

International debt restructuring frameworks and official creditor diversification.

Empirical and theoretical insights on the
new role of official lending in the XXIst century

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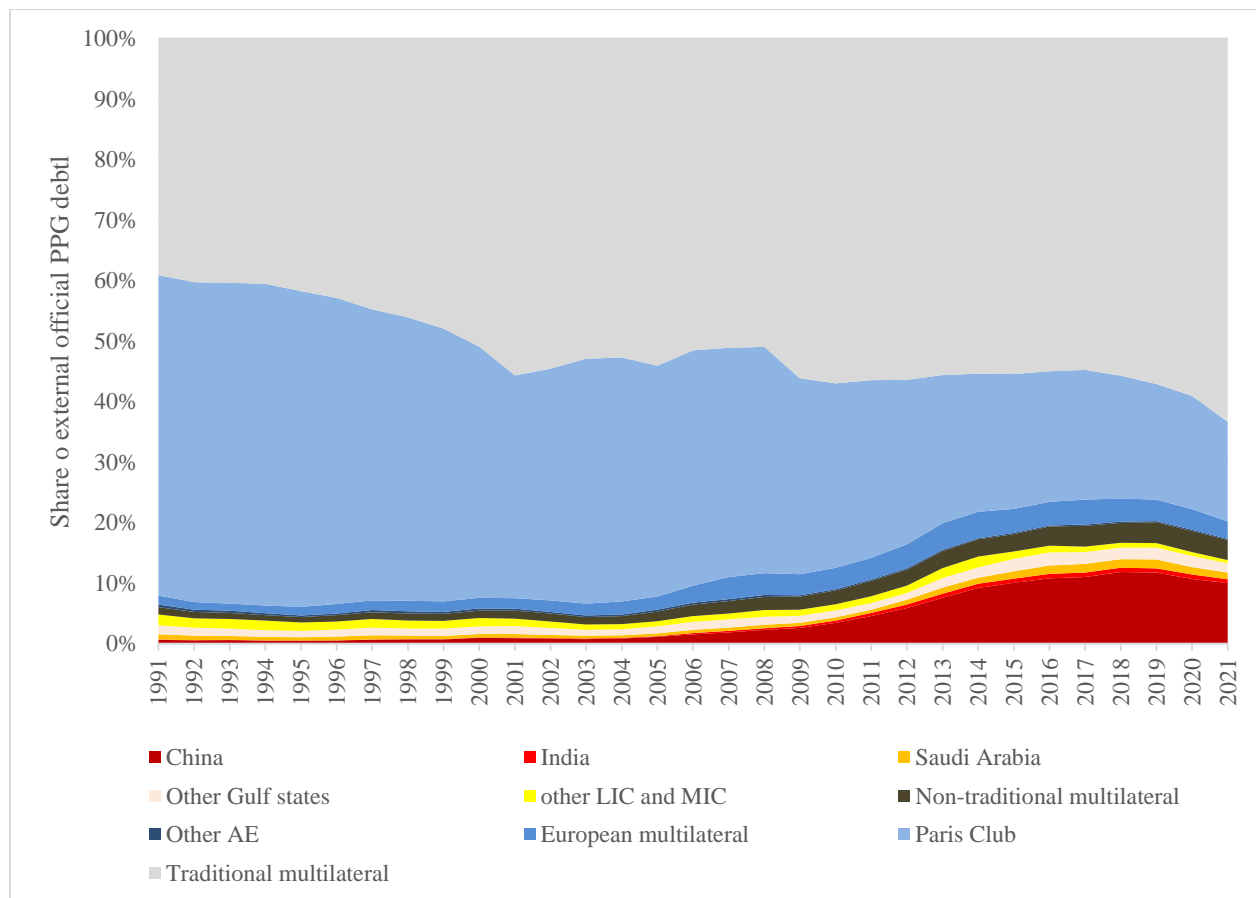
1. Introduction

Sovereign debt workouts are undergoing constant evolutions due to changes in the international economic environment, in creditor composition or in credit instruments. Since the 1990s, sovereign debt has in particular grown much more complex than it was when the main creditors of developing countries were almost exclusively multilateral institutions of the United Nations (UN) or Western governments and banks.

In this paper, I chose to focus on the diversification of the official creditors of developing countries as a factor of debt complexification and thus of change in sovereign debt treatments. Official creditors are comprised of multilateral institutions and sovereign governments.

This change in the official creditor base has most strongly unwound during the last sovereign lending boom, in the aftermath of the *Heavily Indebted Poor Countries* Initiative (HIPC) and the global financial crisis. Figure 1 shows that the share of official debt owed to lenders other than the founding members of the Paris Club (PC), UN or European institutions has increased from below 6.5% in 1991-2005 to 20.2% in 2019.

Fig 1: Relative shares of external PPG official debt by creditor



Note: See section 4.a and table A.1 for the classification of official creditors and a discussion of the data.

Concerns over the new structure of the official creditor base were already rising before the pandemic: the public and publicly guaranteed (PPG) external debt of low-income countries reached its pre-HIPC levels in 2017, while the debt of low and middle-income countries has doubled over 2010-2022 to 2 500 billion current dollars (World Bank, 2023). The Covid-19 crisis and its aftermath have however triggered what now seems to be a new systemic international debt crisis; with over half of the 73 countries eligible to concessional IMF-lending at high risk of or in debt distress as of January 2023 (IFAD, 2023).

Attempts to face the first symptoms of this crisis amid the pandemic with the *Debt Service Suspension Initiative* (DSSI) in 2020 and 2021 have revealed the extent of the deterioration in inter-official-creditor coordination. 33 of the 73 countries eligible to the DSSI did not join it, and the G20's efforts towards a *Common Framework for debt treatments* have been met by much skepticism. The Paris Club's chair Emmanuel Moulin made these difficulties clear in December 2021 by declaring that "some countries have decided not to apply for the final [DSSI] extension as they didn't want to create difficulties with China" (Wheatley, 2021). Similar concerns were raised about the fear by borrowers of the effect of debt renegotiations on credit ratings (Hagan, 2020). It constitutes the core of the problem this paper aims to tackle, by answering *how the recent diversification of the official sovereign creditor base affects the incentive structure towards defaults and restructurings*.

The starting point is that the creditor composition is not neutral, especially in the absence of a legal restructuring framework. Using the theoretical and empirical literature on sovereign debt, this paper argues that the diversification of official creditors is changing the restructuring characteristics of official debt. This has two main implications. First, it can lead to debt buildups for countries with a diversified official creditor base due to lower incentives to restructure or default. Secondly, it induces a change in the role that official debt plays in the debt mix. By using data on official debt detailed by counterpart and aggregated in different creditor groups, this paper's empirical investigation confirms that official creditor diversification has been associated with debt buildups in 2010-2021, and that it can explain differences in debt levels between countries. Empirical findings on the effect of creditor diversification on restructurings are more nuanced. I show that it is in average associated with higher risks of debt distress but also with higher participation rates to the DSSI's restructurings.

By focusing on official debt, this paper aims to contribute to the current research effort on the topic. It first exploits the existing theoretical literature on restructurings and default to deduce original implications for multilateral and bilateral debt. It also extends the ongoing empirical research on official debt by focusing not only on Chinese lending, but on all new official creditors. This approach is even more necessary now that the Chinese lending boom seems to be over (Horn, Reinhard and Trebesch, 2022) and that lenders such as India, Kuwait, Saudi Arabia as well as regional multilateral institutions are rising in the creditor landscape. It uses IMF sovereign risk ratings - which are widely used in policy

reports but much less in academic research - and exploits insights on restructuring incentives from the DSSI as a natural experiment.

The remainder of the paper is structured as follows: Section 2 reviews the existent literature and its insights for the role of official lending. Section 3 applies the lessons from section 2 to the context of the diversification of official lenders and provides a hypothesis. Section 4 tests this hypothesis and discusses policy implications as well as insights for future research. Section 5 offers concluding remarks.

2. The role of official debt: insights from the theoretical and empirical literature

2.a What makes official lending different?

Research on sovereign debt has mostly ignored official debt in its effort to model the behavior of sovereign lenders. In this section, I however argue that many lessons from existing models can be applied to official debt.

Theoretical research has been centered around attempts to solve the paradox of the existence of sovereign debt in absence of a legal enforcement mechanism. In their seminal paper, Eaton and Gersovitz (1981) set up a model in which borrowing by sovereign lenders is possible even in the absence of explicit penalties for non-payment. Default is considered as a strategic move by the borrower given uncertain future income. Anticipating this behavior, lenders apply a debt ceiling to ensure full repayment.

This has become the mainstream approach for models of sovereign borrowing, with the academic debate focusing on the nature of the incentives to default and the effect of different creditor types and credit instruments. Arellano (2008) provides an important extension of this framework by showing that default in equilibrium is possible under an in-complete asset structure, thus analyzing sovereign default as an equilibrium choice.

Limited commitment hence appears to be the structuring factor of sovereign borrowing. Aguiar and Amador (2013) argue that it prevents sovereigns from fully pledging future income to debt repayments. Pitchford and Wright (2012) in turn emphasize that the lack of commitment to equally repay all creditors makes strategic holdout by creditors an optimal strategy, resulting in delays in restructurings.

