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Statistical Governance and FDI in Emerging Economies[1]

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Abstract

The importance of institutional settings for economic development outcomes is broadly acknowledged nowadays. This paper investigates the role of official statistics in alleviating financing constraints in emerging and developing economies, with a particular focus on Sub-Saharan Africa. Official statistics has a major dual role: it directly adds to the information set of investors regarding the general state of the economy and it is a key commitment and signalling device as to future good governance. Empirically, the paper investigates, for a sample of 98 emerging and developing countries, the relationship between the adoption of the IMF General Data Dissemination Standard (GDDS) for statistical data production and the net incurrence of foreign direct investment liabilities. Direct investment is considerably higher under GDDS. Controlling also for time and country effects, using fixed effects and quantile panel regression, the relationship ceases to be uniformly positive. Heterogeneity matters: There is a large and significant difference between poorer and richer countries, as well as between countries in Sub-Saharan Africa and elsewhere. Given the information asymmetry problems in poor developing countries, this is not unexpected. Furthermore, it becomes evident that the relationship between the adoption of GDDS and net incurrence of FDI liabilities is negative for richer countries and outside Sub-Saharan Africa. This is not due to endogeneity of GDDS adoption. For richer countries, the relevant alternative might have been the more demanding SDDS, turning the adoption of GDDS into an unfavourable signal. Quantile regression is carried out using the quantile panel estimator of Canay (2011).

Keywords: governance, FDI, emerging economies, policy evaluation, quantile panel regression, Compact with Africa, official statistics, asymmetric information, financing constraints

JEL-Classification: O16, G31, D82

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Non-technical summary

Research Question

The importance of institutional settings to development outcomes is broadly acknowledged nowadays. This paper investigates the role of official statistics in alleviating financing constraints with regard to funding investment projects in emerging and developing economies, with a particular focus on Sub-Saharan Africa. Official statistics has a vital dual role: it directly adds to the information set of investors regarding the general state of the economy and it is a key commitment and signalling device as to future good governance. A statistical system conforming to international standards is costly to set up, and its data production makes it much easier to monitor government policy. This renders credible the government's pledge to maintain transparency and good governance.

Contribution

Empirically, the paper investigates, for a sample of 98 emerging and developing countries, the relationship between the adoption of the IMF General Data Dissemination Standard (GDDS) for statistical data production and the net incurrence of foreign direct investment liabilities. Owing to heterogeneity and in order to make the results robust, panel quantile regressions are carried out.

Results

Heterogeneity matters: There is a large and significant difference between poorer countries and richer countries as well as between Sub Saharan Africa and other countries regarding the estimated relationship. Given the grave information asymmetry problems in poorer developing countries, this is not unexpected. Furthermore, it becomes evident that the relationship between the adoption of GDDS and net incurrence of FDI liabilities is actually negative for richer countries and outside Sub-Saharan Africa. For richer countries, the relevant alternative might have been the more demanding IMF Special Data Dissemination Standard (SDDS), turning the adoption of GDDS into an unfavourable signal.

1 Governance and the Compact with Africa

The year 2017 saw a major change in development policy. One outstanding point of the political agenda of the G20 summit of that year was "Investment conditions – Compact with Africa". The focus is no longer on financing bilateral projects. Instead, the initiative intends to create the conditions necessary for drawing in private investors, specifically concerning infrastructure projects. If successful, this will induce self-sustaining virtuous circles, where one project lays the basis for the profitability of the next, and where outside investors, both from the home country and abroad, are willing to put their money at risk and do what is necessary to make the project a success.

What is needed to create such a situation? The G20 Compact with Africa initiative distinguishes three modules. A macroeconomic framework is intended to make investment projects viable by providing stable macroeconomic conditions. A business framework is designed to make projects bankable by attracting investors. Promoting reliable institutions and regulations is deemed to be essential. A finance framework makes a project fundable by attracting private finance from national or international investors, banks, insurers and funds. In order to achieve this, the prohibitively high return required for investments in Africa needs to go down substantially. An interested African country will enter into an accord with sponsor countries with mutual obligations. The client country commits both to the framework of making investment attractive, as well as to specific measures tailored to the country in question, and the sponsor countries commit to general and specific, monetary or non-monetary support.

