable examples. These two country cases are examined in greater depth in the next section.

2.2. Theoretical and technical aspects of GDP-linked debt

GDP-linked debt can be defined as a debt security in which the issuer, typically a national government, commits to pay a return on the principal that varies with the evolution of GDP. GDP-linked securities are, in this sense, a form of floating-rate security, with a coupon or interest payment that is linked to the growth rate of an economy. They belong to the wider class of state-contingent financial assets.

The underlying idea behind GDP-linked securities is to link debt repayments to economic performance, with the aim of stabilizing external debt dynamics and minimizing the probability of sovereign debt default. It seeks, in this sense, to link debt service repayments to a country's ability to pay, as determined by the

⁴ These meetings were held at the United Nations Headquarters in New York in October 2005 and at the IMF's headquarters in Washington D.C. in April 2006. See UN (2005) and UN (2006) for more details.

macroeconomic and external conditions it faces at any given point in time. In a way, this type of security acts as an insurance mechanism that allows issuing countries to hedge against episodes of poor economic performance, as measured by GDP growth, and the subsequent risk of a (costly) sovereign debt default. Unlike other state-contingent debt mechanisms, such as collective action clauses (CACs) and sovereign contingent convertible bonds (CoCos), which are designed to improve debt crisis resolution processes and only come into effect in the event of debt distress episodes (e.g. problems of liquidity, default, etc.), indexing securities to GDP performance constitutes more of an ex-ante and preventive mechanism, that seeks to avoid this type of debt distress episodes from happening in the first place. Beyond its debt stabilization benefits, another important advantage of GDP-linked debt is its counter-cyclical nature. By reducing debt payments in times of economic slowdown, when government revenue also typically drops, it reduces the pressure to cut back on other budget expenditures, implicitly creating greater fiscal space for expansionary fiscal policies. Similarly, increased debt service payments during episodes of high economic growth reduce the scope for over-expansionary fiscal policies that could fuel unsustainable growth spurts. The benefits for lenders, on the other hand, come down to two. First, this type of security helps reduce the risk of debt default and the subsequent costs that lenders face during these episodes. Second, it offers the possibility of obtaining higher rates of return, if issuing countries outperform in terms of GDP growth, whilst providing new opportunities to diversify their investment portfolios.⁵

There is no standard predefined design for GDP indexed debt securities.⁶ In this sense, it is the specific contractual design agreed for a given GDP-linked security that will determine debt service adjustments to a country's GDP performance and, therefore, the degree of exposure (cover) that investors (issuers) in this type of securities take in relation to the possibility that the country underperforms. Interest or coupon payments on GDP indexed debt securities can be linked to different measures of economic performance: GDP growth rates or GDP levels, measured in real or nominal terms, and often combine features of all of these measures. Missale and Bacchiocchi (2012: 7) argue that the choice as to whether to use nominal or real GDP values should be determined by the currency in which these securities are denominated. They argue that, if denominated in a foreign currency (e.g. Euros, USD, SDRs) debt should be indexed to real GDP measures, so as to avoid the double charge of paying for inflation and exchange rate movements. On the other hand, nominal GDP measures should be used if securities are denominated in local currency, so as to provide insurance to the borrower against unexpected deflationary dynamics that could put upward pressure on debt-to-GDP ratios, whilst also removing inflationary temptations and protecting foreign lenders against depreciation of the exchange rate. In practice, however, nominal values have been used with foreign denominated GDP-linked securities.

In some cases, for instance the Argentinian and Greek GDP warrants issued in 2005 and 2012, these securities may not hold any principal claim and their notional value is only used as a reference to calculate payments to security holders, similar to dividends on equity, or Shiller's (2009) Trills proposal. Claims (and securities) may also be time-bound or may be paid in perpetuity. A number of mechanisms have been suggested and, in some instances applied in practice, to index securities to GDP performance. This, typically, operates as a way of ensuring that payments stay within reasonable bounds, or only come

⁵ Borensztein and Mauro (2004: 183) argue that the evidence is that income growth across different countries is not highly correlated, so that the large-scale adoption of GDP-indexed sovereign financing would provide an effective avenue for investors to diversify risk in their portfolios.

⁶ See Schroder et al (2004) for a detailed discussion on contractual features of GDP-linked bonds.

into effect when a country's ability to pay an additional (GDP-linked) amount on its debt is warranted. These mechanisms include GDP triggers, GDP trend rates, GDP threshold values and GDP caps.

Despite the benefits that GDP-linked securities can potentially provide to both borrowers and lenders, the operationalization of this type of debt instrument faces a number of challenges, which help explain the limited number of cases in which these securities have been issued. These include:

- ❖ Moral hazard problems: The contractual arrangements underlying GDP-linked securities can in theory create incentives for debt issuing countries to pursue growth reducing or, at least, growth dampening, policies, as a way of limiting GDP-linked interest payments on their debt. Although an important concern in the earlier sovereign debt literature of the 1980s (Lessard, 1985; Krugman, 1988, Froot et al, 1989), more recent research on GDP-linked securities has been generally skeptical as to the scope for such type of phenomena. Miyajima (2006), for instance, argues that GDP is a variable that captures (production) efforts by many economic actors that is shaped by a multiplicity of domestic and external factors. Therefore, it cannot be truly considered an endogenous variable over which government can decide. Others (e.g. Griffith Jones and Hertova, 2012; Williamson, 2008) argue that such moral hazard concerns are highly unlikely to be reflected in real world behaviour by sovereign governments, as the costs (economic, but also social and political) of suppressing growth would greatly outweigh any savings on GDP-linked debt service payments that would result from reducing economic growth. Moreover, as pointed by Borensztein and Mauro (2004: 202), these moral hazard concerns also apply to plain vanilla bonds on which sovereign governments always have the option of defaulting.
- ❖ Measurement and underreporting: A more immediate and potentially serious concern is that posed by the measurement and reporting of GDP magnitudes (e.g. nominal GDP, GDP deflators, etc.). Debt issuing governments could be tempted to underreport GDP figures, in order to reduce interest payments on their GDP-linked debt. Both Borensztein and Mauro (2004) and Griffith-Jones and Sharma (2006) consider this to be a highly unlikely outcome, since economic policy success (and the political rewards that come with it) is ultimately measured by higher rather than lower economic growth. Sandleris et al (2011), on the other hand, put as an example the case of inflation-indexed bonds, which have been issued by several countries, including emerging market economies, and where underreporting has not been a major concern, despite the fact that incentives to do so would be stronger than for GDP, given the negative political connotation that inflation typically holds. However, the recent cases of macroeconomic misreporting that occurred in Greece and Argentina serve to underscore that such concerns are neither unfounded nor implausible.⁷

Beyond the possibility of GDP misreporting, GDP figures are potentially subject to important measurement problems. Thus, producing reliable GDP figures is a complex task involving a significant amount of estimation. It can be a particularly challenging task in developing countries, where statistical capacities are often weak and large parts of these economies are informal, or based

⁷ See for instance Merco Press (2014) article 'IMF joins Argentine GDP linked bonds controversy involving potential payment of 3bn dollars' of April 9th 2014, available on <http://en.mercopress.com/2014/04/09/imf-joins-argentine-gdp-linked-bonds-controversy-involving-potential-payment-of-3bn-dollars> or Reuters (2014) UPDATE 1-Argentina posts 3 pct growth in 2013, dodges GDP warrant bullet of March 27th 2014 <http://www.reuters.com/article/2014/03/27/argentina-growth-idUSL1N0MO1ZT20140327>.

on subsistence production (see Jerven, 2013). Even when GDP figures for a given country meet accepted international standards these figures may (and often are) subject to regular revisions, although in the long-term these problems would even out and, on the other hand, they can be dealt with contractually ex-ante (e.g. ignoring these revisions, if considered randomly distributed). GDP figures are also published with lags, which, if long, could limit the counter-cyclical benefits typically associated with this type of debt instrument (Griffith-Jones and Hertova, 2012). This would occur if by the time reliable GDP figures are published and payments on GDP-linked debt made, there has been a change in the economic cycle.

A way around these measurement problems is using other real economic variables for debt indexation purposes. An obvious candidate is export values. These figures are typically produced in a shorter period of time and are mostly based on administrative records (e.g. from customs), instead of involving complex estimation and aggregation procedures. They can also be obtained from importing countries, if there are concerns about the reliability or accuracy of official export data. In least developed countries, which are often highly dependent on a small number of export commodities and in which subsistence (non-taxable), economic activities are often predominant, using export values may also be a more effective debt-stabilizer mechanism and a better measure of true ability to pay.

- ❖ Political economy considerations: Another set of concerns with GDP-linked bonds relate to the politics of debt management and economic policy making. Markets, for example, might decide to place a premium on this type of securities if they feel that returns will be lower than with plain vanilla-type bonds, making GDP-linked financing potentially a more expensive option. Even if such debt financing might still be desirable from a long term macroeconomic management perspective, voters or political parties might focus more on the short term costs than the longer term benefits provided by GDP-linked financing, politically penalizing incumbent governments. On the other hand, national authorities might face a political fallout for paying higher debt service payments during episodes of high-growth than they would if there were to use standard, fixed-income debt financing instruments, regardless of the advantages and long-term benefits of issuing GDP-linked securities. For these reasons governments may find GDP-linked borrowing a politically unattractive financing option.
- ❖ Missing markets, coordination failures, liquidity and tradability of GDP-linked securities: A main challenge that GDP-linked debt faces in becoming a regular feature in global financial markets is the absence of (fully developed) markets in which these securities can be traded. The absence of such markets reduces the liquidity of such debt instruments, making them riskier for potential investors and a more expensive financing option for sovereign issuers, who may have to pay an additional risk premium. This in itself could discourage the creation of such markets, despite the known long-term, system-wide benefits that both issuers and investors can derive from adopting this type of financing. As argued by Griffith-Jones and Hertova (2012: 140), addressing this 'missing markets' and coordination type of market failure would require concerted efforts by governments, in both advanced and developing countries, and multilateral financial institutions to push for the creation of GDP-linked securities markets.
- ❖ Pricing GDP-linked bonds: One important difficulty GDP-linked bonds face is that of pricing. Pricing challenges partly arise because of the absence of markets on which to trade these securities and compare across similar GDP-linked bonds issued by different emerging economies. Hence, the

importance of establishing these markets. As pointed out by Griffith-Jones and Sharma (2006: 10) ‘Markets like to price comparability’. However, the challenges of pricing GDP-linked bonds might be overstated and perhaps owe more to the novelty factor (and associated costs) of pricing a new financial instrument. Chamon and Mauro (2006) argue, in this sense, that the real challenge is pricing standard plain vanilla bonds, something that takes place in financial markets on a daily basis and something that analysts take for granted. The additional challenge of pricing GDP-linked bonds is minimal, essentially estimating the risk of default and implied loss for investors. In any case, as argued by these same authors, pricing of financial assets has existed for many centuries, without requiring complex (or for the matter, any) pricing models. Regardless of these more theoretical considerations, the few exercises undertaken to estimate possible price ranges for such GDP-indexed bonds suggest, however, that the premium placed by markets on these financial instruments would be small (see Borensztein and Mauro, 2004).