This is central to the analysis of bilateral debt, precisely because it is easier to restructure thanks to the coordination inside the Paris Club. This is mostly the case since the PC has adopted a “relief provision”

rather than a “debt collection” approach as of the HIPC initiative (Cheng and Erce, 2017, p.14). In that sense, bilateral debt differs by its lower restructuring costs, contrasting with the increasing enforceability of private debt contracts (Schumacher, Trebesch and Enderlein, 2021). Schlegl, Trebesch and Wright (2021) show econometrically that bilateral creditors are junior to bondholders and multilateral creditors since the early 1990s, as they are subject to more arrears and grant higher haircuts in restructurings. This higher propensity of sovereigns to accumulate arrears and default on bilateral creditors effectively hints towards the fact that bilateral debt is easier to restructure. Central to this coordination inside the PC is the *pari passu* clause, which prevents all sovereign borrowers that benefit from debt relief by the PC to seek comparable agreements with other creditors.

Through this mechanism, PC debt also plays the role of a catalyzer of restructurings with other creditors, in a similar way to the IMF¹. The typical restructuring process indeed starts with an IMF support and adjustment program, followed by a PC agreement on the basis of the IMF’s assessment, and finally by a restructuring with private creditors (Brown and Bulman, 2006; Hagan, 2020). Because restructuring conditions of official debt can extend to private creditors through *pari passu* treatments, and because adjustment programs may increase debt sustainability, it can be argued that the catalyzing effect of IMF and PC lending can help solving creditor coordination problems (Morris and Shin, 2006).

This does not imply that restructuring bilateral and multilateral debt is overall less costly: official restructurings often contain adjustment programs that can entail a political and economic cost (Hatchondo and Martinez, 2010). Such political economy concerns are however beyond the scope of this paper.

2.b The role of official debt in the debt mix

To understand the role official debt plays in the debt mix, I turn to the theoretical literature on sovereign debt under heterogeneous creditors, which primarily distinguishes creditors according to their restructuring costs.

This approach to creditor heterogeneity can be traced back to the corporate debt literature, in particular to a paper by Bolton and Scharfstein (1996). In their model, highly solvent firms under incomplete contracts optimally chose to take on difficult-to-restructure debts by borrowing from several creditors to make strategic default less attractive. Bolton and Jeanne (2009) in turn provide a theoretical model of sovereign borrowing that captures how restructuring characteristics affect incentives to default.

¹ The IMF does not usually do so by restructuring its own debt, but rather by providing the framework for future renegotiations (Hagan, 2020).

Sovereigns can issue either difficult, or easy-to-restructure debt. The former is *de facto* senior to the latter as borrowers decide to partially default only on the debt that is easy to renegotiate in certain states.

Therefore, issuing difficult-to-restructure-debt is a way for sovereigns to pledge to repay their debts and thus counter their problem of limited commitment. This mechanism however leads to debt stocks that are overly difficult to restructure, resulting in welfare losses when default cannot be avoided. It indicates that in absence of a bankruptcy regime, the extent of coordination between official creditors and with other creditors determines whether official debt plays the role of a hedge against default or of an option for an easy restructuring when default is inevitable.

Dellas and Niepelt (2016) provide a sovereign default model with both official and private debt. In their paper, official creditors are however assumed to have a higher enforcement power, i.e. official debt is more difficult-to-restructure. This is because the model is mainly based on the 2012 Greek crisis. Official creditors are implicitly the IMF – which enjoys preferred creditor status (Ams et al., 2020; Schlegl, Trebesch and Wright, 2021) – and Eurozone members whose threat of a Greek exit from the European Monetary Union grants them high leverage. This typically is not the case of countries that are not part of the same monetary union as their creditors. In such a setup, Dellas and Niepelt however show that official debt provides borrowers with more credibility to repay, hence lowering their borrowing costs and constraints at the expense of less flexibility in the future.

Thus, I have established that each creditor type can be characterized by its *ex post* enforcement power, which determines incentives for sovereign borrowers to default and restructure. In such a context, official debt distinguishes itself by two aspects. First, it is restructured differently than private debt. Secondly, it has a catalyzing effect on restructurings of the whole debt stock because of the implicit time-structure of sovereign debt renegotiations and of *pari passu* clauses. It is however important to keep in mind that official debt is not a uniform creditor category, as the IMF for instance stands out as a senior and difficult-to-restructure-on creditor.

3. Implications for the effect of the diversification of official creditors

It is now central to define which official debts this analysis focuses on. As seen in section 2.b, IMF debt follows specific patterns: it is senior and not often restructured. A similar analysis can be made of debts owed to other institutions that are affiliated with the UN or to the Bank for International Settlements (BIS). Because their restructuring dynamics are largely independent of other official debts, these debts are not the focus of my analysis of the diversification of official creditors.

This leaves three main categories that are the focus of this paper: 1) traditional creditor countries that have been coordinating inside the PC, 2) regional and other multilateral creditors that are at the forefront of the increase in south-to-south lending (Broner *et al.*, 2020) and 3) non-traditional creditor countries. Exact classifications and hybrid cases are detailed in section 4.a and Table A.1.

Even though only limited data on restructuring processes inside the PC is available (Cheng and Erce, 2017a), it is safe to say that PC creditors coordinate more than most other creditor types, making their debts easier to restructure. It is much more difficult to obtain any information on the restructuring policies of the two other creditor categories.

The existing literature on official debt has for now focused on Chinese lending. Recent efforts to uncover data on *hidden defaults* (Horn, Reinhard and Trebesch, 2022) show that the approach of Chinese lenders to official debt restructurings is similar to that of the PC until the mid-1990s, when debt relief with haircuts was excluded from negotiations. This has led in both the case of the PC and now of China to serial restructurings, chronic debt distress and debt buildups. An investigation of Chinese official debt contracts has also reported the existence of *no Paris Club clauses* that effectively bar Chinese debt from restructuring processes (Gelpern, Horn and Trebesch, 2021).

Thus, reasonable concerns can be raised about the restructuring characteristics of official debt owed to non-PC members. China is an extreme example of how difficult it can be to restructure such debts. I further argue that given the confidentiality of sovereign debt agreements as well as the recently observed difficulties to reach an agreement over the *Common Framework for Debt Treatments*, non-PC official creditors outside of China may present a similar reluctance to restructure their claims. Following this reasoning, a direct consequence of official creditor diversification is that debt becomes overall more difficult to restructure.

Two mechanisms are at play here. First, the rise of non-traditional official creditors could weaken *pari passu* commitments (Buchheit and Gulati, 2022). Second, the lack of coordination and information on restructuring policies of non-traditional lenders creates uncertainty about future restructuring processes. This might further reduce incentives to default and to attempt restructurings of official debt, as the PC chair argued. It presents the risk of not only making official but also private restructurings harder as these rely on the catalyzing effect of official negotiations.

The theoretical and empirical framework set-up in section 2 has two main implications for official creditor diversification. First, more difficult-to-restructure-debt deters borrowers from seeking relief agreements with their creditors, leading them to delay restructurings and into debt overhang. Second, as countries with a diversified official creditor base are less likely to default and restructure, their repayment credibility is higher. It enables them to issue more debt, as outlined by Bolton and Jeanne (2009). This is crucial to understand the reluctance of borrower countries to restructure out of fear of the signal it would send to their creditors and rating agencies.

Both these mechanisms allow the hypothesis that countries with a diversified official creditor base should have higher and less sustainable debt stocks due to their reluctance to restructure (I).

4. Empirical investigation of the implications of official creditor diversification

Having established the theoretical underpinnings of official creditor diversification, I now turn to testing its two main hypothetical implications: debt overhang and reluctance to restructure.

4.a The dataset

To measure the effect of official creditor diversification, I mainly rely on data provided by the World Bank's International Debt Statistics (2023) on PPG debt reported for 121 low- and middle-income countries. Eligibility to International Development Agency (IDA) lending requires these countries to report their sovereign loans to the debt reporting system (DRS) yearly. These are aggregated per creditor, yielding detailed data on outstanding debt to 303 counterparts from 1991 to 2021. Debt is weighted against Gross National Income (GNI), both in current US dollars.