2 Investment, Information Asymmetry and Statistics

In the Compact with Africa document, the role of official statistics is not explicitly mentioned. It will be argued that official statistics plays a key role in an integrated framework in terms of making investment attractive for outsiders. To understand why this is so, it is worthwhile to restate the idea of information asymmetry as a barrier to investment. [2] Information asymmetry arises if the "agent" -- somebody who proposes a project and needs outside finance -- has more and better information about the project and its expected returns than the "principal", who is invited to provide outside finance. The information asymmetry may be ex ante or ex post. Ex ante asymmetry is the situation where the investor cannot judge the quality of a project and must be aware of the

[2] See, for example, Jensen and Meckling (1976), Stiglitz and Weiss (1981), Holmström and Tirole (1997), or the textbook of Tirole (2006) on Corporate Finance.

possibility that he or she will be invited to participate only in projects with a low return, while the high return projects are reserved for investors with more power or better information (adverse selection). Ex post asymmetry (moral hazard) prevails if the owner of the project is able to take actions that increase his or her own returns at the cost of the investor. In this case, the investor must take this reduction of the returns into account when making a decision on project financing. If the investor expects to be cheated and cannot safeguard against it, he or she will abstain from the project.

Information asymmetry is clearly a major aspect of outside investment in general, not only in Africa. If unresolved, the financing resources for each project are literally limited by the equity of the owner. This is very generally true: corporate finance as a scientific discipline is today largely the search for ways to systematically reduce agency problems and make commitments credible, i.e. making projects "bankable", in the language of the G20 document. Information asymmetries are a barrier between the outside investor and the local project owner. What is the role of official statistics?

In reality, the prospects of an investment project in Africa or elsewhere depend not only on random returns and the actions of the project owners, but crucially also on the institutional environment, the complex administrative tissue we call "government". This is especially the case when talking about infrastructure projects. In terms of agency theory, the government is a further agent whose actions have to be anticipated by the principal. This is why "governance" is so important. In their relations to outside investors (both from home and abroad), governments in Africa and elsewhere need to commit to strategies that make sufficient or high returns look probable, including in the long run, and – just as important – they need to make such a commitment look credible. Otherwise, the outside investor will refrain from extending funds, for the same reason he or she will not trust the local project owner if information asymmetry cannot be resolved.

Official statistics can play a very important role in this endeavour. By providing information about the country in question and about government activity, they will directly reduce information asymmetry with regard to both the state of the aggregate economy and its sectors and to the actions of the government. With respect to the government, statistics is a monitoring device. With good and informative statistics, the actions of this "agent" are no longer hidden, they are open to anybody who is interested, including to the outside investor. This is similar to the role of financial statements in the relationship to a company with its outside investors.

Second, perhaps even more important, official statistics acts as a commitment device. Statistics is costly, and adopting international standards is difficult and time-consuming. Doing so, however, will underline the government’s willingness to behave accountably.

It is a costly signal, but it is an effective one. Once the generally accepted international standards have been established, they cannot be dismantled without the rest of the world noticing. Committing to the international standards of official statistics is therefore a key part of what a government can do to make a credible commitment to good governance and accountability.

The role of official statistics in the credibility of economic policy can easily be compared to the role of external accounting for the financing of a company. Nobody would provide funds, credit or equity, to a company that is not willing to set up informative annual accounts or that refuses to comply with the generally accepted rules of accounting. This is why companies willingly pay a lot of money for outside evaluation of their accounts. In a nutshell, official statistics is the accounting of the government, above and beyond the budget. Putting statisticians into prison for handing out the "wrong" results to the public is more detrimental to investment conditions than publishing those "wrong" results could ever be.

Historically, the focus of interest was more on the direct value of statistical information for decision-makers in government, very often for military purposes.[3] Concerning the task of making investment attractive however, the information value to outside investors is crucial: both directly and as a signalling device in order to make the commitment of the government credible. In the logic of the Compact with Africa, it is an essential task for African countries to take up the challenges of creating and maintaining statistical systems that adhere to international standards, and for the international community it is crucial to support African countries in this endeavour. The IMF assistance for statistical development can be considered a case in point.