- ❖ Call options: GDP-debt issuances that include a call option, such as Greece’s 2012 GDP-linked warrant, might be seen as less attractive by market operators, especially those with a longer-term investment horizon, as they may fear that the higher long-run returns that GDP-debt securities may offer could be lost if the issuing governments decide to exercise these repurchase options. This in part seems to have been the reason behind Bulgaria’s GDP-linked bond issuance’s relative failure to attract interest among investors (Sandleris et al, 2011: 22). However, bond contracts can always be made un-callable, which would avoid situations such as those faced by investors with the Bulgarian issuance (Forbes, 2004). As Borensztein and Mauro (2004: 203) point out, during episodes of higher than expected growth, interest rates on plain vanilla debt would most likely fall, reflecting the improved solvency position of that country. In this context, the borrower would have an incentive to recall GDP-linked securities and issue new plain vanilla bonds at a lower interest rate.

2.3. GDP-linked debt securities in practice: the Argentinian and Greek cases

The analysis of examples of GDP-linked debt securities issued to date can help shed light on the actual operationalization of this type of financing instrument and illustrate better the points raised in the previous section. The use of GDP-indexation, while not very common, is far from unprecedented, especially in the context of debt restructuring. For instance, in 180 episodes of bank loans and bond restructurings between 1978 and 2010, Edwards (2015) identified twelve cases where the warrants linked to the terms of trade of GDP.⁸ The following paragraphs present details of two such GDP-linked debt security issuances, that of Argentina in 2005 and Greece, most recently in 2012.

Argentina’s 2005 GDP-linked warrant issue⁹

The Republic of Argentina issued its GDP-linked securities on January 14th 2005, as part of a debt restructuring package affecting US\$ 81.8 billion in debt obligations (US\$ 79.7 billion of principal and US\$ 2.1 billion of accrued but unpaid interest as of 31st December 2001) on which it had defaulted four years earlier. This debt swap operation involved the possibility of exchanging eligible securities for three types

⁸ This occurred in: Honduras 1989, Costa Rica 1990, Mexico 1990, Venezuela 1990, Nigeria 1991, Uruguay 1991, Bolivia 1993, Bulgaria 1994, Ecuador 1995, Bosnia 1997, Cote d’Ivoire 1998, and Argentina 2005.

⁹ The information presented on the Argentinian GDP-linked security mostly comes from the prospectus published by the government of Argentina for this bond issuance. The prospectus can be downloaded from: http://www.mecon.gov.ar/finanzas/sfinan/english/download/us_prospectus_and_prospectus_supplement.pdf

of bonds: Pars, Discount and Quasi-Pars bonds, due on the years 2038, 2033 and 2045 respectively; plus an additional GDP-linked security (or warrant), expiring in December 2035.

The Argentinian GDP-linked warrants were to be initially attached to these Pars, Discounts and Quasi-pars bonds and were issued in three different currencies: Argentinian Pesos, Euros and US dollars.¹⁰ Their issuance was to be done in the same currency and governed by the same law as the new bonds (Pars, Discounts or Quasi-Pars) to which they were initially attached. GDP-linked warrants were to be issued as a single unit together with these bonds and traded as such during the first 180 days following the issuance settlement date of April 1st 2005. Thereafter, these GDP-linked warrants were to be automatically detached and traded as separate debt securities.

Each GDP-linked warrant was to have a notional amount equal to the corresponding 'Eligible Amount' of Eligible Securities tendered and accepted, as established in the issuance prospectus. GDP-linked warrants were to have no principal payments attached to them. In this sense, they operated as an additional, GDP-indexed coupon premium to be paid on top of the interest and principal payments due on the Pars, Discounts or Quasi-Pars bonds to which they were attached at issue, all of which presented pre-set, non-indexed, interest payments.

As suggested by their name, any payments on GDP-linked warrants were contingent on Argentina's GDP performance, and were to be made each year on December 15th in the currency of subscription, with the first payment potentially occurring on December 15th 2006. Payments on GDP-linked securities were to be made only if the following three conditions were met:

1. For the reference year, actual real GDP exceeded the 'Base Case GDP' value defined in the issuance prospectus. The 'Base Case GDP' for any year essentially reflected an underlying real GDP trend growth of around 3-3.5% per annum, depending on the year.
2. For the reference year, annual real GDP growth exceeded the growth rate in 'Base Case GDP' for this reference year.
3. Total payments made on a GDP-linked warrant did not exceed the payment cap established for that GDP-linked Security. This cap was set at 0.48 per unit of currency of the security, so that, for instance, an investor receiving GDP-linked warrant in a notional amount equal to U.S.\$1 million, could only be paid a total amount on this security of US\$ 480,000.

If all three criteria were met, holders of GDP-linked securities were then entitled to receive a payment on the due payment date equal to an 'Available Excess GDP' figure for the corresponding reference year, multiplied by the aggregate notional amount of GDP-linked securities they held. 'Available Excess GDP' was to be determined by the following formula:

$$\text{Available Excess GDP} = (0.05 \times \text{Excess GDP}) \times \text{unit of currency coefficient}$$

¹⁰ A similar offer was later issued on similar terms in Japan. This offer was denominated in Japanese Yens and governed by Japanese law.

Where:

- a) *Excess GDP was the amount, if any, by which actual real GDP, converted to nominal pesos, exceeded the 'Base Case GDP', also converted to nominal pesos.*
- b) *The unit of currency coefficient is the proportion that one GDP-linked security with a notional amount of one unit of currency bears to the aggregate 'Eligible Amount' of all 'Eligible Securities' outstanding, approximately U.S.\$81.8 billion, calculated using exchange rates of 31st December 2003.*

The creditor participation rate in the Argentinian 2005 debt swap to which the GDP-linked security was attached was 76%, with the notional value of these securities reaching USD\$ 62 billion. According to Costa et al (2008), initially, at the time of the exchange offer, investment banks were suggesting a price of 2 cents per dollar for the US\$ denominated GDP-linked warrants. Yet by the time these warrants became detached from their underlying Pars, Discounts and Quasi-pars bonds, on November 30th 2005, the warrants were trading at 4.25 cents per dollar. Since then, traded prices for the Argentinian GDP-linked warrants have soared, reaching a peak of 18.666 cents to a dollar on July 25th 2011, although since then their price has dropped significantly and is currently, as of 15th April 2015, trading at 9.350 cents.¹¹ The strong trading track record of the Argentinian GDP-linked security warrant over the past decade owes largely to the Argentinian economy's strong performance, with real GDP growth averaging 5.9% from 2004 to 2013, according to data from the World Bank, more than two percentage points higher than the trend growth rate used to compute annual GDP-linked warrant payments.

According to Griffith-Jones and Hertova (2012), by the end 2011 the Argentinian government had paid out to warrant holders around USD\$6.1 billion on account of the GDP-linked warrant, with another payment of US\$ 3.5 billion made by end of 2012, corresponding to the 2011 GDP reference figure, as reported by Bloomberg News.¹² This puts the total amount paid out so far on this warrant at around US\$ 9.6 billion,¹³ representing almost a third of the maximum payable amount on this bond of \$US 29.8 billion, as per the 0.48 per unit of currency cap placed on the total notional amount of the warrant subscribed on issuance.

Greece's 2012 GDP-linked security issue¹⁴

The Greek GDP-linked security issue of 2012 shares many of the traits of the Argentinian issuance described above, in that it essentially operates as a coupon premium payment or security warrant on fixed-rate government securities to which it is attached. As in the Argentinian case, the Greek GDP-linked security has no principal payment attached to it, with payments based on a GDP-indexed notional amount.

¹¹ <http://www.boerse-frankfurt.de/en/bonds/argentina+2035+io+gdp+US040114GM64>

¹² www.bloomberg.com/news/articles/2013-07-23/hard-to-believe-gdp-in-argentina-triggers-warrants-surge

¹³ No payments were made in 2013 or 2014, due to GDP growth performance below reference rates in both years.

¹⁴ The information presented on the Greek GDP-linked security mostly comes from the US Invitation Memorandum published by the Geek Authorities for this bond issuance. This and other related documents can be downloaded from: <http://pdma.greekbonds.gr/>

The Greece GDP-linked security issue was approved by the Greek authorities on 24th February 2012, as part of a debt restructuring programme agreed with the EU during the Euro summit of October 2011 and the Euro-group meeting of February 2012. This programme involved an offer to private holders of bonds issued or guaranteed by Greece to exchange selected bonds for (i) new bonds issued with a face value equal to 31.5% of their exchange bonds; (ii) the net cash proceeds from the sale of European Financial Stability Facility (EFSF) notes with a maturity date of two years or less from the PSI settlement date and having a face amount equal to 15% of the face amount of the exchanged bonds and (iii) detachable GDP-linked securities issued by the Republic of Greece with a notional amount equal to the face amount of each holder's new bonds.

Each GDP-linked security was issued with an initial notional value of 100 euros and has an expiration date of 15 October 2042. It uses, as a reference, GDP figures for the Greek economy published by EUROSTAT, the official statistical office of the EU. Every year, on October 15th, holders of GDP-linked securities receive a 'Payment Amount' equal to the product of (1) a 'GDP-Indexed Percentage' figure obtained for the reference year, multiplied by (2) the 'Notional Amount', provided that actual nominal GDP for the corresponding reference year exceeds the 'reference nominal GDP' figure established for that year. Otherwise, the 'Payment Amount' will be equal to zero. In other words:

$$\text{Payment amount} = [\text{GDP-Indexed Percentage}] \times [\text{Notional Amount}] \quad \text{if actual nominal GDP} > \text{Reference nominal GDP}$$

$$\text{Payment amount} = 0 \text{ [zero]} \quad \text{if actual Nominal GDP} < \text{reference nominal GDP}$$

In the Greek GDP-linked security issuance the GDP Percentage Index for a reference year is defined as the product of (i) the Real GDP Growth rate for that year, minus the reference real GDP growth rate for that reference year, multiplied by (ii) 1.5. That is:

$$\text{GDP Percentage Index} = [\text{Real GDP Growth rate} - \text{reference real GDP growth rate}] \times 1.5$$

The invitation Memorandum documentation for this issuance established the following provisos on how the GDP Percentage Index will be used an applied:

1. The GDP Percentage Index for any year will not exceed 1%.
2. In the event that the GDP Percentage Index for a given year exceeds 1%, this difference will not be taken into account in the computation of future GDP Percentage Index coefficients.
3. If real GDP growth for a given year is negative the GDP Percentage Index for that year will be zero.
4. If real GDP growth for a reference year is lower than the reference real GDP growth rate, then the GDP Percentage Index will also take a value of zero.