This dataset allows to estimate the relative shares that different official creditor groups represent by aggregating counterparts into chosen categories. To dig into the analysis of official creditor diversification, I distinguish traditional from non-traditional official lenders. This arbitrary classification is based on the historical relative shares of these lenders in external PPG debt, the extent of their coordination with other lenders and the transparency of their lending practices. As such, the PC members, UN-institutions as well as the main other multilateral institutions, i.e. those affiliated to the UN or whose voting powers are in majority held by developed countries², are classified as traditional lenders. They have historically represented the majority of official lending as displayed on Figure 1. Traditional multilateral lenders such as the IMF or the IDA steadily represent about 50% of official lending to low and middle-income countries, while the share of PC lending has decreased from 53% in 1991 to 19% in 2021. On the other end of the spectrum, China, India, the Gulf States and other low- and middle-income countries that have not explicitly joined the PC are classified as non-traditional bilateral lenders, as they represented less than 5% of total official lending until the mid-2000s. Lastly, this paper aims to take into the account the thrive of new multilateral institutions that are mostly autonomous from the UN and whose voting powers do not rest in majority within the hands of advanced economies. Examples include the OPEC Fund for International Development. Most of these institutions have not

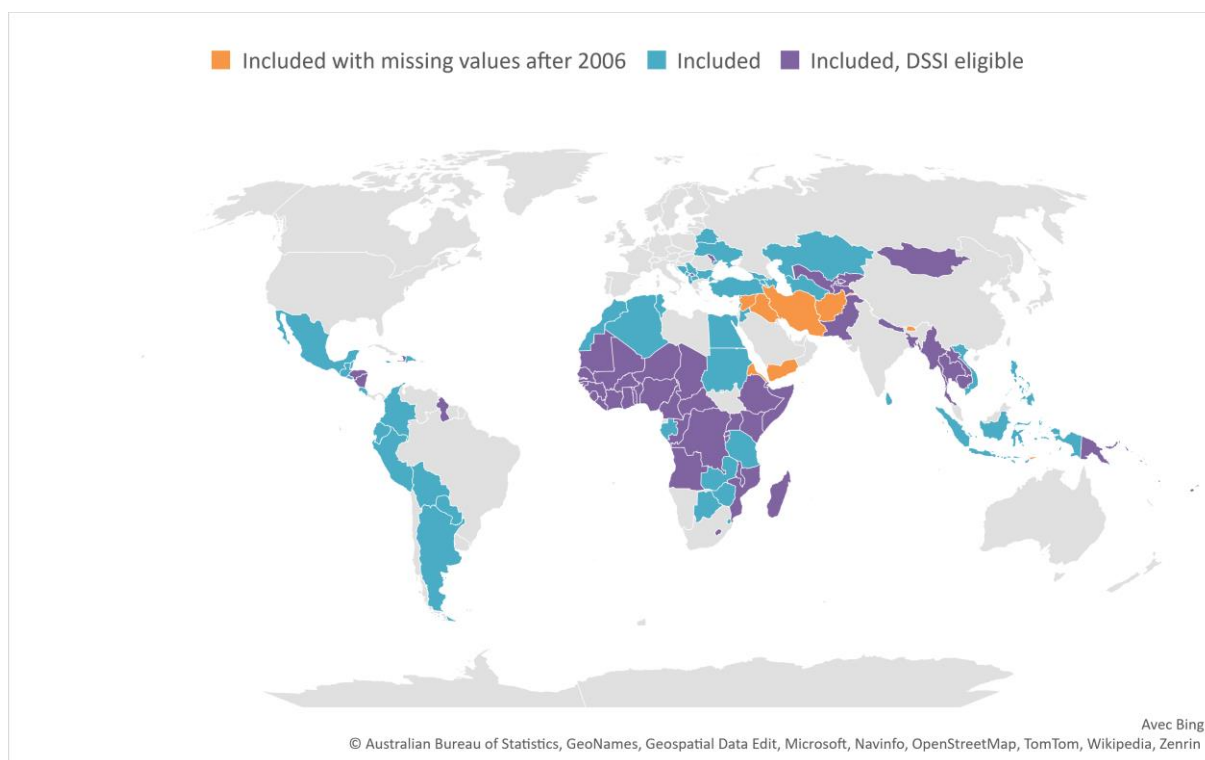
² The major non-UN multilateral institutions are the Bank for International Settlements, as well as the Asian Development Bank, the African Development Bank, the Inter-American Development Bank, institutions affiliated to the European Union and to Nordic countries (Nordic Investment Fund and others).

yet openly committed to any global debt restructuring framework, whilst their share in total official lending has increased from 1% in the early 1990s to over 3,5% in 2020 - with even higher shares in Sub-Saharan Africa (SSA), the Middle East and North Africa (see Figure 3). Hence, they are also classified as non-traditional lenders, which is contrary to the usual practice of considering multilateral lenders as a homogeneous category. Exact categorizations are detailed in Table A.1 of the Appendix.

This data is complemented by qualitative information on debt sustainability drawn from the IMF's debt sustainability analyses (DSA) for 63 countries (IFAD, 2023), as well as information on participation to DSSI-restructurings reported by Horn, Reinhart and Trebesch (2022) for 68 countries. A DSA results in an overall assessment of short- and long-term sustainability based on baseline and historical scenarios as well as random combined shock simulations (see IMF, 2018). Analyzed countries enter four possible categories: these are low, moderate, high-risk of or in debt distress. Debt distress means that a country has effectively stopped making principal or interest payments.

For the analysis of official creditor diversification, the main traditional or non-traditional lenders are excluded from the dataset's borrowing side (South Africa, Russia, Brazil, China and India).

Fig 2. Data coverage



Note: Afghanistan, Bhutan and Timor-Leste are DSSI eligible but have missing GNI values after 2006.

This process results in an unbalanced panel data set which spans over 31 years for 116 low- and middle-income countries. Given the lack of transparency and the high variability across countries of sovereign debt reporting (Seiferling, 2020), individual amounts owed to each creditor group should be considered

carefully. However, advanced economies and UN-institutions tend to commit to higher standards in terms of lending transparency. Thus, most of this uncertainty concerns non-traditional lenders. Moreover, I assume that no country has an incentive to overreport its debt. Hence, debts owed to non-traditional creditors can be considered as lower bounds. Horn, Reinhart and Trebesch (2021) typically estimate much higher levels of Chinese lending.

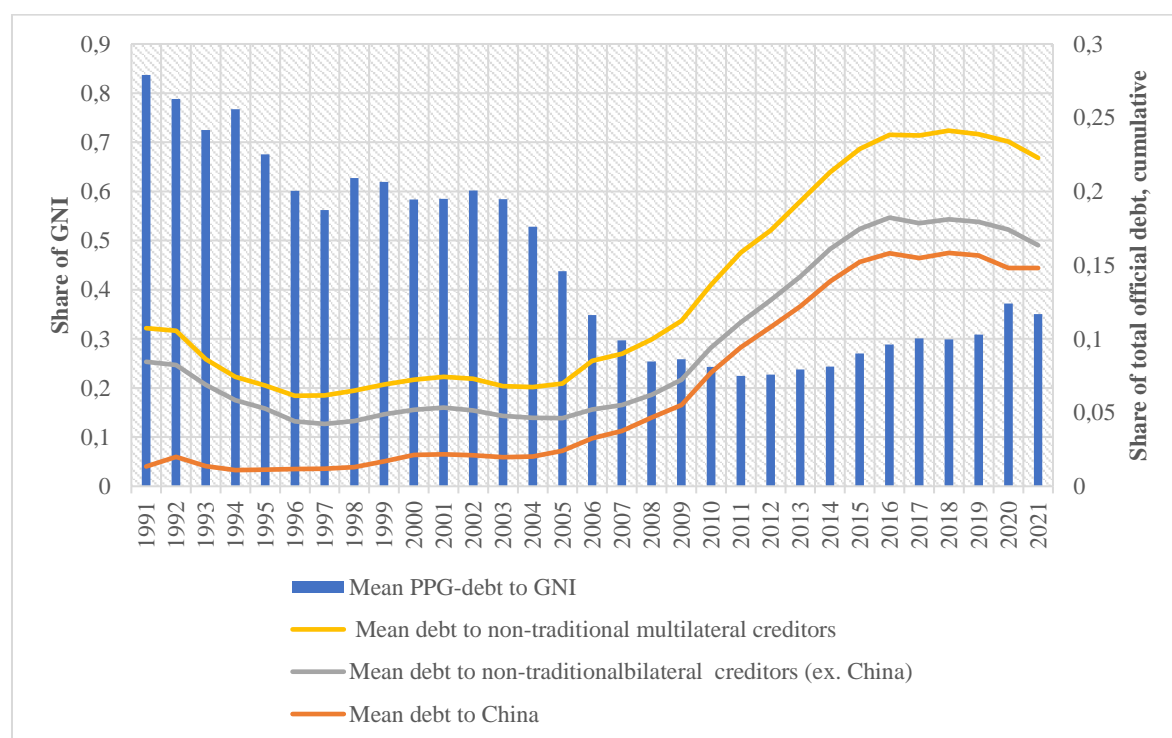
26 countries have missing GNI data for at least one year. Most of the missing values are concentrated in the early 1990s. 12 countries however have missing GNI values after 2006 (the end of the HIPC initiative), as shown in figure 2. Their debt compositions are excluded from any statistics involving GNI ratios. DSA ratings are available for most DSSI eligible countries.

4.b Stylized facts of official creditor diversification

This section provides a detailed description of official creditor diversification over 1991-2021 and discusses preliminary evidence on its effect on debt buildups.

Figure 3 compares the evolution of mean debt ratios with that of the mean shares of non-traditional official creditors in official debt. Two borrowing trends are distinguishable. The first is characterized by decreasing mean debt ratios until the late 2000s, associated with low non-traditional lending. It can be attributed to high debt write-offs through the HIPC initiative (Ali Abbas, 2019). The second trend picks-up in the early 2010s and is increasing, although at much lower levels. This increase still accounts for 15 GNI percentage points between 2011 and 2020.