3 Governance and Statistical Standards

As a result of research over the past two decades, the importance of institutional settings for development outcomes is almost universally acknowledged.[4] Regarding statistics, there are two, partly independent, lines of evolution regarding international standards for statistical production, both of them the offspring of traumatic experiences in economic history.

[3] A very old and detailed account of a population census among Semitic desert dwellers for the purpose of collecting information on military strength may be found in the Book of Numbers, which is part of the Jewish Tanach and of the Old Testament of the Christian Bible.
[4] For a highly readable summary with pointed statements, see Acemoglu and Robinson (2012).

3.1 UN Fundamental Principles of Official Statistics

One of them departs from the formulation of the Fundamental Principles by the UN/Economic commission for Europe in April 1992, as decision C(47). The need for a common framework arose quite specifically with the collapse of the Communist bloc when the new transition countries required guidance on how to introduce a statistical system fit for the needs of a market economy. Bodin (2003) stresses that market systems ask a far greater number of people to take informed economic decisions than centrally planned economies do. Such decisions imply the use of adequate information systems and, in particular, sound and relevant statistical information. Moreover, it was vital for statisticians to gain the confidence of the general public in the information they were to produce.

Statisticians from central and eastern Europe were quick to recognise that economic and social statistics should be both legitimate and credible, satisfying the following criteria:

> *Impartiality*: Statistics should be produced in an objective and independent way, removed from any pressure coming from political or other interest groups, particularly regarding the choice of techniques, definitions, concepts and methodologies.
>
> *Reliability*: Statistics should reflect as closely as possible the reality they represent; to this end, only scientific criteria should be used to select the sources, methods and procedures that are used.
>
> *Relevance*: Statistics should be compiled only if they meet recognised needs for a large variety of users.
>
> *Transparency*: Official authorities in charge of the collection and production of statistics should also make public all information on the sources, methods and procedures, as well as on the laws, regulations and measures under which the statistical system operates.

From this kernel, a set of "ten commandments" was created at a conference of European Statisticians in 1991. These were summarised by Willem de Vries under the following headings:[5]

1. Relevance, impartiality and equal access
2. Professionalism
3. Accountability
4. Prevention of misuse
5. Cost-effectiveness
6. Confidentiality
7. Making public legislation

[5] For a historical account regarding the Fundamental Principles, see Bodin (2003). Seltzer (1994) gives a contemporaneous discussion of the underlying problems and may be read as an interpretation of the Principles. He discusses both the dangers to statistical integrity and the factors that are conducive to their strengthening. The agency background of the standards becomes very clear: There are many short-run incentives for government to exercise influence on the results of statistical work, and also many ways of doing so. Among them, direct falsification is not among the most common, as it is difficult to falsify consistently and statisticians' resistance is high.

8. National co-ordination
9. International co-ordination
10. International statistical co-operation.

These keywords have stood the test of time; they are almost identical to the ones in the UN "implementation guideline" as of 2013. In April 1992, the UN/ECE accepted the Fundamental Principles, and the UN Statistical Commission adopted them in 1994 as the UN Resolution on Fundamental Principles of Official Statistics. Today, they are the basis of very detailed handbooks, both in supranational organisations such as Eurostat and the UN, and in national statistical agencies such as the Statistical Offices in Germany or Canada. Notably, the African Charter on Statistics of 2009 is directly based on the Fundamental Principles.[6]