Values for the 'Reference nominal GDP' and 'Reference Real GDP growth' indicators are established in detail for each year from 2014 to 2042 in the documentation attached to this security issuance and are based on an underlying trend growth rate of between 2% and 2.9%, depending on the year. The notional amount value used for the purpose of this calculation was established at 100% of the original notional

amount for payments on this GDP-linked security running up to 2022. Thereafter, this notional amount is to be reduced by fractions of 15/315 per year until 2042.

This GDP-linked security offer by the Greek authorities establishes that subsequent revision in GDP figures by EUROSTAT further to the calculation date will not entitle security holders to any revision of payment amounts. The Greek authorities also reserve the right to repurchase all or part of this GDP-linked security issuance after 1st January 2020, with prior notification to security holders. In the event that the Greek authorities decide to make use of this repurchase option, security holders will be required to sell the GDP-linked securities they hold at a specified Call Price, equivalent to the arithmetic mean of the market price for the 30 trading days prior to the date on which the relevant purchase option notification is given to security holders by the Greek government.

The Greek GDP-linked security offer took place between late February and early March 2012, with an initial issue amount of 55.8 billion euros. Trading started soon afterwards, with these GDP-linked warrants trading as high as 89.2 cents per 100 euros, but had dropped to an all-time low of 28.2 cents by 28th May 2012. It has thereafter experienced a steady climb, reaching a high of 142.2 cents in 14 July 2014. Since then, however, its trading value has dropped dramatically, and is currently being traded at 46.1 cents.¹⁵

Are there any conclusions/insights we can draw from these two examples?

3. EXTENDING THE GDP-LINKED DEBT FRAMEWORK TO EXTERNAL DEBT WITH OFFICIAL CREDITORS

3.1. GDP-linked Official Lending: preliminary considerations

Much of the literature on GDP-linked debt reviewed in the previous section focuses on the application of GDP indexation principles to sovereign bonds and other similar securities. That is, financial instruments through which governments raise funds from financial markets and which, once issued, can be traded in secondary debt/bond markets. The exceptions are Tabova's (2005) proposal to extend the GDP indexation framework to concessional loans to LDCs by the International Development Association (IDA), and a similar proposal by Missale and Bacchiocchi (2012) to adopt GDP-indexation for all multilateral loans.

In this regard, many of the challenges identified in Section 2.2 refer to and are largely exclusive of market-based GDP-indexed debt instruments, such as GDP-linked bonds and GDP-linked warrants; i.e. debt instruments in which funds are raised directly from financial markets. This is the case for example of problems of pricing, liquidity and tradability of GDP-linked bonds, caused by the absence of fully developed markets in which to trade in these securities. Or the disincentives that call-option clauses represent for market operators willing to invest in GDP-linked securities.

In this paper we follow the steps and extend the approach taken by Tabova (2005) and Missale and Bacchiocchi (2012) and consider whether the adoption of GDP-indexation principles for all developing

¹⁵ <http://www.boerse-frankfurt.de/en/bonds/griechenland+12+42+io+gdp+GRR000000010>

countries' external lending with official creditors, whether bilateral or multilateral, concessional or non-concessional. It differs from Tabova (2005) and Misslae and Bacchiocchi (2012) in that our research is not limited only to multilateral development loans, but to all developing countries' debt with official creditors. We see no reason to limit GDP debt indexation to development finance alone, given the fungibility of government financing, including debt financing. Similarly, principles of GDP indexation can be adopted by bilateral creditors as much as by multilateral agencies. Altogether, we believe this approach presents a number of advantages, which might also help circumvent some of the difficulties so far experienced in extending in practice the use of GDP-indexation in sovereign bonds issuances.

First, for many developing countries' loans with official creditors constitute a major source of external financing, in some cases the most important one. Thus, as discussed in detail in section 3.1., around 36.2% of developing countries' and emerging economies' external financing comes from official creditors, with this share increasing to 57.8% for least developed countries. In this sense, applying principles of GDP indexation to this type of lending could go a long way in extending the benefits of GDP-linked lending to developing countries' external debt, especially for least developed countries, which are particularly vulnerable to changes in the external economic environment – of course, grants, where possible, are perhaps the first best option for many, though not all, LDCs.

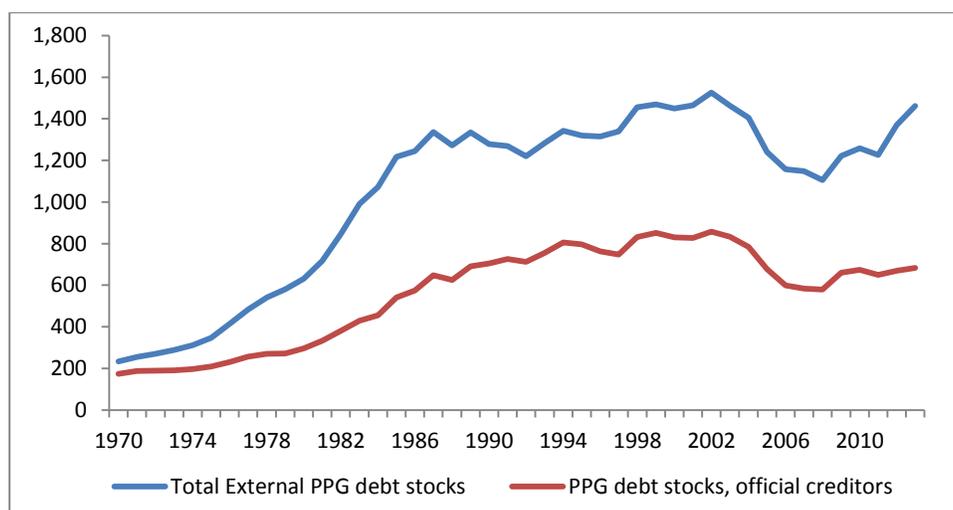
Second, given the limited interest that market operators have so far shown in GDP-linked securities, reaching out to official creditors might prove to be a more effective avenue for extending the principles of GDP-indexation. Among other things, it involves advocating for this type of financial innovation with a smaller number of counterparts: essentially international financial and development institutions, including regional agencies and multilateral banks, and sovereign governments. Moreover, official creditors presumably operate with a longer time horizon and, therefore, can factor in the long term benefits that can be derived from this type of debt financing, especially in terms of reducing the risk of sovereign defaults. Finally, most, if not all, of these official creditors, also have an agenda for international development and may see in the adoption of GDP-linked lending a way of supporting global efforts to increase and improve the quality of development finance. Eventually, the adoption by official creditors around the world of GDP-indexation principles could even have a demonstration effect on financial markets, by demonstrating the macro- and debt stabilizing effects of this type of financial instruments.

Third, adopting GDP-indexation principles for debt with official creditors avoids dealing with some of the difficulties experienced in developing an effective market for GDP-linked securities, as discussed in section 2.2., while extending the benefits of GDP-indexation to an important proportion, in some cases the largest share, of developing countries' external financing needs. This is particularly the case as regards concerns over pricing, missing markets, liquidity, tradability, call-ability and complexity of GDP-linked type of securities, none of which apply to government-to-government (directly or through international and multilateral institutions) lending. Thus, official debt typically involves two sovereign states, or a sovereign country and an international financial public institution, in the case of multilateral lending. Therefore, it does not require the intermediation of financial markets, making the absence of markets in which to trade (and price) in GDP-linked securities irrelevant. In other words, the proposal made here involves changing approach – from a market based approach to a government-to-government solution – to essentially attain the same goal: extending GDP-indexation to developing countries' external debt financing.

3.2. Overview of official creditors' lending to developing countries

Public and publicly guaranteed (PPG) external debt with official creditors constitutes one of the main sources of finance for governments in developing countries around the world. This category includes loans with international organizations (i.e. multilateral loans) and loans with other national governments (i.e. bilateral loans). It comprises both concessional and non-concessional loans, the former being defined as loans that contain an original grant element of at least 25%. Developing countries are defined as countries categorized by the World Bank as Low Income and Middle Income countries, and include a total of 139 economies from around the world. Of these, the World Bank's International Debt Statistics (IDS) database, the main source of data for this study, reports regular statistics for 124 developing economies: 34 low income countries, 44 lower middle income economies and 46 upper middle income countries, many of which are generally considered as emerging market economies. In addition to this income-based country categorization, we report results for the Least Developed Countries (LDCs) UN country classification, which in addition to the income dimension, takes into account countries' economic vulnerabilities and levels of human development. The LDCs list includes a total of 43 countries, mainly low income economies, but also some lower middle income economies and one upper middle country: Angola.

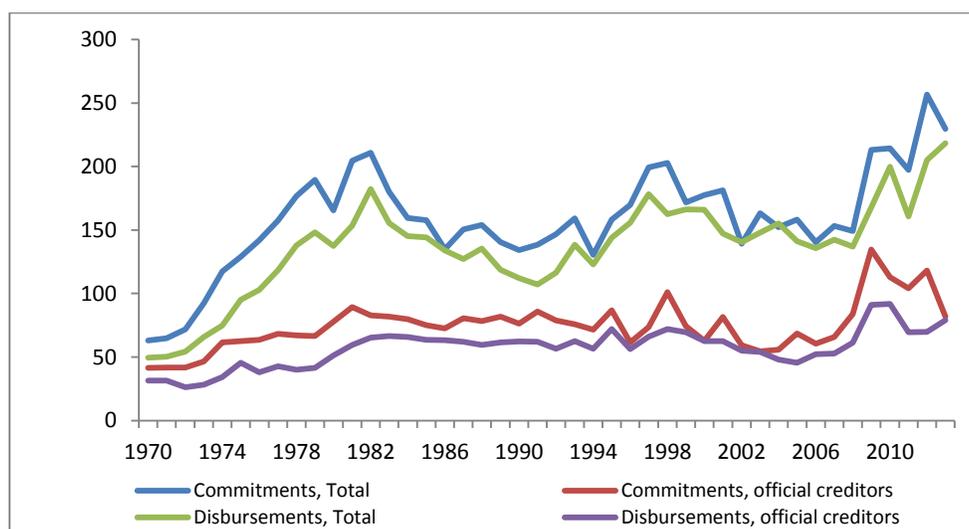
Figure 1: Stock of external PPG debt, 1970-2013 (constant 2005 US\$)



In 2013 the total value of stocks of public and publicly guaranteed (PPG) external debt with official creditors to this group of 124 developing countries amounted to US\$ 913 billion, up by 2.6% with respect to the figure reported in 2012, US\$ 891 billion, and an amount which has almost quadrupled in real terms since 1970 (See Figure 1). This follows a steady real increase in PPG external debt flows from official creditors since the early 1970s, with disbursements of this type of debt to developing countries increasing from an average of \$US 35.9 billion per year during the 1970s to \$US 66.1 billion per year over the last decade, from 2004 to 2013, reaching a historical peak of \$US 91.8 billion in 2010, measured in constant 2005 USD terms.