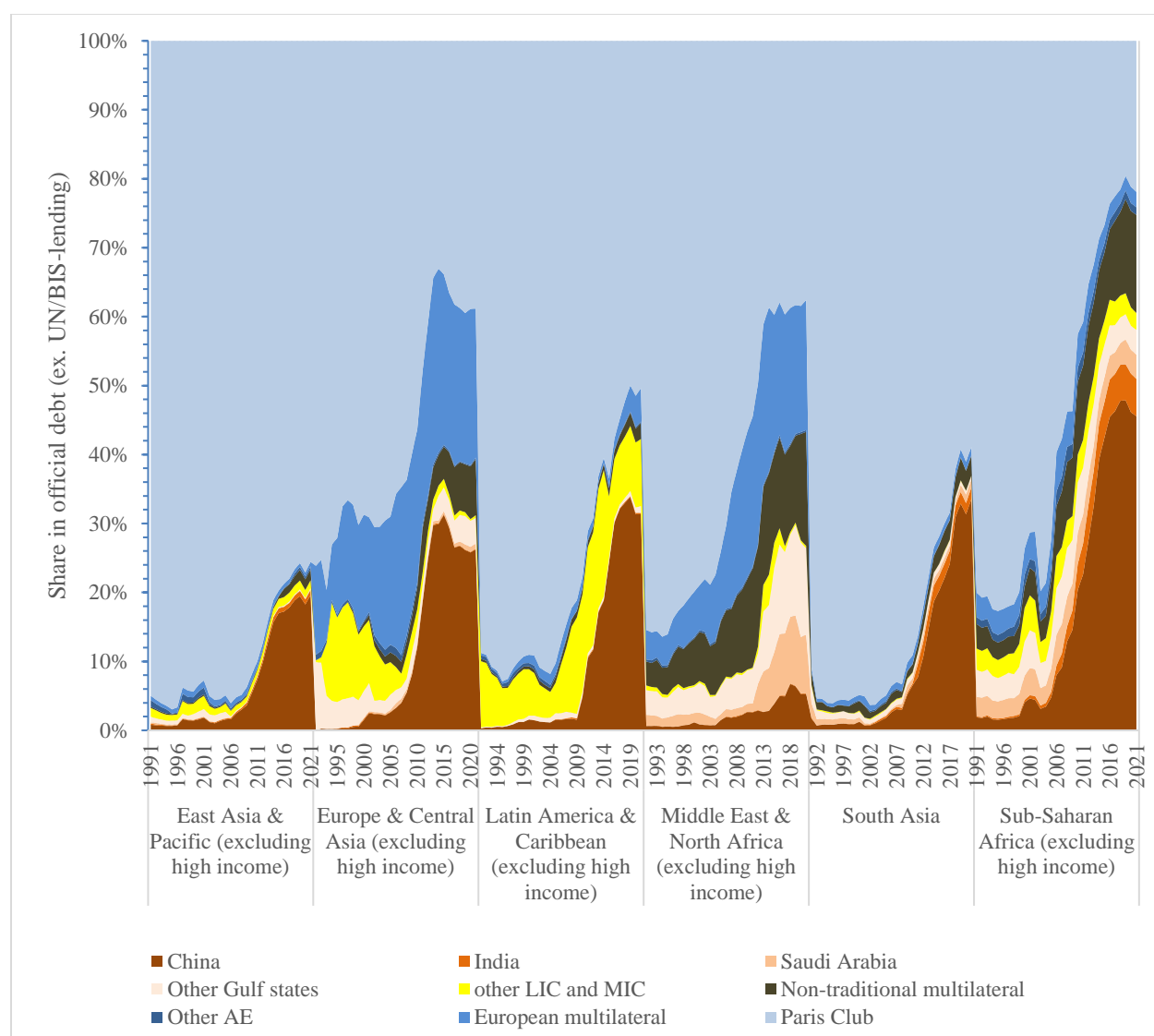
Fig 3. Debt burdens and creditor diversification since 1991



Overall, the mean share of non-traditional creditors in official debt increased from 7% in 2005 to 22% in 2016. The slight decline after 2019 is mainly attributable to an expansion of IMF lending since the outbreak of the Covid-19 pandemic. Mean values indicate a correlation across time of official creditor diversification and debt ratios after 2010. However, mean aggregate levels do not allow for a complete grasp of the extent of creditor diversification.

Indeed, together with the other UN-institutions, the (BIS) and the major regional development banks, the IMF accounted for 56% of official debt reported by sample countries in 2000 and reached a record at 62% in 2021. Given that lending from these creditors is fully reported to the DRS while lending from other sources probably is not, these shares are likely to be overestimated. Furthermore, section 3 established that these traditional multilateral debts do not generally have the same restructuring characteristics as other official debts. It therefore appears useful to exclude these debts from the picture and take a deeper look into what is happening to the rest of official creditors.

Fig 4. Shares of PPG official debt by creditor and region between 1991 and 2021, excluding UN and BIS lending

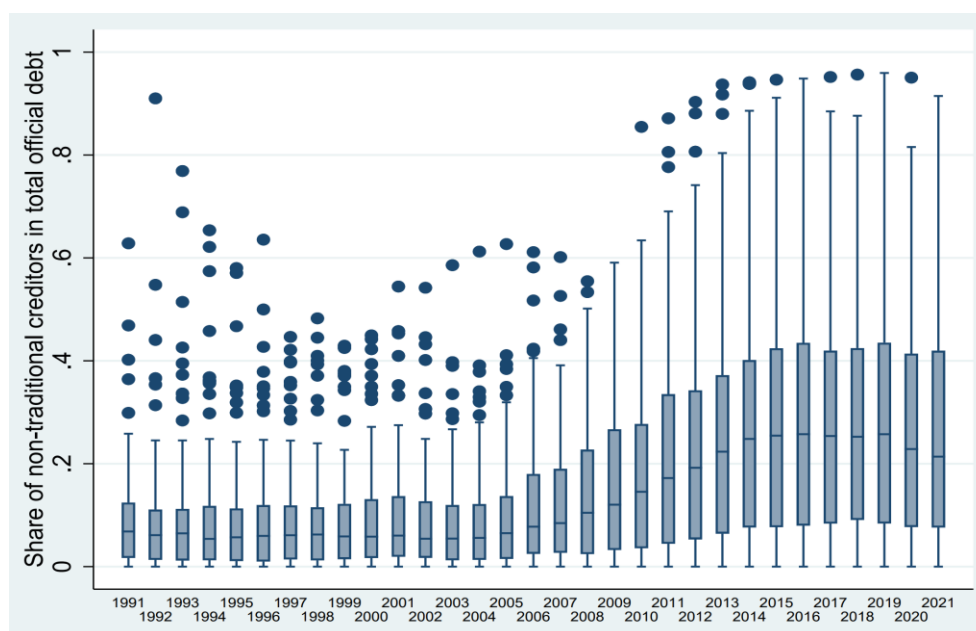


Once having excluded the UN and BIS from the picture, the share of non-traditional creditors (all except for the Paris Club, European multilaterals and other advances economies (AE)) has very strongly increased from 20% in the 1990s to 55% in average over 2016-2021.

Moreover, official debt compositions by creditor differ greatly across regions as shown by Figure 4. This is in line with the recent theoretical and empirical findings that show that official lending increases with the degree of economic integration (Horn, Reinhart and Trebesch, 2021; Tirole, 2015). While all regions except for East Asia and the Pacific exhibit shares of non-traditional debts over 40% since the early 2010s, China is far from being the only new relevant creditor. This is especially clear in the Middle East and North Africa, where Chinese debt accounts for less than 6% of the total across 1991-2021, while the Gulf states hold 25% of official debt after 2015. Regional multilateral institutions governed by local countries are also increasingly important creditors with a share of 17% in 2021. Similarly, in SSA, 29% of non-UN official debt was owed to non-traditional and non-Chinese creditors in 2021.

I now turn to a cross-country analysis of official creditor diversification. Figure 4 has shown this phenomenon to be heterogeneous across regions, both regarding the magnitude of the diversification and the composition of the new creditors. Figure 5 shows the distribution of the shares of non-traditional official debt in total official debt (including UN-lending) by country across time.