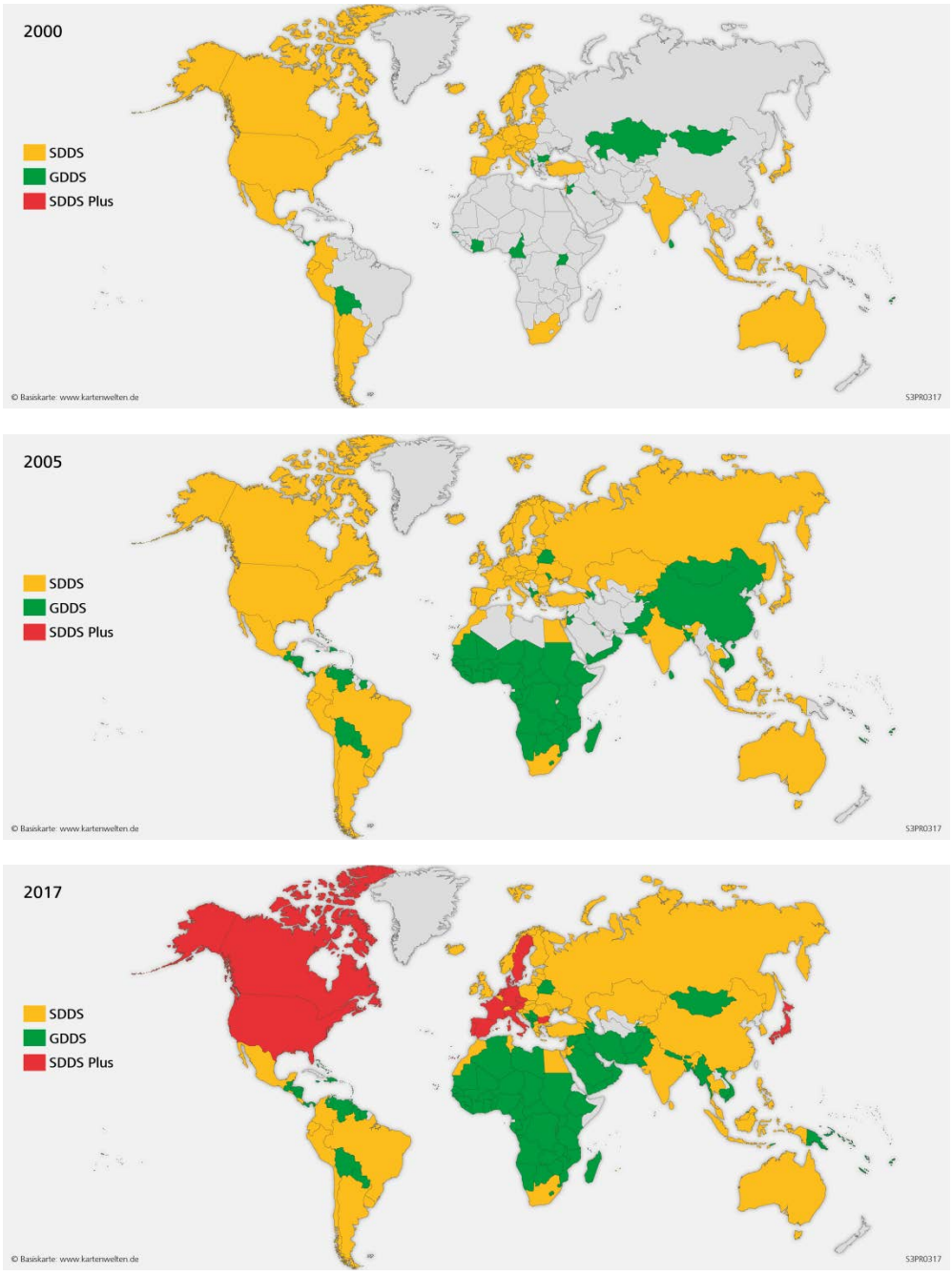
3.2 IMF Data Dissemination Standards

The second line of evolution derives from the IMF's urge to enhance transparency and comparability of the statistical data of its member countries. As a result of the major disruptions on the capital markets caused by the Asian Crisis, the Special Data Dissemination Standard (SDDS) was established in 1996 to guide members with (potential) access to international capital markets in providing their economic and financial data to the public. The General Data Dissemination System (GDDS) was established in 1997 for member countries with less developed statistical systems as a framework for evaluating their needs for data improvement and setting priorities. In 2012, the SDDS Plus was created as an upper tier of the IMF's Data Standards Initiatives to help address data gaps identified during the global financial crisis. In 2015 the enhanced GDDS (e-GDDS) replaced the GDDS. Today, there are 110 participants in the e-GDDS, 60 SDDS subscribers, and 14 SDDS Plus adherents. The UN Fundamental Principles, outlined above, are an integral part of the IMF dissemination standards, but the essence of the latter is technical in nature, being based on international conventions, such as the Standard of National Accounts or the Balance of Payment Manual.