These upward historical trends, however, mask a large degree of variability in this type of financing over the past four decades, both in terms of stocks and flows, as can be observed in the trend-lines presented in Figures 1 and 2. A particularly striking feature is the very sharp decline in debt stocks of PPG external debt from official creditors experienced since the early 2000s: from a high of US\$ 857 billion in 2002, to the current figure of US\$ 683 billion, measured in constant 2005 US dollar terms. This decline is in line with the general decrease in total external debt stocks held by this group of 124 developing countries observed during this same period.

Figure 2: External PPG debt commitments and disbursements, (constant 2005 US\$)



The proportion of public debt stocks held with official creditors over total external debt for this group of 124 developing countries, which stood at 74.4% in 1970, has seen a steady decline over the past four decades. Yet, it still remains a major source of financing for these countries' governments. Thus, in 2013, total external debt from official creditors accounted for as much as 46.75% of their total PPG external debt stock. On the other hand, debt flows from official creditors, measured in terms of disbursements of official external debt, reached \$US 105.8 billion in 2013 measured in current US\$, accounting for 36.2% of total PPG external debt disbursements to this group of 124 developing countries that same year.

External debt financing from official creditors is an important source of financing for all developing country sub-groups, both in terms of debt stocks and debt flows, although its weight is particularly large for low income and lower middle income countries. For the first group of countries, external financing from official creditors accounted for up to 84% of total PPG external debt disbursements in 2013. For the group of lower middle income countries this share was somewhat smaller, yet still constituted the main source of external debt financing in 2013: 53.4%. Only for upper middle income countries does this share drop below the 50% mark, yet even for these economies external debt financing with official creditors provides a sizeable proportion of PPG debt financing: 24.2%.

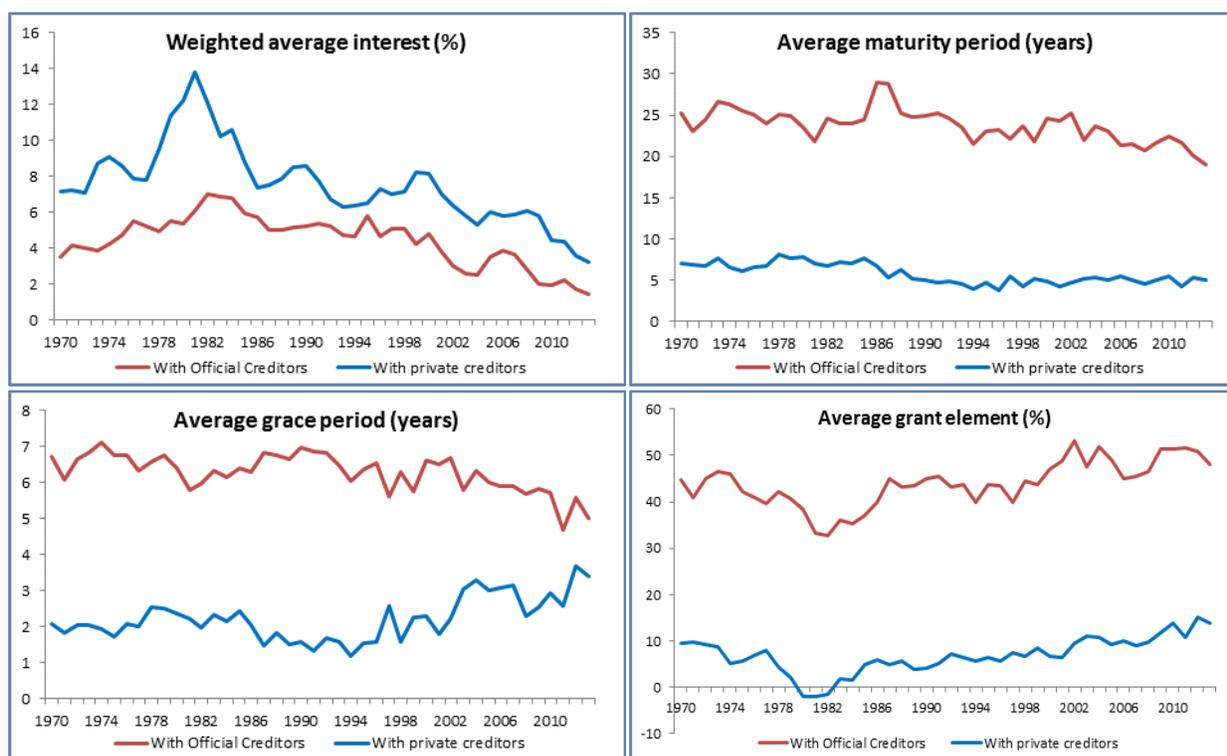
Table 1: External and Official Creditors PPG debt, 2013 (Billions of current US\$)

	LDCs	%	LICs	%	Lower MICs	%	Upper MICs	%	Total	%
PPG External debt stocks	194.6	100.0	120.3	100.0	629.1	100.0	1,206.8	100.0	1,956.2	100.0
PPG stocks, official creditors	150.2	77.2	112.0	93.1	417.9	66.4	384.6	31.9	914.5	46.7
Concessional	121.9	81.2	105.0	93.8	294.2	70.4	151.7	39.5	551.0	60.3
Non-Concessional	28.3	18.8	7.0	6.2	123.7	29.6	232.8	60.5	363.5	39.7
Bilateral	61.3	40.8	38.2	34.1	187.4	44.9	118.8	30.9	344.5	37.7
Bilateral concessional	47.9	78.2	35.8	93.8	171.9	91.7	96.4	81.1	304.1	88.3
Bilateral Non-concessional	13.35	21.8	2.35	6.2	15.57	8.3	22.46	18.9	40.4	11.7
Multilateral	89.0	59.2	73.8	65.9	230.5	55.1	265.7	69.1	570.0	62.3
IBRD	3.3	3.7	0.5	0.6	44.4	19.3	94.9	35.7	139.8	24.5
IDA	43.2	48.6	42.5	57.6	76.9	33.4	10.7	4.0	230.1	22.8
Other multilateral	42.4	47.7	30.9	41.8	109.2	47.4	160.1	60.3	300.2	52.7
Multilateral concessional	74.0	83.2	69.2	93.8	122.3	53.1	55.4	20.8	246.9	43.3
Multilateral concessional	14.9	16.8	4.6	6.2	108.1	46.9	210.4	79.2	323.1	56.7
PPG External debt commitments	39.0	100.0	22.41	100.0	94.1	100.0	190.6	100.0	307.1	100.0
PPG commitments, official creditors	23.0	58.8	17.6	78.5	53.4	56.8	38.6	20.2	109.6	35.7
PPG External debt disbursements	32.3	100.0	16.8	100.0	85.9	100.0	189.8	100.0	292.4	100.0
PPG disbursements, official creditors	18.7	57.8	14.1	84.0	45.9	53.4	45.9	24.2	105.9	36.2

Source: International Debt Statistics, World Bank, accessed March-April 2015

The weight of external debt financing with official creditors and the importance developing countries' governments attach to this type of financing should not come as a surprise. To start with, many low income and least developing countries simply don't have access to external debt financing from private creditors and, when they do, it typically comes with highly onerous conditions attached. More importantly, however, developing countries' PPG external debt with official creditors typically offers highly favorable conditions and often includes an important grant element, as is the case of concessional lending with official creditors (see Table 1). As can be seen in Figure 2, interest rates paid on external PPG debt with official creditors have historically been around 2-3 percentage points below those paid on external PPG debt with private creditors, while the average grant element share of official creditors PPG external debt has historically hovered around 40% to 50%. The average maturity period with official creditors is also significantly higher than for debt with private creditors, around 20 to 25 years, as opposed to 5 to 10 years for external debt with private creditors. A similar situation arises with respect to average grace periods on official external debt, which have historically stood at around 6 to 7 years – as opposed to an average grace period on external PPG debt with private creditors of only 2 to 3 years, although this gap in grace periods has narrowed significantly in recent years for middle income countries.

Figure 3: Key indicators for new external PPG debt commitments, 1970-2013



Historically, multilateral agencies have constituted the main source of official lending to governments in developing countries, accounting for US\$ 570 billion of the total stock of PPG loans with official creditors in 2013, equivalent to 62.3% of total public and publicly guaranteed external debt stocks held by this group of 124 developing countries (see Table 1). This is true for all income categories and country groupings. The World Bank, through its IBRD and IDA branches, accounts for almost half of this

multilateral debt stock, 24.5% the IBRD and 22.8% the IDA. The rest is provided by regional development banks (e.g. ADB, IADB, AfDB), other multilateral institutions and intergovernmental agencies.

Much of this debt stock is still in the form of concessional lending, 60.3% of the total in 2013, although the weight of concessional debt varies significantly across different income groups: 39.5% of total external PPG debt for upper middle income countries, 70.4% for lower middle income countries and 93.8% for low income economies. As can be seen in Table 1, the weight of concessional lending is significantly higher for bilateral official creditors, with this type of lending accounting for 88.3% of their debt portfolio with developing countries, as opposed to only 43.3% for the case of multilateral agencies. However, there is significant variability in the weight of multilateral concessional lending across different income country groupings.

Global stocks and flows of external PPG debt from official creditors have traditionally been concentrated in a small group of developing countries. For example, between 2009 and 2013 the top 10 recipients of external debt from official creditors accounted for up to 43% of total debt flows of this type going to developing countries, approximately US\$ 221 billion out of total of US\$ 513 billion worth of PPG external debt with official creditors. The composition of this group of main recipients of external debt with official creditors has remained relatively stable over the decades and has typically included countries such as Brazil, China, Egypt, India, Indonesia, Mexico and Turkey, as top recipients of this type of debt.

3.3. Debt with Official creditors and public finance in developing countries

For most developing countries, public and publicly guaranteed (PPG) external debt with official creditors provides a major source of development finance and, therefore, constitutes an important variable for macroeconomic policy management. A number of standard debt sustainability indicators serve to illustrate this point (see Table 2). Thus, as a whole, between 2009 and 2013, median debt stocks for this type of debt as a share of GDP and as a share of exports for this group of 124 developing countries averaged 17.62% and 53.92%, respectively. This share was somewhat higher for low income countries (22.85% and 103.8%) than for lower middle income countries (19.36% and 46.73%) and, especially, upper middle countries: 9.40% and 23.71% respectively.