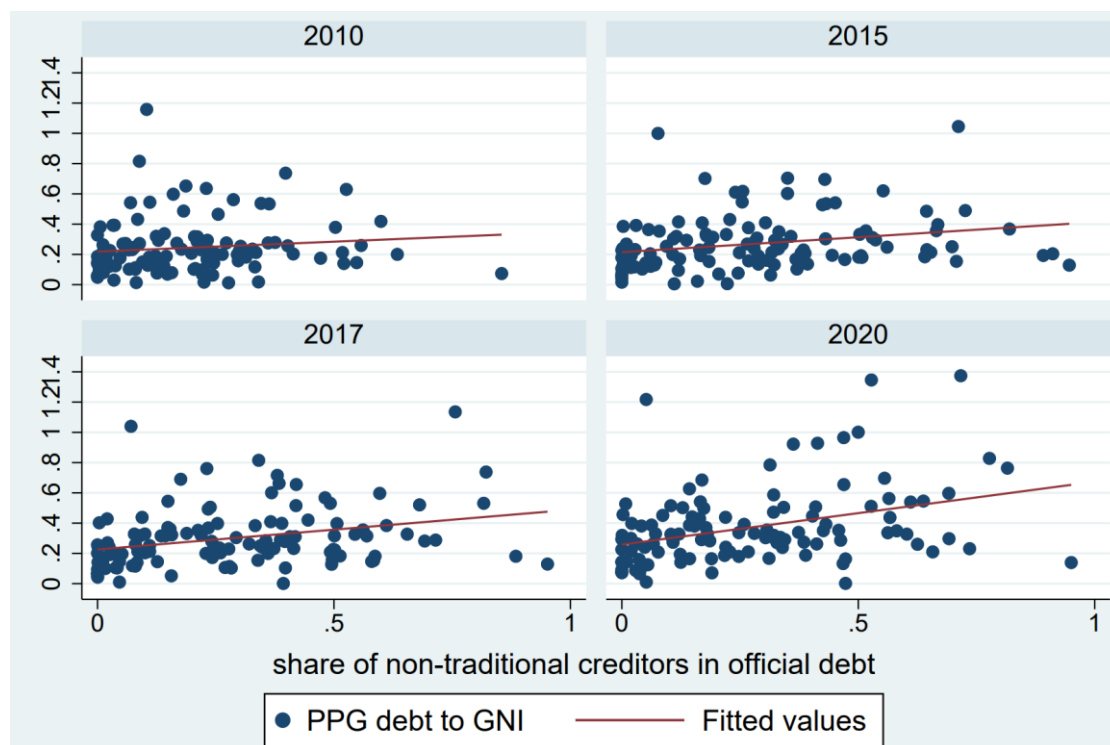
Fig 5. Distribution of the share of official debt owed to non-traditional creditors across time



Despite the clear general increase of the share of non-traditional official debt, official creditor diversification affects sample countries at varying levels. In each year, non-traditional debt shares are skewed downwards with 25% of the countries owing less than 8% of their official debt to non-traditional creditors even after 2010.

If hypothesis I. holds, cross-country analysis should display a positive relationship between the exposure to non-traditional creditors and the debt ratio. Figure 6 shows this relationship in several years. The correlation is positive in all cases and increases in the later years. In 2020, baseline regression results displayed by the fitted line show that if non-traditional creditors account for 10 additional percentage points in official debt, the predicted debt to GNI ratios is 4.1 percentage points higher – which is both statistically and economically significant (see Table B.1).

Fig 6. Creditor diversification and PPG debt to GNI, fitted trends.



4.c Measuring the role of official creditor diversification in debt overhang

Having established the stylized facts of the evolution of official debt composition and its association with debt buildups, I now turn to an econometric test of hypothesis I.

Preliminary results show that official creditor diversification has mainly picked up towards the late 2000s. Therefore, my econometric analysis is restricted to the years 2010-2021.

Its aim is to uncover whether a diversified official creditor base can explain differences in debt levels between countries. Because official creditor diversification at the aggregate level is correlated with debt buildups across time (see Fig.3), controlling for time effects is crucial. Heterogeneity of debt levels and compositions across regions (see Figure 4) also makes a case for including regional effects.

I further control for key determinants of debt levels to isolate the effect of creditor diversification. I consider the share of debt owed to private creditors within total PPG external debt to control for the fact that access to private capital markets allows countries to issue more debt. I also control for the possibility that non-traditional lenders lend at higher cost by including the DRS' measure of the weighted average interest on new official loans by country. Finally, debt ratios are mechanically driven by their denominator. I therefore control for GNI growth.

Three additional macroeconomic variables are included as a robustness check, although they have a lower data coverage. These are drawn from the World Bank's World Development Index: GDP per capita in constant 2015 US dollars to control for different borrowing practices across development levels, CPI inflation and gross investment to GNI in current dollars.

Given these inputs, I consider a standard linear model across 11 years and 104 countries:

$$y_{i,t} = a + \beta_1 \text{nontrad_debt}_{i,t} + \beta_2 Y_{i,t} + u_{i,t}$$

with $y_{i,t}$ the PPG debt to GNI of country i at time t , $\text{nontrad_debt}_{i,t}$ is the share of non-traditional creditors in official debt, $Y_{i,t}$ the vector of control variables that can include region, country and time fixed effects and $u_{i,t}$ the error term.

The analysis focuses on the magnitude and the statistical significance of the estimated coefficient $\hat{\beta}_1$ across different specifications and regression types. I conduct a standard pooled OLS regression with time effects, based on Schlegl, Trebesch and Wright's approach (2021). No fixed effects panel data regression is conducted because I focus on cross-country differences. A To mitigate the impact of autocorrelation of debt levels across time, I include debt to GNI with a one period lag as a robustness check.

Table 1 presents the key results of these regressions which are detailed in appendix B. Official creditor diversification i.e., the share of non-traditional creditors in official debt, is highly significant across all specifications with a 5% confidence level at least. The effect of diversification strengthens both in magnitude and significance when including controls and is stable at about 0.24 after controlling for the key determinants of debt levels. This indicates that the model predicts an increase of the share of non-traditional official creditors of 5 percentage points to be associated with a PPG debt to GNI ratio higher by 1,2 percentage points. This is economically significant since the interquartile range of the share of non-traditional official debt in 2020 is of 32.5 percentage points (see Figure 5). Overall, the R^2 values are comprised between 10% and 20%. These rather low values are however of little interest given that the aim of this model is not to predict debt levels accurately, but to estimate the effect that debt diversification has on them.

Regional controls are significant with a confidence level of at least 10% outside of South Asia, indicating that the estimation effectively takes regional determinants of debt levels into account. SSA's coefficient is almost three times lower (0,29) than the ones of other regions excluding South Asia (at least 0,85). This is crucial, as it captures differences in *debt intolerance* across regions i.e., the fact that lower debt levels in SSA may be as unsustainable as higher levels elsewhere due to more vulnerable institutions or debt compositions (Eichengreen, Hausmann and Panizza, 2007).

Time dummies behave as expected: they are positive and increase in magnitude and significance after 2015, consistent with the observation of a new debt boom in the 2010s (see Table B.2). This is especially important because it allows to consider that the measured effect of creditor diversification is not solely due to the fact that this diversification has happened simultaneously with higher debt levels.

Other controls also behave as expected. The share of PPG external debt owed to private creditors is highly significant and has a positive predicted effect of debt levels, as suggested in 4.b. Results also show that debt ratio changes caused by the denominator are effectively controlled for as the coefficient on GNI growth is significant and negative across most specifications.

Table 1. Effects of official creditor diversification on debt levels, OLS regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Baseline	Baseline	Key controls	Robust (heterosk.)	robust (clustered)	robust (autocorr.)	robust full controls
nontrad_debt	0.171*** (0.0240)	0.226*** (0.0258)	0.242*** (0.0257)	0.242*** (0.0358)	0.242** (0.105)	0.0258*** (0.00921)	0.243*** (0.0379)
av_interest_new			0.00425 (0.00507)	0.00425 (0.00552)	0.00425 (0.0103)	0.00215 (0.00208)	0.00429 (0.00569)
private_debt			0.101*** (0.0224)	0.101*** (0.0254)	0.101 (0.0644)	0.0230** (0.00892)	0.133*** (0.0289)
gni_growth			-0.217*** (0.0374)	-0.217 (0.152)	-0.217** (0.0932)	-0.236** (0.106)	-0.215 (0.163)
inflation							0.000118 (0.000476)
gdp_cap							-6.74e-06*** (2.04e-06)
inv_gni							0.0365 (0.0584)
Constant	0.215*** (0.0180)	0.150*** (0.0219)	0.153*** (0.0232)	0.153*** (0.0278)	0.153*** (0.0406)	0.00279 (0.0143)	0.156*** (0.0312)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged dependent	No	No	No	No	No	Yes	No
Controls	No	No	Yes	Yes	Yes	Yes	Yes
Observations	1,248	1,248	1,248	1,248	1,248	1,248	1,200
R-squared	0.104	0.145	0.187	0.187	0.187	0.924	0.202