This paper intends to make a contribution to the role of governance for investment in Africa. Thus the focus will be on GDDS, as it was developed for countries with little access to capital markets. Most of the poorer countries, in fact almost all African countries, adhere to it. Chart 1 gives a visual impression of the adoption of the IMF statistical standards over time and space.

[6] https://au.int/en/treaties/african-charter-statistics

Chart 1: Diffusion of statistical dissemination standards: 2000, 2005 and 2017



While the SDDS and the SDDS Plus standards have a strong focus on strict rules and their monitoring, the GDDS is more flexible, with an emphasis on evolution and development.[7] On the part of adopters, the GDDS is in essence a firm commitment, a promise: IMF members that participate agree to use the GDDS as a framework for

[7] The rest of this paper will not distinguish between GDDS and its successor e-GDDS, using the designation GDDS for both.

statistical development, designate a country coordinator, and prepare descriptions of current statistical production and dissemination practices and plans for their improvement for posting publicly on the IMF Dissemination Standards Bulletin Board (DSBB).[8] The IMF, for its part, provides extensive technical assistance. In this way, the GDDS approach to statistical governance is very much a precursor of the G20 Compact with Africa.

4 Related work

There are a number of earlier empirical studies on the role of transparency for direct investment. Daude and Fratzscher (2007) look at the role of information frictions for foreign direct investment and portfolio investment in general terms, using, among other things, indicators for transparency and information disclosure. Harding and Javorcik (2011) investigate the effects of investment promotion on the inflow of US foreign direct investment. There is also a growing recent literature on the effects of adopting SDDS or SDDS+ on FDI, see Gelos and Wei (2006), Hashimoto and Wacker (2016) and Choi and Hashimoto (2017). This paper contributes to this literature, first, by focusing on poorer countries, for which the adoption of SDDS is not possible or meaningful, and second, by shedding more light on the role of commitment.

5 Empirical strategy

We combine data on the net incurrence of foreign direct investment liabilities according to BPM6 (henceforth: net incurrence FDI) and some aggregate variables on economic activity with the dates of subscription to GDDS, namely the years in which the metadata on the existing statistical system and the plans for development were published. We compare the flows of net FDI liabilities in two steps. First, we formally compare the distributions of net incurrence FDI (normalised by total investment and GDP) conditional on whether the country followed GDDS in the given year, using a non-parametric approach. This is done for three groups of countries: a) a group of developing and emerging countries in the entire world, b) a set of countries in Africa and the Middle East, and c) the Sub-Saharan countries. Second, by means of parametric regression, we eliminate both time effects and country fixed effects from the observations. This amounts to a Difference in Difference approach using the panel dimension for identification. In terms of methodology, the approach taken is closest to Hashimoto and Wacker (2016) and to Chemutai and Escaith (2017), a study on the effects of WTO accession. The standard fixed effects estimation is based on minimising the sum of squared residuals. In

[8] See the documentation of the IMF on the GDDS, e.g. on https://www.imf.org/en/About/Factsheets/Sheets/2016/07/27/15/45/Standards-for-Data-Dissemination

order to cope with the outlier problems in the data on developing and emerging countries and to make better use of heterogeneity for identification purposes, we augment the standard fixed effects estimation with quantile regression. We take account of fixed country effects using the Canay (2011) two-stage estimator.

6 The data

The data on net incurrence FDI, total investment and GDP are from the October 2017 edition of the World Economic Outlook database maintained by the IMF, with annual data between the years 1998 and 2016[9] The GDDS began its existence in December 1997 with the approval of the IMF executive board, so that 1998 yields the first complete year with GDDS as an option for all developing and emerging countries. In 2000, the earliest transmission of metadata for GDDs took place, so that 2001 yields the first complete country years under GDDS. Not for all countries there is official statistical information for all years up to 2016. We use only country information data based on actual statistical reporting, although estimates carried out by the WEO team and the country teams of the IMF for later periods are also available.

The starting point for the construction of the evaluation database are all "emerging and developing countries" according to the IMF categorisation as of 2017, but excluding those countries that are now part of the European Union, as their past direct investment inflow was dominated by the process of integration. The data have current account information and GDP in US$ billions. Data on national investment was converted from local currency to US$ billions using market exchange rates averaged over the year.