Table 2: Average external debt with official creditors, 2009-2013 (Country grouping median values)

	LDCs	LICs	Lower MICs	Upper MICs	TOTAL
	21.6	22.8	19.3		17.
Debt stock / GNI (%)	1	5	6	9.40	62
Debt stock / Exports goods & Serv. (%)	110.18	103.80	46.7	23.7	53.
			3	1	92
					1.9
Disbursements / GDP (%)	2.05	1.84	2.24	1.66	9
Disbursements / Gov. Consumption (%)	15.6	15.4	15.4	10.5	13.
	7	1	2	1	09
Disbursements / GFCF ^a -Public (%)	26.8	24.7	45.1	20.9	28.
	9	4	9	8	01

Disbursement / Revenue (ex. Grants) (%)	14.47	14.35	10.94	6.10	9.73
					4.2
Disbursements / Imports (%)	6.23	5.57	5.28	3.75	2
	21.7	20.1	72.2		59.
Disbursement/ net ODA (%)	7	3	8	167.58	94
	58.6	66.0	55.1	34.0	51.
Disbursements / net FDI (%)	2	0	5	8	23
Disburs. / Personal remittances (%)	80.6	73.2	35.5	62.9	48.
	1	8	2	9	97
Disburs. per capita / GDP per capita (%)	53.7	48.1	68.3	97.2	58.
	6	3	1	5	93
					0.9
Debt Service / GNI (%)	0.69	0.61	1.14	1.06	9
					2.7
Debt Service / Exports (%)	2.87	2.72	3.05	2.07	2
Debt Service/ Revenue (ex. Grants) (%)	3.46	3.48	6.31	3.32	3.90
Debt Service per capita (current USD)	5.14	3.71	23.6	56.9	20.
			6	6	25

Source: World Bank World Development Indicators, accessed on 7th April 2015

a) Gross Fixed Capital Formation, public sector

In terms financing capacity, disbursement figures provide a useful measure of the extent to which PPG debt with official creditors contribute to developing countries governments' budgets. In this regard, median values of average disbursements of this type of debt to developing countries between 2009 and 2013 as a share of government consumption, government gross fixed capital formation and government revenue excluding grants stood, as a whole, at a sizeable 13.09%, 28.01% and 9.73% respectively, with these shares remaining relatively stable across different income groups: 15.41%, 24.74% and 14.35% for low income countries, 15.42%, 45.19% and 10.94% for lower middle income economies and 10.51, 20.98% and 6.10% for upper middle income countries. In other words, an important part of developing countries' consumption and investment financing needs is met through external debt with official creditors. This type of external debt also contributes to ease absorption capacity constraints in these countries in a significant way, with the average median share of PPG debt disbursements from official creditors as a proportion of imports reaching 4.22% between 2009 and 2013 for this group of developing countries, as a whole. Comparing PPG debt flows from official creditors with other sources of finance, provides an alternative measure of the importance of this type of finance in meeting developing countries' developing financing needs. Thus, between 2009 and 2013 the median value of these disbursements to developing countries was, as a whole, equivalent to 51.23% of total net FDI, 48.97% of personal remittances and 59.9% of net ODA flowing into these countries.

Debt service payments, meanwhile, serve to illustrate the extent to which PPG debt represents an important fiscal burden for developing country governments. In median terms, between 2009 and 2013 developing countries devoted an average of US\$ 20.25 per person to debt service payments to official creditors. This amount represented 0.99% of these countries' GNI, 2.72% of their annual exports of goods and services, and 3.90% of their governments' revenues, excluding grants, all measured in median terms. These shares remain relatively stable across the various income groups considered here, as can be seen in the figures reported in the bottom half of table 2, above. The exception perhaps is the average median share of debt service repayments to government revenues, which for lower middle income countries

stood at 6.31% between 2009 and 2013, almost twice as high as for the group of developing countries as a whole.

4. SIMULATING THE IMPACT OF GDP-LINKED OFFICIAL LENDING FOR DEVELOPMENT

Having reviewed the literature on GDP-linked debt in Section 2 and examined in detail in Section 3 patterns and trends of official debt to developing and emerging economies, this section presents the results of a simple simulation exercise in which interest payments on developing countries' debt with official creditors is indexed to their GDP performance. The purpose of this exercise is to illustrate the potential financial and economic impact of adopting GDP-linked debt instruments for developing countries' external debt with official creditors. This exercise also serves to identify a number of practical issues that would need to be taken into consideration in designing a GDP-linked debt package of this type, and proposes ways in which these issues could be addressed in an effective way so as to maximize the benefits that can be potentially derived from this type of lending.

4.1. Preliminary methodological considerations

The exercise undertaken in this section is based on a simple, backward-looking simulation using historical aggregate data on developing countries' external debt stocks and flows with official creditors. We use data for the 124 emerging economies and developing countries included in the World Bank's International Debt Statistics database, focusing on the 10 year period going from 2004 to 2013. Our simulations consists in comparing the evolution of real debt management and sustainability indicators during this period – the baseline scenario – with a simulated scenario in which this group of 124 countries instead adopt GDP indexation on their debt with official creditors throughout this period.

Sovereign debt analysis is usually framed in the literature along the lines of the following government budget constraint equation:

$$\frac{D_t}{Y_t} = \frac{(1+r)}{(1+g)} \times \frac{D_{t-1}}{Y_{t-1}} - \frac{S_t}{Y_t} \quad (1)$$

Where ' D_t ' is government debt, ' Y_t ' is output, S_t is the government's primary surplus, g_t is the growth rate, and ' r ' is the real interest rate. Essentially, this equation tells us that, other things equal, a country's sovereign debt position, measured in terms of its relation to GDP (i.e. D_t/Y_t), is driven by four factors:

1. Its debt position in the previous period, captured in this equation by ' D_{t-1} / Y_{t-1} ';
2. The country's GDP growth rate (g_t), which directly affects the value that the denominator in ' D_t / Y_t ' takes. In other words, other things equal, GDP growth reduces a country's debt-to-GDP ratio.
3. Interest rates, ' r ', applied on debt in period (t-1), i.e. the previous year. This captures the debt-refinancing component of debt dynamics and directly affects the numerator in D_t / Y_t . That is, interest payments on previous years' debt, unless financed through other sources (e.g. government revenue, grants), generates additional debt liabilities.

4. The government's primary surplus or primary fiscal balance, 'S_t'; That is, the difference between current government spending and current government revenue, net of government interest payments on its debt.

In other words, reductions (increases) in a country's sovereign debt-to-GDP ratios are either driven by an increase (reduction) in GDP growth, a reduction (increase) in interest rates or an increase (reduction) in the government's primary fiscal balance, or a combination thereof.

Ideally, within this framework, a debt analysis would involve some sort of dynamic structural modeling work within an economy wide framework. This would allow, among other things, to endogenise the dynamics of each of the variables included in the above equation and examine second-round effects. Under such a framework it would be possible, for instance, to model how government uses, during a recession, interest payment savings resulting from the adoption of GDP indexation (e.g. whether it increases spending or reduces its primary fiscal deficit) and to examine within this modeling framework how this affects debt sustainability dynamics.

Our simulation, however, takes a simpler, static approach and, therefore, obviates many of the above considerations. Essentially our simulation focuses only on the '*interest payment*' component of the above equation (i.e. the 'r'), comparing interest payment dynamics depending on whether we use actual implicit rates paid on debt or we use some form of GDP indexation of interest rates. The analysis therefore extracts how these different interest payment streams affect debt dynamics and, also, how other relevant variables interplay and affect these same debt dynamics. Essentially, our analysis is limited to a comparison between two different sets of interest payment streams:

1. One in which interest payments use a 'plain vanilla' type of rate, captured by the following expression:

$$\text{Interest Payments}_t = r_t \times D_{t-1} \quad t: 2003, 2002, \dots 2014 \quad (2)$$

Where 'r' is the plain vanilla type of interest rate, and 'D' is the principal.

2. The other, in which interest rates are indexed to GDP performance, and which can be summarized by the following expression:

$$\text{Interest Payments}_t = r_t \times D_{t-1} \times \text{GDP-Index}_{(t/t-1)} \quad t: 2003, 2002, \dots 2014 \quad (2)$$

The debt management framework captured in equation (1) does come into play in our analysis, but only indirectly and *ex-post*, when using some of these other variables to compare results coming out of our simulation. While this leads to limitations as to how our results can be interpreted, our simulations still generate useful findings that help illustrate the benefits and challenges of indexing developing countries' public and publicly guaranteed debt with official creditors to their GDP performance.

An additional caveat comes from how the data from the World Bank's International Debt Statistics database is used and transformed in our analysis. Typically, at any given point in time, a country's external debt with official creditors consists of a portfolio of loans with different interest rates, maturity and grace periods, and degrees of concessionality. Ideally, these differences should be factored in when

simulating interest payment streams. However, the World Bank's International Debt Statistics database does not provide disaggregated data at this level, and only reports on aggregate debt stocks, interest payment, amortization values and debt service figures, as well as average grant elements, maturity and grace periods. As a result, we have to work for our simulation with implicit (and average) interest rates, obtained by dividing interest payments in a given period by the value of the total debt stock in the previous period:

$$\text{Implicit Interest Rate}_t = \text{INT}_t / \text{DOD}_{t-1} \quad \text{Where INT: Interest paid and DOD: Debt Stock}$$

In our analysis we are therefore assuming that all debt payments have the same implicit interest, grant element, maturity and grace periods, which in reality is not the case. The only degree of debt-specificity captured in our simulations is between concessional and non-concessional external official PPG debt.

Similarly, the World Bank's International Debt Statistics database does not report on events and decisions that may affect the debt situation of a given country and that should, therefore, be taken into consideration. For example, there is no information on debt relief programmes in which developing countries may have participated during the simulation period, and which might have led to significant changes in their external debt position. Yet, these will have had a direct impact on the debt stock and interest payment figures reported by the World Bank, potentially leading to a biased estimation of the implicit interest rates computed for our simulation.

4.2. GDP-linked debt specification used in simulation

The simulations undertaken for this paper are based on a GDP-indexed debt specification informed by the issues discussed in section 2, including elements from Argentina's and Greece's 2005 and 2012 GDP-linked bonds issuances. In coming up with this specification we do not intend to define an 'ideal' GDP-linked debt specification. As discussed in Section 2 and in Section 4.4, different GDP-linked debt specifications capture different country-specific conditions and different contract negotiation settings. The approach taken here is to define a GDP-linked debt specification that, based on past experiences and following some simple allocation rules, generates reasonable results, in terms of aggregate interest payment outcomes for both debtors and creditors. The idea is to illustrate the benefits and challenges for developing countries derived from adopting GDP indexation of debt.

Our GDP-linked debt simulation involves two different sets of specifications, one for concessional debt, the other for non-concessional lending from official creditors to governments in developing countries. The idea behind this distinction is to allow for an additional degree of concessionality driven by GDP-linked debt dynamics. More specifically, our specifications are defined as follows:

1. The specification is based on indexing implicit interest rates to GDP performance in the following way:

$$\text{GDP-indexed Interest Rate}_t = \text{Implicit interest rate}_t + [\square \text{GDP}_t - \text{Average } \square \text{GDP}_{t, t-4}]$$

$$\text{if } \square \text{GDP}_t \leq 1.5 \times \text{Average } \square \text{GDP}_{t, t-4}$$

$$\text{GDP-indexed Interest Rate}_t = \text{Implicit interest rate}_t + [0.5 \times \text{Average } \square \text{GDP}_{t, t-4}]$$

$$\text{if } \square \text{GDP}_t > 1.5 \times \text{Average } \square \text{GDP}_{t,t-4}$$

This indexation of implicit interest rates works as follows: a Premium is added to the ‘*vanilla type*’ implicit interest rate for period ‘t’. This premium is equivalent to the difference between real GDP growth recorded that same period and the average real GDP growth of the previous four years. This second item is a standard measure of the underlying, potential, trend growth of an economy, used, among others, by the IMF. We impose a cap on this premium, so as to limit the amount of additional interest paid during periods of high growth. This cap limits this premium to a maximum of 0.5 times the average real GDP growth of the previous four years. This is a particularly important feature for developing countries, especially least developed economies, which often experience brief growth acceleration episodes. In this regard, under this GDP debt indexation scheme, countries are able to retain a larger share of the benefits accrued from such growth accelerations.