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

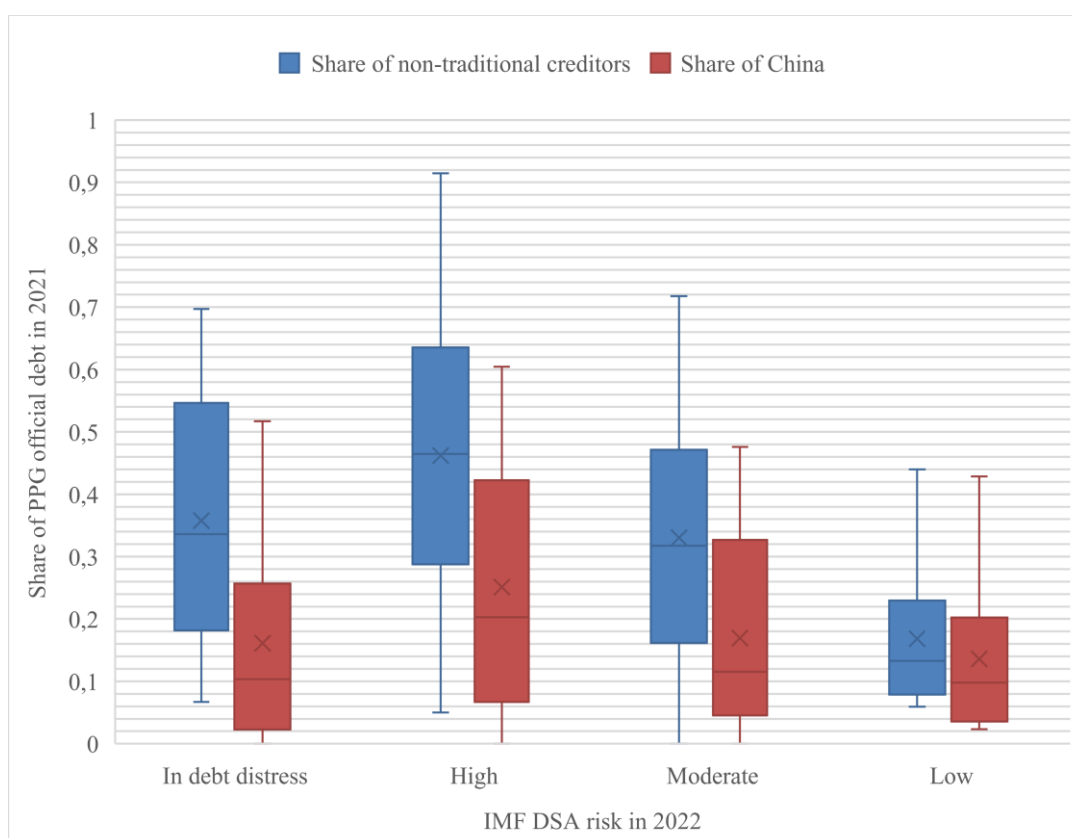
The significant positive effect of official creditor diversification also holds through multiple robustness checks. Including heteroskedasticity-robust standard errors decreases slightly the t-value of $\hat{\beta}_1$ to 6,76 in specification (4) against 9,4 in (3). Clustering standard errors by country further reduces this t-value to 2,3. Hence, even when taking intra-country autocorrelation into account, $\hat{\beta}_1$ stays significant at the 5% confidence level. Finally, the high significance of the main explanatory variable is unchanged when controlling for autocorrelation of the dependent variable in specification (6).

4.d Creditor diversification, debt distress and restructurings: evidence from DSAs and DSSI participation

Having measured a positive effect of official creditor diversification on debt levels, I turn to a detailed analysis of its impact on restructurings and debt distress.

Figure 7 displays mean shares of non-traditional official debts across different debt risk profiles. A preliminary assessment suggests that creditor diversification may result in unsustainable debts: the mean share of non-traditional creditors in official debt is more than twice as high for high-risk countries than it is for low-risk countries.

Fig 7. Official creditor diversification across debt risk profiles in 2022 for 63 countries



Note: creditor shares are computed for 2021 as debt levels for 2022 have not yet been published.

The negative relationship between debt sustainability and official creditor diversification does not however extend to countries in debt distress. Surprisingly, the 10 countries in debt distress in 2022 have on average lower debt-shares owed to non-traditional creditors than countries at high risk do, despite similar distributions. Given the theoretical framework examined in section 3, this can be interpreted as a higher reluctance of countries with a diversified official creditor base to default and thus to restructure: despite being on average at high levels of DSA risk, they are underrepresented among countries in debt distress. Similar patterns are observable when considering official debt owed to China.

The recent DSSI provides a natural experiment to test whether official creditor diversification effectively deters from restructurings as suggested by Figure 7. To do so, I setup a simple probit model which links a country's participation to the DSSI with my measure of official creditor diversification:

$$DSSI_i = a + \theta_1 x_i + \theta_2 Y_i + SSA_i + u_i$$

with $DSSI_i$ a dummy variable equal to 1 when country i has participated in the DSSI, 0 otherwise. x_i is the key explanatory, which is the share of non-traditional creditors in official debt or, alternatively, the share of China in official debt. It is computed for 2019 to consider creditor composition before the pandemic and avoid endogeneity. Y_i includes controls for the debt ratio, the share of private creditors in external PPG debt. I also include a dummy for SSA because 29 of the 39 DSSI participants are African, and official creditor diversification is stronger there (Figure 3). Probit regression results are displayed in Table 2.

Table 2. Effects of official creditor diversification on DSSI participation, probit regression results

VARIABLES	(1) Baseline	(2) Controls	(3) Controls	(4) Controls
share_nontrad	0.0145** (0.00689)	0.0127* (0.00734)		0.0107 (0.00736)
PPG_gni		0.627 (0.816)	0.940 (0.803)	
private_debt		1.239 (0.960)	0.907 (0.970)	
share_china			0.0150* (0.00888)	
SSA				0.8703*** (0.3293)
Constant	-0.323 (0.287)	-0.640* (0.364)	-0.537 (0.340)	-0.6549** (0.3233)
Observations	68	68	68	68

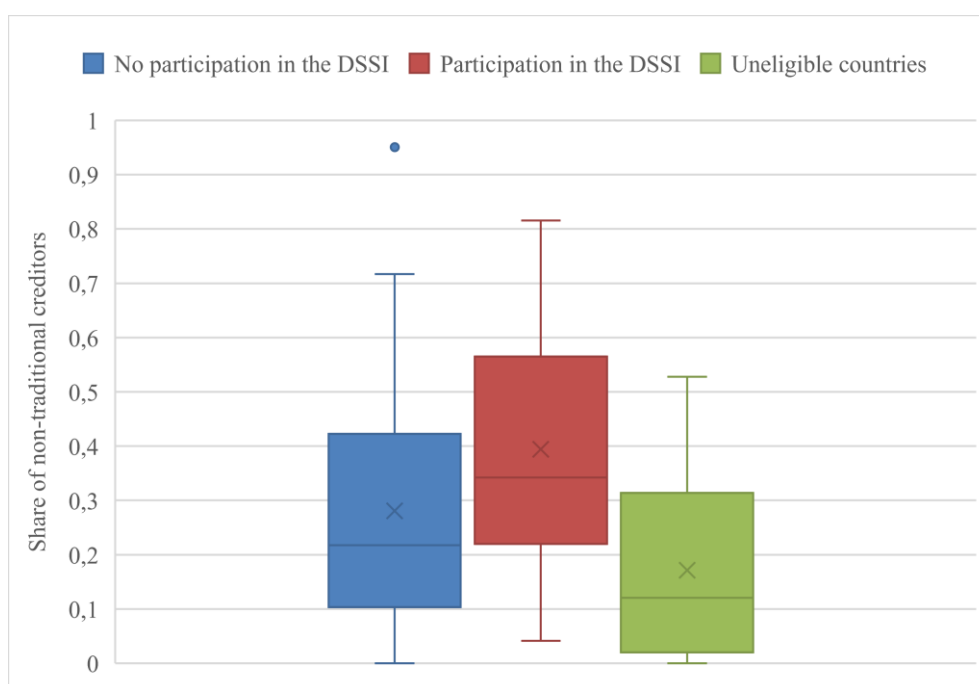
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Contrary to theoretical predictions, they suggest that official creditor diversification has a positive effect on DSSI participation. $\hat{\theta}_i$ is positive and significant at the 10% confidence level in specification (1)-(3).

Moreover, the extent of the official creditor diversification performs better in predicting country participation in the DSSI than the PPG debt to GNI ratio, which has a p-value of 0.443, does. Controlling for SSA weakens both the statistical and economic effect of the explanatory, which however remains significant at the 15% confidence level.

Marginal effects detailed in Table B.4 for different percentile values of the explanatory show the predicted probability of DSSI-participation of a country with traditional creditors only to be of 37%, given that 57% of the 68 eligible countries have participated. Predicted probabilities range up to 79% for the 95th percentile. Figure 8 shows these differences in official creditor diversification according to participation in or eligibility to the DSSI. It confirms that although the groups have similar distributions, DSSI participants have higher shares of their official debt owed non-traditional creditors. This effect is however partially due to SSA being overrepresented among DSSI eligible countries. In any case, creditor diversification does not seem to have deterred from DSSI participation.

Figure 8. Distributions of the shares of non-traditional creditors in official debt across DSSI eligibility and participation, 2019



4.e Limitations and policy implications

The empirical investigation has shown that a sovereign lending boom has occurred since the late 2000s and is associated with a strong diversification of the official creditor base since 2006. The analysis for the subsequent period has shown that this association of higher shares of non-traditional creditors in

official debt with higher debt levels is confirmed both at the aggregate and the cross-country level. These results are in favor of hypothesis I., as they show that a more diversified official creditor base can partially explain debt overhang in the last decade.

Hypothesis I. is backed by two economic mechanisms in section 3. The first and main one is that official creditor diversification deters countries from defaulting because of costly restructurings. The empirical strategy in sub-section 4.d however fails to confirm that this channel effectively operates: the analysis of the DSSI shows that countries with diversified official creditor bases have higher participation rates. This indicates that the apparent higher restructuring costs have not deterred countries from seeking debt relief, in contradiction to the PC chair's statement. It can however be argued that the DSSI drastically reduced restructuring costs by fostering creditor coordination. This may have encouraged countries with diversified creditor bases to participate because of the reduction in perceived restructuring costs. It opens doors for further research, especially once the result of the current restructuring efforts under the Common Framework for Debt treatments are known. Early results in Zambia have shown that restructurings with non-traditional creditors are possible, although at the cost of long negotiations and high coordination efforts (Setser, 2022).

My empirical analysis does not cover in detail the second mechanism behind hypothesis I., which is related to the higher perceived repayment probability of borrowers with a diverse official creditor base. Such considerations need to take the supply side of sovereign debt into account, which is left to further research.

Overall, this paper's theoretical and empirical findings confirm that official creditor composition matters for debt levels, debt sustainability and restructuring decisions because it affects the difficulty-to-restructure and thus the incentives of the borrower to default. This should be borne in mind by policymakers when designing future debt treatment frameworks. Too easy-to-restructure-debt might deter creditors to lend in the first place. In that sense, Michael Dooley argued that (2000, p.20):

treating the symptom, the difficulty of renegotiating sovereign debt, will not improve the performance of the international monetary system. Effective reform will have to address the far more difficult task of altering the incentives faced by private debtors and creditors.

A direct policy implication of my findings is thus that a stronger application of the IMF's lending into official arrears (LIA) policy may improve the efficiency of restructurings with non-traditional official creditors. Since 2015, IMF official LIA is technically feasible and allows the IMF to lend to countries which have accumulated arrears to official creditors. However, if such official creditors have significant voting powers inside the IMF, this presents real obstacles to the implementation of LIA (S. Ali Abbas, 2017; Force and Vonessen, 2021). I argue that a stronger implementation of the official LIA would directly affect the incentives of official creditors by making holdout less profitable and hence restructuring less costly. This policy would require much less coordination efforts than a common debt

treatment framework, while maintaining the restructuring flexibility that sovereign debt creditors seem to value so much (Cooper and Rieffel, 2004).

5. Conclusion

This paper has analyzed the theoretical and empirical implications of the recent diversification of official creditors. It has shown that difficulty-to-restructure is a key feature of sovereign debt, as it allows borrowers to mitigate their limited commitment problem. It has further argued that the emergence of new official creditors is changing the way official debts are restructured by weakening comparable treatment and the catalyzing effect of official restructurings. The main implications of this are debt buildups for countries borrowing from non-traditional creditors. Econometric results show that differences in official creditor diversification effectively allow to predict differences in debt ratios. The effect of official creditor diversification on restructurings proved to be more difficult to test: insights from the DSSI do not indicate that countries with high debts owed to non-traditional creditors are reluctant to restructure, in contradiction to the PC chair's argument.

Finally, this paper has contributed to the fundamental academic debate on the commitment problem of sovereign borrowers as set out by Eaton and Gersovitz (1981) by investigating how official creditor heterogeneity affects incentives to default and restructure.

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Appendix A. Detailed dataset characteristics

Table A.1 Overview of the classification of official creditors

Traditional		Non-traditional	
Bilateral	Multilateral	Bilateral	Multilateral
<p>Paris Club (original): Australia; Belgium; Denmark; Finland; France; Germany; Ireland; Israel; Italy; Japan; Spain; Sweden; Switzerland; United Kingdom; United States; Netherlands; Canada</p> <p>New Paris Club members: Russia; South Korea; South Africa; Brazil</p> <p>Other Advanced Economies: Estonia; Gibraltar; Greece; Hong Kong; Hungary; Iceland; Latvia; Lithuania; Luxembourg; Malta; Monaco; New Zealand; Norway; Poland; Portugal</p>	<p>UN: WB; IMF; UN-Children's Fund (UNICEF); UN-Development Fund for Women (UNIFEM); UN-Development Programme (UNDP); UN-Educ., Scientific and Cultural Org. (UNESCO); UN-Environment Programme (UNEP); UN-Fund for Drug Abuse Control (UNFDAC); UN-Fund for Human Rights; UN-General Assembly (UNGA); UN-High Commissioner for Refugees (UNHCR); UN-Industrial Development Organization (UNIDO); UN-INSTRAW; UN-Office on Drugs and Crime (UNDCP); UN-Population Fund (UNFPA); UN-Regular Programme of Technical Assistance; UN-Regular Programme of Technical Coop. (RPTC); UN-Relief and Works Agency (UNRWA); UN-UNETPSA; UN-World Food Programme (WFP); UN-World Intellectual Property Organization; UN-World Meteorological Organization; World Health Organization; World Trade Organization; International Fund for Agricultural Dev.; International Labour Organization (ILO)</p> <p>European: EUROFIMA; European Bank for Reconstruction and Dev. (EBRD); European Coal and Steel Community (ECSC); European Development Fund (EDF); European Economic Community (EEC); European Free Trade Association (EFTA); European Investment Bank; European Relief Fund; European Social Fund (ESF); Nordic Development Fund; Nordic Environment Finance Corporation (NEFCO); Nordic Investment Bank; International Investment Bank</p> <p>Major regional development banks: Asian Development Bank; Africa Development Bank; Inter-American Development Bank</p> <p>Other: Bank for international Settlements</p>	<p>Main emerging lenders: China; India; Saudi Arabia</p> <p>Other Gulf States and associated: Bahrain; Iran; Iraq; Kuwait; Oman; United Arab Emirates; Qatar</p> <p>Other low- and middle-income countries: Afghanistan; Albania; Algeria; Andorra; Angola; Anguilla; Antigua; Argentina; Armenia; Aruba; Azerbaijan; Bahamas; Bangladesh; Barbados; Belarus; Belize; Benin; Bermuda; Bhutan; Bolivia; Bosnia-Herzegovina; Botswana; Brunei; Bulgaria; Burkina Faso; Burundi; Cabo Verde; Cambodia; Cameroon; Chad; Chile; Colombia; Comoros; Congo, Dem. Rep.; Congo, Rep.; Costa Rica; Cote D'Ivoire, Republic Of; Cuba; Djibouti; Dominica; Dominican Republic; Ecuador; Egypt; Equatorial Guinea; Eritrea; Eswatini; Fiji; Gabon; Gambia, The; Georgia; Ghana; Grenada; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; Indonesia; Iraq; Jamaica; Jordan; Kazakhstan; Kenya; Kiribati; Korea, D.P.R. of; Kosovo; Kyrgyz Republic; Lao People's Democratic Rep.; Lebanon; Lesothl; Liberia; Libya; Macao; Madagascar; Malawi; Malaysia; Maldives; Mali; Mauritania; Mauritius; Mexico; Micronesia Fed Sts; Mongolia; Morocco; Mozambique; Myanmar; Namibia; Nepal; Neth. Antilles; Nicaragua; Niger; Nigeria; Pakistan; Panama; Papua New Guinea; Paraguay; Peru; Philippines; Puerto Rico; Samoa; Sao Tome & Principe; Senegal; Seychelles; Sierra Leone; Solomon Islands; Somalia; Sri Lanka; St. Kitts And Nevis; St. Lucia; St. Vincent & The Grenadines; Sudan; Surinam; Syrian Arab Republic; Tajikistan; Tanzania; Thailand; Timor-Leste; Togo; Tonga; Trinidad & Tobago; Tunisia; Turkiye; Turkmenistan; Uganda; Ukraine; Uruguay; Uzbekistan; Vanuatu; Venezuela, Republic Bolivarian; Vietnam; Zambia; Zimbabwe</p>	<p>Arab multilateral: Arab African International Bank; Arab African International Bank; Arab Fund for Economic & Social Development; Arab Fund for Tech. Assist. to African Countries; Arab International Bank; Arab International Bank; Arab Monetary Fund; Arab Towns Organization (ATO); Org. of Arab Petroleum Exporting Countries (OAPEC); Islamic Development Bank</p> <p>African multilateral: African Export-Import Bank; Central Bank of West African States (BCEAO); Dev. Bank of the Central African States (BDEAC); East African Community; Eastern & Southern African Trade & Dev. Bank (TDB); Econ. Comm. of the Great Lakes Countries (ECGLC); Economic Community of West African States (ECOWAS); West African Development Bank – BOAD; West African Monetary Union (UMOA)]]]; Entente Council</p> <p>Latin American and Caribbean multilateral: Bolivarian Alliance for the Americas (ALBA); Caribbean Community (CARICOM); Caribbean Dev. Bank; Center for Latin American Monetary Studies (CEMLA); Central American Bank for Econ. Integ. (CABEI); Central American Bank for Econ. Integration (BCIE); Corporacion Andina de Fomento; Fondo Latinoamericano de Reservas (FLAR); Foreign Trade Bank of Latin America (BLADEX); Latin Amer. Conf. of Saving & Credit Coop. (COLAC); Latin American Agribusiness Dev. Corp. (LAAD); Plata Basin Financial Dev. Fund</p> <p>Asian multilateral: Asian Infrastructure Investment Bank; Eurasian Development Bank; South Asian Development Fund; ECO Trade and Development Bank</p> <p>Other: OPEC Fund for International Development</p>

Table A.2 Overview of control variables

nontrad_debt: share of official Public and Publicly Guaranteed debt owed to non-traditional creditors (see Table A.1), as reported by each country to the DRS.

share_china: share of official Public and Publicly Guarantee debt owed to China, as reported by each country to the DRS.

private_debt: share of debt owed to private creditors (banks, bondholders and others) in total external Public and Publicly Guaranteed debt, as reported by each country to the DRS.

gni: Gross National Income in current US dollars.