2. This GDP-indexed rate is paid only when the value of real GDP, measured in constant 2005 US\$ terms is above the value of real GDP in 2004, the starting year for our simulation. This condition allows us to impose a minimum threshold on interest payments that ensures that countries coming out of a recession, which typically experience sharp increases in GDP growth during the early stages of economic recovery, only start paying interest on their debt once real GDP levels have recovered and surpassed a certain reference value. This threshold seeks to stop debt repayments from derailing economic recovery efforts in countries coming out of a recession or other crisis.
3. As can be seen in the GDP-linked debt specification outlined above, this specification leads to GDP-indexed interest rates lower than the ‘*vanilla-type*’ rates whenever a country is growing at a rate below average real GDP growth of the previous four years. This clause could potentially lead to negative GDP-indexed interest rates in times of deep recession or contraction of economic activity. We allow this to happen (i.e. to have negative interest rates) only for concessional loans. For non-concessional debt, we impose an interest rate floor of zero percent. In other words, non-concessional GDP-indexed interest rates are zero-bound. For concessional lending, this condition would essentially entail not only reducing interest payments, but also amortization. This would amount to increasing the level of concessionality of this debt, and could be seen as a support measure to increase these countries’ fiscal space to implement expansionary fiscal policies during recessions. As most concessional debt goes to low income and least developed countries, it could be considered as a debt and recession-specific aid instrument.

4.3. Simulation results

Based on this methodology and contract specifications, we discuss the results of our simulation exercise on the adoption of GDP indexation for external public and publicly guaranteed (PPG) debt with official creditors, both concessional and non-concessional. Table 3 presents aggregate results for the full simulation period for key debt management and debt sustainability indicators, with a breakdown for different country groupings. Figures 4, 5, 6 and 7, on the other hand, present a visualization of the simulation results throughout the whole 2004-2013 simulation period.

As can be seen, on aggregate, the financial impact of adopting GDP indexation for external debt with official creditors under the contract design defined for our simulation is relatively small. Overall, total interest payments on this debt when adopting GDP debt indexation drop by US\$8.95 billion for the full simulation period, compared to the interest actually paid during this same period, representing a 4.92% decline. Percentage-wise this decrease is somewhat smaller when looking at debt service payments as a whole: 1.76%. By type of debt, interest on concessional lending experiences a higher drop than interest paid on non-concessional loans: 3.81% vis-à-vis 5.82%. This reflects the additional level of concessionality built into the contract specification defined for GDP-linked concessional debt, in which we have removed the zero-bound rule, allowing for negative interest payments, which eat into debt amortization during recessions.

By country grouping, the Least Developed Countries (LDCs), category would be the main beneficiaries from the adoption of GDP indexation into their external debt with official creditors, with total interest payments for this group dropping by as much as 25.17% for the full simulation period, while debt service payments would fall by 7.95%. The following main beneficiary would be low income countries, who would see interest payments drop by 9.23%, followed by upper middle income countries, whose interest payments would fall by 8.75% when adopting GDP indexation on their external official debt, compared to what they actually paid over the 2004-2013 simulation period. Lower middle income economies, on the other hand, would see total interest payments on their external debt with official creditors increase by 0.37% for their non-concessional loans with bilateral and multilateral creditors. It should be stressed, though, that these country grouping results vary significantly for individual countries.

Table 3: Basic simulation results – GDP linked external official debt vs. actual figures

	LDCs		LICs		Lower MICs		Upper MICs		Total	
	Actual	GDP-L	Actual	GDP-L	Actual	GDP-L	Actual	GDP-L	Real	GDP-L
Weighted Average Interest Rate (%)										
Concessional	0.95	0.57	0.91	0.78	1.73	1.77	2.34	2.18	1.73	1.68
Non Concessional	2.88	2.89	2.70	2.82	3.43	3.35	3.90	3.57	3.70	3.47
Correlation coefficients: GNI Growth vs.										
Debt service/GNI	-0.04	0.28	-0.36	-0.26	0.36	0.37	0.67	0.81	0.51	0.62
Debt Serv/GovRev ^a	0.30	0.40	0.13	0.29	0.48	0.54	0.67	0.82	0.50	0.73
Total Interest paid on debt (Bn US\$)										
Concessional	9.61	5.88	7.89	6.88	45.51	46.40	28.15	25.17	81.55	78.44
Non	5.27	5.26	2.05	2.15	31.55	30.94	66.87	61.54	100.4	94.62

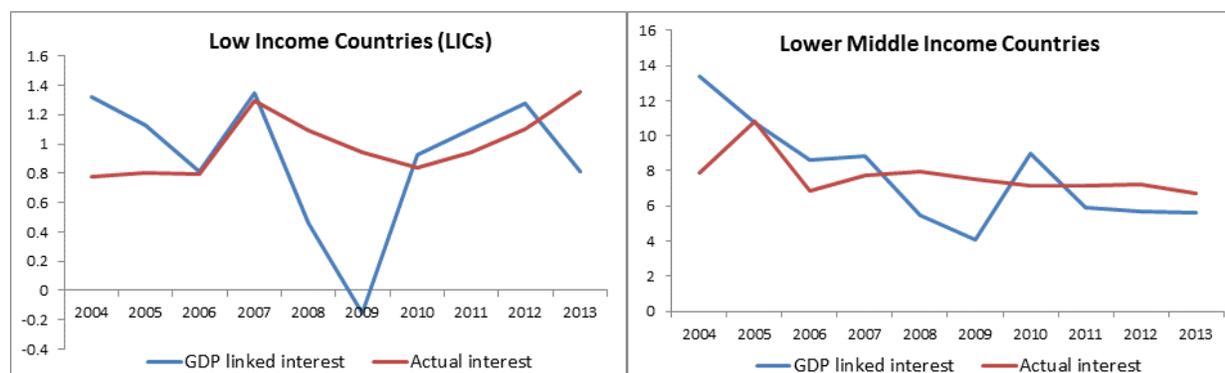
Concessional										6
Total Debt Service paid on debt (Bn US\$)										
Concessional	32.94	28.41	25.49	23.68	165.8	164.8	113.3	110.1	304.6	298.6
Non-Concessional	24.17	24.16	5.80	5.90	129.6	128.6	282.1	276.3	417.6	410.9
					1	3	6	1	6	2
					6	5	5	9	1	3

Source: World Bank, World Development Indicators, International Debt Statistics. a) GovRev: Government revenue excluding grants

It is important to highlight that the simulation figures reported here are contract-specific and that, for the most part, these contracts would be defined on a case-by-case basis for specific debtor countries. It is possible, in this sense, to design, *ex ante*, GDP-linked debt contracts that yield different interest and debt service payment outcomes and that still partly preserve the debt management and debt sustainability benefits for developing and emerging economies. For instance, results from the early research indicate that reintroducing the zero-bound rule on concessional lending – so that GDP indexation cannot drive interest rates on concessional debt below zero – would result in a drop in total interest payments on GDP-linked debt over the 2003-2014 simulation period of US\$ 4.45 billion, equivalent to a 1.93% fall vis-à-vis actual interest payments by these countries between 2004 and 2013. This is almost half the simulation figures reported in Table 3 in which this zero-bound rule for interest payments is dropped for concessional debt.

In any case, it would be possible to design alternative *ex-post* contractual mechanisms to deal with the ‘interest payments gaps’, both positive and negative, while at the same time preserving the full debt management and debt sustainability benefits from adopting GDP indexation on external PPG debt. These are briefly discussed below.

Figure 4: Interest paid on external debt with official creditors, Actual vs. GDP-linked (US\$ Billion)



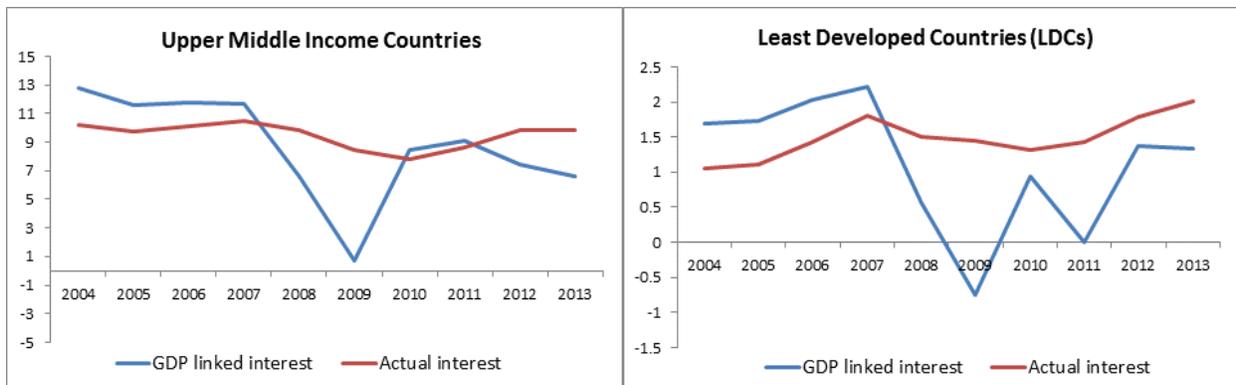
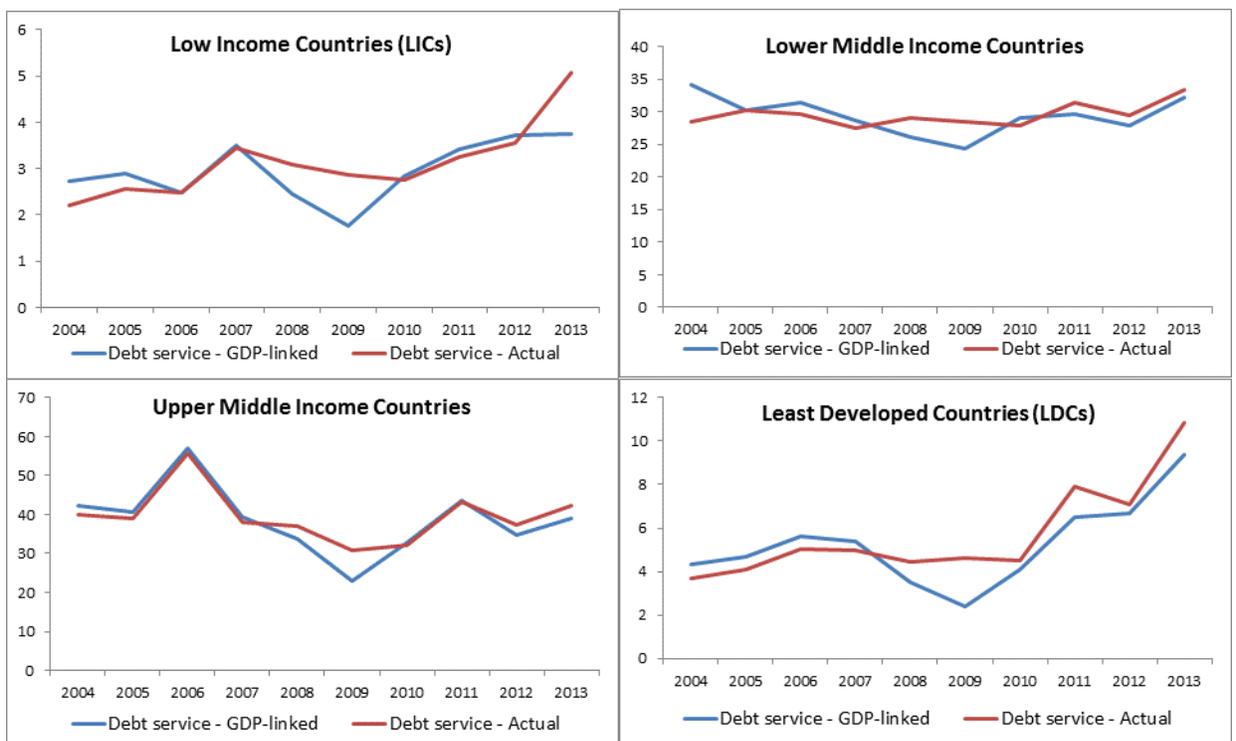


Figure 5: Debt Service paid on external debt with official creditors, Actual vs. GDP-linked (US\$ Billion)

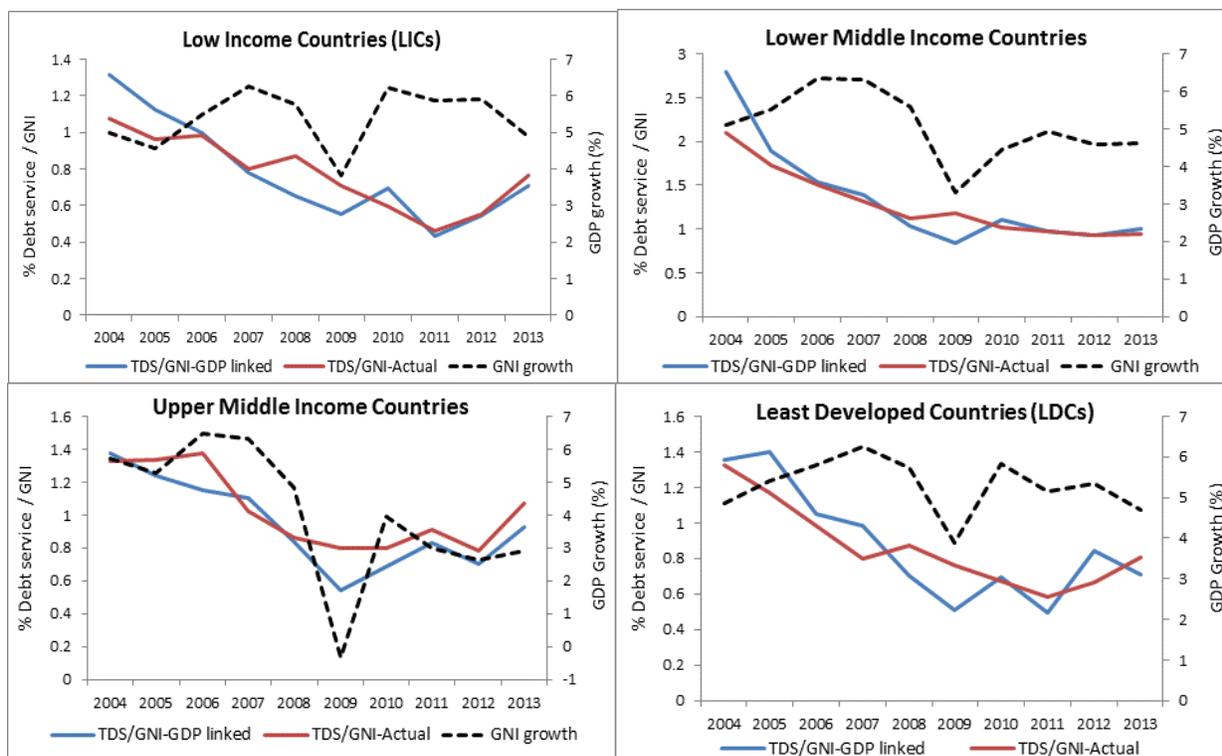


Perhaps more important from a debt management and debt sustainability perspective is to examine these simulation results from the point of view of the impact that adopting GDP indexation has on developing countries' ability to pay back their debt and to adopt countercyclical macroeconomic policies. The correlation coefficients reported in Table 3 help illustrate this. Thus, the correlation coefficient between GNI growth and developing countries' total debt service-to-GNI ratios over the 2004-2013 simulation period increases as a whole from 0.51 to 0.62, when adopting GDP-linked borrowing on debt with official creditors.¹⁶ In other words, by adopting this type of borrowing, developing countries' debt service-to-GNI

¹⁶ These correlations are based on median GNI growth and Debt-service-to-GNI ratios for each of the country groupings considered in our analysis.

ratios move more closely to the evolution of their gross national income, which would imply an improvement in their ability to pay back their debt. As can be observed in the correlation coefficients reported in Table 3, these gains are greatest for least developed countries, followed by upper middle income countries, low income countries and lower middle income countries, for which these gains are only marginal.

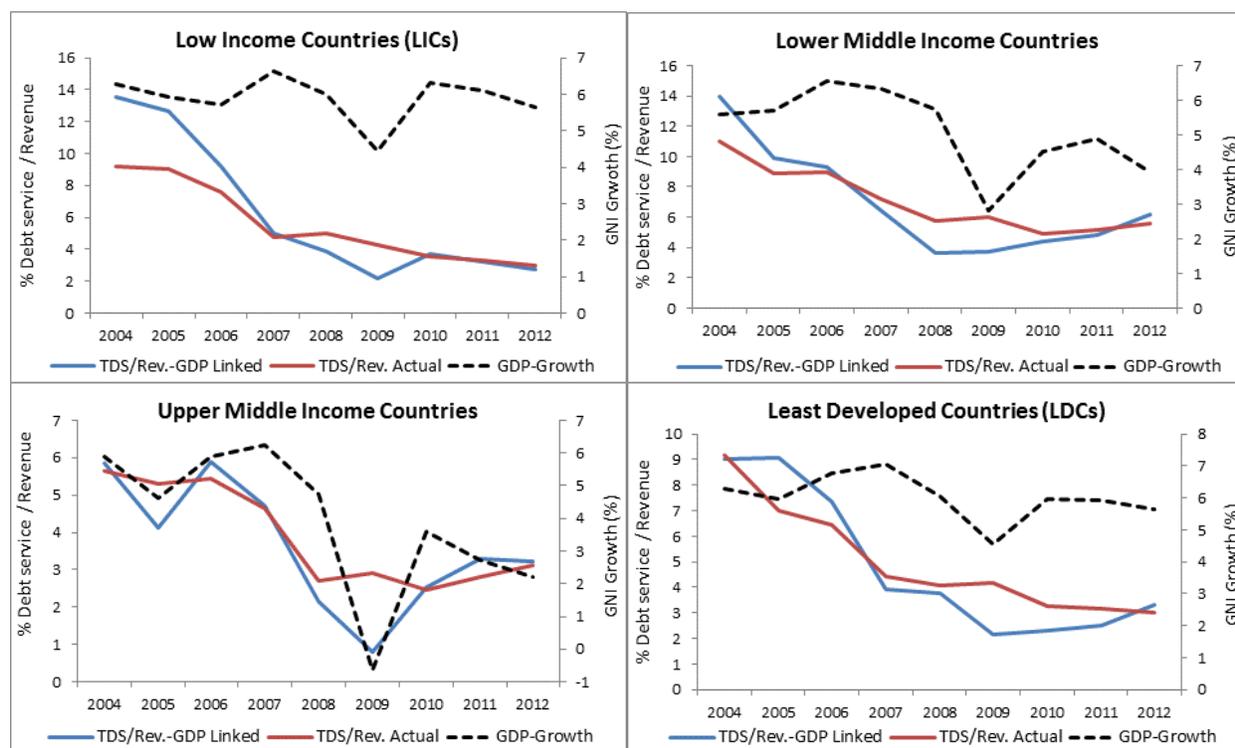
Figure 6: Total Debt Service (TDS) to Official Creditors to GNI, Actual vs. GDP-linked, and real GNI Growth



The graphs presented in Figure 6 help visualize better these results on the potential ‘ability to pay’ gains derived from adopting GDP indexation on external PPG debt. Thus, actual median debt-service-to-GNI ratios between 2003 and 2014 on official PPG debt for this group of countries (captured by the red solid line) has remained insensitive to changes in these countries’ median GNI growth throughout this same period, as captured by the black dotted line. This can best be seen for the 2008-2010 sub-period, when all of these countries experienced a sharp decline in GNI growth, as a result of the global financial crisis. For this sub-period, the evolution of these countries’ debt-service-to-GNI ratios was either unaffected, as was the case of low income countries (LICs) and least developed countries, or even experienced a slight increase, particularly notable for the group of Lower Middle Income Countries, meaning that their debt service burden increased during this period of economic recession. However, median debt-service-to-GNI ratios (blue, solid line) evolve more closely to median GNI growth rates when simulating the adoption of GDP-linked official external debt, co-movement which is particularly pronounced for the 2008-2010 sub-period.

Similar results are obtained when examining the impact of adopting GDP indexation on official PPG debt on government finance and, therefore, on the constraints imposed by external debt management on the possibility of adopting counter-cyclical fiscal policies. Thus, as reported in Table 3, the correlation coefficients between median GNI growth rates and median 'Debt Service-to-Government Revenue'¹⁷ ratios, which can be seen as a measure of the amount of revenue governments need to pay back their debt, also increases and in this case in a greater measure: from a correlation coefficient of 0.50 actually observed between 2003 and 2012 to a correlation coefficient of 0.73, when simulating the adoption of GDP indexation on external official debt during this same period.¹⁸ In other words, with GDP-linked debt, debt service-to-Government Revenue ratios evolve more closely to GNI growth rates. For instance, when GNI growth drops, this ratio falls in a greater measure when adopting GDP indexation, meaning that, other things equal, governments have to set aside a smaller amount of revenue to service their external official debt, 'surplus revenue' that could be devoted to countercyclical public expenditure policies.