PPG_gni: total Public and Publicly Guaranteed external debt weighted against GNI, as reported by each country to the DRS.

GDP_cap: Gross Domestic Income per capita, in constant 2015 US dollars.

inv_gni: gross capital formation (outlays on additions to the fixed assets of the economy plus net changes in the level of inventories) weighted against GNI, reported by the WDI.

inflation: Annual percentage change in the cost of change in the consumer price index, reported by the WDI.

av_interest_new: average interest paid in percentages on new official debts reported to the DRS, weighted by loan size.

gni_growth: GNI percentage change from the previous year.

DSSI: participation in the DSSI for 68 out of 73 eligible countries which report data to the DRS.

Table A.3 Sample statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max	(6) Var	(7) p25	(8) p50	(9) p75
nontrad_debt	3,456	0.167	0.183	0	0.959	0.0336	0.0290	0.0985	0.247
private_debt	3,457	0.190	0.229	0	1	0.0523	0.00696	0.0897	0.300
gni	3,397	5.220e+10	1.366e+11	7.280e+07	1.283e+12	1.865e+22	2.436e+09	9.525e+09	3.459e+10
PPG_gni	3,397	0.440	0.516	0	8.328	0.267	0.177	0.306	0.537
GDP_cap	3,459	2,905	2,563	189.3	14,200	6.568e+06	931.2	2,089	4,120
inv_gni	3,397	0.208	0.123	-0.0399	0.798	0.0151	0.150	0.215	0.275
inflation	3,136	32.01	463.3	-16.12	23,773	214,635	2.472	5.470	10.31
av_interest_new	3,496	2.131	1.842	0	12.50	3.395	0.858	1.594	2.948
gni_growth	3,280	0.0457	0.195	-5.090	0.771	0.0381	0.00348	0.0633	0.122
DSSI	68	0.574	0.498	0	1				

Appendix B. Detailed regression results

Table B.1 Effects of official creditor diversification on debt levels in 2020, OLS results

VARIABLES	(1) Baseline	(2) Controls
nontrad_debt	0.406*** (0.101)	0.376*** (0.100)
av_interest_new		0.0593*** (0.0199)
private_debt		0.140 (0.0949)
gni_growth		-0.831*** (0.167)
GDP_cap		-1.82e-05* (1.01e-05)
EU & CA		0.145* (0.0739)
LatAm & Carib		0.0950 (0.0753)
ME & NA		0.00170 (0.0923)
SA		0.00930 (0.133)
SSA		0.0413 (0.0664)
Constant	0.262*** (0.0359)	0.109 (0.0675)
Observations	113	112
R-squared	0.127	0.402

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B.2. Effects of official creditor diversification on debt levels, OLS detailed results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Baseline	Baseline	Baseline with key controls	robust (heterosk.)	robust (clustered)	robust (autocorr.)	robust full controls
nontrad_debt	0.171*** (0.0240)	0.226*** (0.0258)	0.242*** (0.0257)	0.242*** (0.0358)	0.242** (0.105)	0.0258*** (0.00921)	0.243*** (0.0379)
av_interest_new			0.00425 (0.00507)	0.00425 (0.00552)	0.00425 (0.0103)	0.00215 (0.00208)	0.00429 (0.00569)
private_debt			0.101*** (0.0224)	0.101*** (0.0254)	0.101 (0.0644)	0.0230** (0.00892)	0.133*** (0.0289)
gni_growth			-0.217*** (0.0374)	-0.217 (0.152)	-0.217** (0.0932)	-0.236** (0.106)	-0.215 (0.163)
inflation							0.000118 (0.000476)
gdp_cap							-6.74e-06*** (2.04e-06)
inv_gni							0.0365 (0.0584)
EU & CA		0.0855*** (0.0187)	0.0705*** (0.0184)	0.0705*** (0.0158)	0.0705 (0.0472)	0.00533 (0.00484)	0.0818*** (0.0169)
LatAm & Carib		0.113*** (0.0178)	0.0908*** (0.0179)	0.0908*** (0.0176)	0.0908 (0.0556)	-0.000613 (0.00427)	0.112*** (0.0203)
ME & NA		0.0871*** (0.0237)	0.0537** (0.0236)	0.0537** (0.0257)	0.0537 (0.0726)	0.00623 (0.00817)	0.0610** (0.0260)
SA		0.0318 (0.0324)	0.0343 (0.0318)	0.0343* (0.0176)	0.0343 (0.0494)	0.00418 (0.00369)	0.0292 (0.0184)
SSA		0.0294* (0.0164)	0.0273* (0.0161)	0.0273* (0.0155)	0.0273 (0.0477)	-0.000765 (0.00381)	0.0255 (0.0160)
2011	-0.0249 (0.0248)	-0.0267 (0.0243)	-0.0218 (0.0238)	-0.0218 (0.0228)	-0.0218** (0.0107)	0.00273 (0.0116)	-0.0233 (0.0233)
2012	-0.0226 (0.0248)	-0.0253 (0.0243)	-0.0404* (0.0239)	-0.0404* (0.0241)	-0.0404*** (0.0141)	0.00665 (0.00975)	-0.0419* (0.0244)
2013	-0.0188 (0.0249)	-0.0227 (0.0244)	-0.0361 (0.0240)	-0.0361 (0.0238)	-0.0361** (0.0164)	0.0128 (0.00801)	-0.0378 (0.0239)
2014	-0.0161 (0.0249)	-0.0212 (0.0244)	-0.0418* (0.0242)	-0.0418* (0.0250)	-0.0418** (0.0195)	0.00541 (0.00922)	-0.0424* (0.0251)
2015	0.0123 (0.0249)	0.00639 (0.0244)	-0.0379 (0.0248)	-0.0379 (0.0350)	-0.0379 (0.0260)	0.00508 (0.0185)	-0.0383 (0.0358)
2016	0.0281 (0.0250)	0.0215 (0.0245)	-0.0100 (0.0243)	-0.0100 (0.0286)	-0.0100 (0.0237)	0.00779 (0.0126)	-0.0102 (0.0288)
2017	0.0429* (0.0250)	0.0365 (0.0245)	0.0170 (0.0241)	0.0170 (0.0255)	0.0170 (0.0224)	0.0193** (0.00857)	0.0200 (0.0257)
2018	0.0407 (0.0250)	0.0341 (0.0245)	0.00639 (0.0242)	0.00639 (0.0244)	0.00639 (0.0219)	-0.00381 (0.00762)	0.00892 (0.0245)
2019	0.0519** (0.0250)	0.0455* (0.0245)	0.0157 (0.0242)	0.0157 (0.0267)	0.0157 (0.0236)	0.00593 (0.0107)	0.0173 (0.0271)
2020	0.117*** (0.0249)	0.111*** (0.0244)	0.0671*** (0.0249)	0.0671* (0.0349)	0.0671** (0.0271)	0.0422** (0.0178)	0.0721* (0.0371)
2021	0.0976*** (0.0249)	0.0920*** (0.0244)	0.0810*** (0.0243)	0.0810*** (0.0269)	0.0810*** (0.0212)	-0.00260 (0.00921)	0.0876*** (0.0284)
PPG_gni_lag1						0.961*** (0.0292)	
Constant	0.215*** (0.0180)	0.150*** (0.0219)	0.153*** (0.0232)	0.153*** (0.0278)	0.153*** (0.0406)	0.00279 (0.0143)	0.156*** (0.0312)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Lagged debt_gni	No	No	No	No	No	Yes	No
Controls	o	No	Yes	Yes	Yes	Yes	Yes
Observations	1,248	1,248	1,248	1,248	1,248	1,248	1,200
R-squared	0.104	0.145	0.187	0.187	0.187	0.924	0.202

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.3 Predicted probabilities of DSSI participations across percentiles of the share non-traditional creditors in official debt, probit regression

Percentiles (in %)	Share of non-traditional debt (in %)	Predicted margin (in %)	Delta-method std.err.	[95% conf. interval]	
1	0	37	0.11	0.16	0.59
10	6	41	0.10	0.21	0.60
25	18.7	48	0.08	0.33	0.63
50	34.3	57	0.06	0.45	0.69
75	53.4	67	0.07	0.53	0.82
95	78.54	79	0.10	0.60	0.99
99	95.9	86	0.10	0.66	1.06