Figure 7: Total Debt Service (TDS) to Official Creditors-to-Gov. Revenue excluding Grants and real GNI Growth



These results can be better visualized in the graphs reported in Figure 7. As can be seen, the co-movement over the 2003-2012 period between median GNI growth rates (black dotted line) is much stronger for median Debt Service-to-Government Revenue ratios when external official debt is indexed to

¹⁷ Government revenue figures exclude grants.

¹⁸ The simulation time period taken for this indicator is 2004-2012, and not 2004-2012 as in the rest of the analysis. This owes to the fact that the World Development Indicators database of the World Bank only reports 2013 government revenue figures for a very small number of countries.

GDP performance (blue solid line) than when it is not. In fact, during the 2008-2010 sub-period, at the height of the global financial crisis, we observe that real median Debt Service-to-Government Revenue ratios actually increased for all country groups reported in Figure 7, suggesting that, on average, debt service payments during this time reduced these governments' fiscal space to adopt countercyclical, expansionary fiscal policies. This is not necessarily because these countries had to make higher debt service payments during this time (as can be seen in Figure 5, above, debt service payments remained relatively stable during this period, and in some cases dropped), but most likely because the slowdown experienced in GNI growth led to a decline of these countries' revenues. As a reference, in 2009, at the height of the global financial crisis, the median share of government revenue going to debt service payments on official external debt for the group of 124 developing and emerging economies reached 4.72%. Our estimates is that adopting a GDP-indexation debt contract design would have brought down this proportion to 2.10% of government revenue.

4.4. Addressing GDP-linked 'interest payment gaps'

One of the main challenges arising with the indexation of external debt to GDP performance is that it is likely to lead to differences in the amount paid on interest compared to interest payments derived from non-indexed debt. These 'interest payment gaps', which could be positive or negative, and the uncertainty that surrounds them, can act as an important disincentive, for both debtors and creditors to adopt GDP-linked debt instruments— even if for private creditors there could be an incentive to buy GDP-linked bonds with an expectation of an upside in good times. Thus, debtor governments will fear underestimating the long term growth potential of their economies and, therefore, fear paying a higher interest on their debt. Creditors, on the other hand, may prefer to assume the higher risk (and associate costs) of debt default attached to plain vanilla bonds, or *ex-post* debt crisis resolution contractual arrangements, such as collective action clauses (CACs) or sovereign contingent convertible bonds (CoCos).

Our simulation results suggest there are grounds for such concerns. As a whole, the figures in Table 3 indicate that the total 'interest payment gap' in our simulation would amount to US\$ 8.95 billion in favour of debtor countries. That is, debtor countries would pay US\$ 8.95 billion less in interest by indexing their external official debt to their GDP performance. However, even in this generally favourable scenario for debtor countries, the total interest bill paid by lower middle-income economies to its official creditors would have increased by an estimated US\$ 282 million over the simulation period. In fact, when looking at country specific cases in our simulation there are some very large variations in the cost/gains that creditors/debtors derive from our GDP-linked contract specification. These range from the 760% savings over the 2004-2013 period that Zimbabwe would make from having all of its external debt with official creditors indexed to GDP performance (it would go from having paid US\$ 88.7 billion in interest during this time, to receiving an interest payment rebate of US\$ 593 million), to the estimated 141.2% increase in its interest payment bill that Guinea Bissau would have experienced had it indexed its external PPG debt with official creditors to its GDP performance (Guinea Bissau paid US\$ 22.1 million in interest on its

external official debt between 2004 and 2012, an amount that in our simulation increases to \$US 53.4 million with GDP debt indexation).

Partly, these variations arise from the approach taken in our simulation, in which we have applied the same GDP debt-indexation framework for all countries under analysis. In practice these variations and related interest payment gaps could be minimized by adopting country-specific debt contract designs that capture in a more precise way the socioeconomic conditions faced by a specific country or reflect better the bargaining/contract negotiation power of debtors and creditors. This could be done by using different or additional caps, thresholds, ceilings and trigger clauses to those defined for our simulation. As a simulation exercise, it would even be possible to design, *ex-post*, a GDP-linked debt contract that was neutral, in terms of its impact on overall interest payments. However, these contractual adjustments would most likely come at the cost of reducing the debt management and debt sustainability benefits of GDP indexation of debt, as in most cases they would involve limiting the extent to which interest payments on external official debt adjust to changes in economic performance, as captured by a country's GDP growth.

Alternatively, if this is a concern, it is possible to think of contractual arrangements that could help address and even eliminate these interest payment gaps *ex post*. These are particularly applicable to the case of debt with official creditors, where there are a limited number of parties involved and, therefore, it might be simpler to agree on mutually beneficial long term arrangements that help address this issue of interest payment gaps. They would involve recognizing, *ex ante*, the possibility of interest payment gaps and agreeing on interest payment rescheduling arrangements to pay off (or recover) differences between interest payments paid on GDP-linked debt and those that would have been generated through non-indexed debt.

For instance, debtor countries could contractually agree that, in the event that interest payments generated on GDP-linked debt were below those arising from non-indexed debt, these differences would be settled and paid off at a later stage, for instance, by increasing the maturity period of this debt. This would ensure that official creditors received an interest payment equivalent to that they would obtain from non-indexed debt, while preserving the full debt management benefits of GDP indexation, in terms of adjusting interest payments to a country's ability to pay and creating greater fiscal space to pursue countercyclical fiscal policies. Creditors, on the other hand, could contractually agree to return excess interest payment charges to debtor countries. This could be done, as a one off payment, at maturity and could even generate its own interest. It could also be paid in part or in full throughout the maturity period, for instance, in support of countercyclical expansionary fiscal policies during economic recessions. Exceptions could be built in an asymmetric way for specific groups of countries or specific circumstances. For example, creditors could levy the obligation of full interest repayment for least developed countries, while ensuring they got back any excess interest payments, in what would amount to an additional degree of concessionality on their debt with official creditors. Alternatively, both parties could mutually agree to take a bet on the GDP indexation of this debt and introduce none of these clauses.

All of these arrangements could help deal, ex ante, with interest payment gaps in a clear and transparent way, reducing the disincentives that GDP debt indexation might generate for both creditors and debtors. At the same time, they would help retain the full debt management and debt sustainability benefits.

5. CONCLUDING COMMENTS AND SUMMARY OF KEY FINDINGS

External debt management constitutes one of the main tasks that governments around the world have to contend. It is also a challenging one for many developing countries. In a context where domestic financial resources are scarce, accessing international finance, private or public, is critical to fund countries' development efforts. Yet, managing international financial flows can be a challenging job. External shocks, to which developing countries are often exposed, can easily undermine developing countries' ability to pay back their debt and can lead to costly sovereign debt defaults. Debt obligations, on the other hand, have a strong pro-cyclical component: they are easier to meet during times of economic growth, when government revenues typically increase, while becoming relatively more onerous to service during recessions and economic slowdowns, making it harder for governments to pursue countercyclical fiscal policies seeking to smooth economic cycles.

Against this background, this paper has considered how indexing developing countries' external public and publicly guaranteed (PPG) debt with official creditors to their GDP performance could work. This follows a well-established line of academic and policy research, which has mainly focused on the indexation to GDP of sovereign bonds floated in international financial markets. While the idea behind GDP-linked bonds has generated significant interest in academic and policy circles, its practical application has been limited, with only a few countries opting for this type of debt financing instrument, mainly as part of debt restructuring programmes. This lack of practical experiences with GDP indexed debt owes to a number of factors: the absence of markets on which to trade (and price) this type of securities, and associated first-movers costs; the challenges posed by GDP measurement and (under)reporting; the moral hazard problems that could potentially emerge in the form of incentives to economic underperformance; the political difficulties faced by governments in developing countries when justifying paying higher interest rates during periods of high growth; and, ultimately, the uncertainties surrounding the final payouts for debtors and creditors arising from a debt financing modality in which future interest payment streams are partly determined by countries' future economic performance, a variable which for the most part is an unknown.

However, many of these problems are not applicable to external debt with official creditors. Thus, this type of financing does not involve nor require the intermediation of financial markets, making the absence of markets in which to trade in GDP-linked securities irrelevant. It also involves a much smaller number of participants, typically the governments of debtor and creditor countries, as well as multilateral lending institutions. This makes it easier to come up with contractual arrangements that provide a clear picture of

future payment streams, while preserving the debt management benefits of GDP debt indexation. For instance, official creditors can agree to pay back 'excess' interest payments to debtor countries for which GDP-linked debt leads to higher interest rates, and to do so when more convenient from a debt and macroeconomic management perspective. Likewise, debtor countries for which such debt schemes results in interest savings can agree to pay the full vanilla-equivalent interest over a longer period of time. In this sense, focusing on external debt with official creditors may offer the best change of extending the principles (and benefits) of GDP debt-indexation and could even have a demonstration effect over financial markets,

Focusing on external debt with official creditors could also make an important difference to developing countries. External debt with official creditors constitutes a key source of government finance in many developing countries, accounting, on average, for 36.2% of total public and publicly guaranteed external debt disbursements in developing countries as a whole in 2013: 24.2% in upper middle income economies, 53.4% in lower middle income countries, and as much as 84% in low income economies. It is also important in general development finance terms, with official external debt disbursements to developing countries in 2013 being equivalent to 59.9% of net ODA disbursements and 51.23% of net FDI inflows into these same countries. Debt service payments on official debt, on the other hand, take up a considerable share of government revenue: an average median percentage of 3.9% between 2009 and 2013 for developing countries as a whole, percentage which increases to a high of 6.31% for lower middle income countries.

The simulation exercise undertaken for this paper serves to illustrate the potential debt management benefits that could be derived from indexing external PPG debt to these countries' GDP performance. Our simulation results suggest that indexing external official debt GDP growth could increase the median correlation between debt service payments and GNI by 22%, and by as much as 43% between debt service payments and government revenue trends. Other things equal, this would result in a significant improvement in developing countries' ability to pay back their debt and to implement counter-cyclical fiscal policies. Just as an example, in 2009, at the height of the global financial crisis, developing countries would have seen debt service payments on official external debt as a share of government revenue drop from 4.72% to an estimated 2.10% under our backward-looking simulation exercise, providing for greater fiscal space to implement counter-cyclical policies.

Our analysis of GDP indexation of debt with official creditors comes as policy actors around the world – governments, civil society organizations, private sector associations, etc. – are working out the details of the new Post-2015 International Development Agenda that will replace the MDG framework from 2016 onwards. An important part of these discussions revolve around how to ensure that financial resources, both public and private, are available for sustainable human development, and are supportive of the transformational agenda the Post 2015 process is advocating.

Adopting GDP indexation of debt can go a long way in improving the financial outlook faced by developing countries around the world, by improving debt management and debt sustainability outcomes. It can also help governments pursue policies that promote more balanced and sustainable growth paths. Focusing on GDP indexation of external public debt with official creditors perhaps provides the most effective route of achieving this. All that is required to make this happen is for governments in both debtor and creditor countries to take action.

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