Data on GDDS adoption are from the IMF Dissemination Standards Bulletin Board (DSBB).[10] As a date for adoption we interpret the date when country metadata were first posted on the DSBB. In order to allow a comparison between episodes without commitment to GDDS and episodes with a commitment to GDDS, we exclude countries that took up the more demanding SDDS or SDDS+ standard at some point without having adopted the GDDS previously. Specifically, this excludes some of the larger and more technically sophisticated developing and emerging countries that belong to the club of the "founding members" for SDDS, such as India, Russia, Indonesia, South Korea, Mexico, Chile, Morocco, Turkey and South Africa. However, if a country switches from GDDS (or its successor, the e-GDDS) to the more encompassing SDDS or the even more

[9] The estimations and tabulations are based on a download from the Bundesbank image of the IMF WEO-database on 26.10.2017. See http://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx for general information on the WEO database. The country level information on net incurrence FDI is not included in the public use version.

[10] http://dsbb.imf.org/Pages/GDDS/ImportantDates.aspx, accessed on 08.09.2017.

demanding SDDS+ later on, the country years in question are still categorised for the purpose of this study as GDDS episodes.

Successful switchers contained in the final dataset are Jordan, Sri Lanka, Mauritius, Seychelles, Armenia, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, the People's Republic of China and Malta. Countries that never adopted either of the two standards and still provide the necessary current account and national account information needed for this study are Equatorial Guinea and Eritrea. The other countries in the final dataset adopted GDDS at some point between 2001 and 2015.

The final evaluation dataset thus consists of all "emerging and developing countries" outside the European Union that did not adopt the SDDS without having previously followed the GDDS and for which the WEO has data on net incurrence FDI. Table 1 lists the countries in the evaluation dataset and the year when they adopted the GDDS, and, where applicable, the SDDS framework.

The database of Dreher (2006 / 2017) was used for data on the inclusion of countries in IMF programs by country-year.

In interpreting the following results, it is probably too much to expect to find clear-cut effects of isolated variation in the policy on statistical governance. The information policy of countries has many aspects, ranging from press freedom through electoral systems to the treatment of political adversaries, and depending on the priorities of governments and the most important constraints, there will be changes in several of these dimensions at the same time, and these changes will be correlated. Singling out two variables, a measure for statistical governance, on the one hand, and direct investment activity, on the other, will not show effects that can be reproduced by varying statistical governance while leaving everything else as it is. But in the array of choices open to the government, statistical governance may be regarded as an important *pars pro toto* for a country's entire information policy.

7 Descriptives

Table 2A gives descriptive statistics of two FDI ratios: net incurrence FDI to total investment (*IFDI/Inv*), and net incurrence FDI to GDP (*IFDI/GDP*). The descriptive statistics are computed for four datasets that are used in this paper. First is the full dataset, with all values included. The full dataset includes some extreme values on both sides. This can generate influential data points which may determine the outcome of a statistical test. Extreme values are usually due to non-standard circumstances (including data consistency problems), i.e. the data-generating process we want to understand is

suspended. We follow the conventional procedure to eliminate such extreme values. Thus, the second dataset we consider results from cutting off the upper and the lower two percentiles of $IFDI / Inv$ and $IFDI / GDP$. This results in a loss of 84 country years, 5% of the full data. This cleaned dataset is used to study the distribution of $IFDI / Inv$ and $IFDI / GDP$, conditional on whether a country had adopted GDDS by that time.

A third dataset is generated for regression analysis on the basis of logarithms. Conditioning on the existence of logs for both *IFDI* and *Inv* reduces the number of country years by 99 compared to the full sample. Again, these data is subjected to a moderate cleaning of outliers on the basis of deviations from country-specific means: the 2% observations with the largest absolute deviations of $\left(\log IFDI_{i,t} - \log Inv_{i,t}\right)$ from country mean are removed, resulting in a loss of 32 country years.

The regression data set is depicted in more detail in the panels C and D of Table 2. The distribution of the regression variables $\log IFDI$, $\log Inv$, $\log GDP$ and the GDDS indicator is described: for a sample consisting of all 98 countries and for a subsample consisting of countries in Sub-Saharan Africa (41 countries).

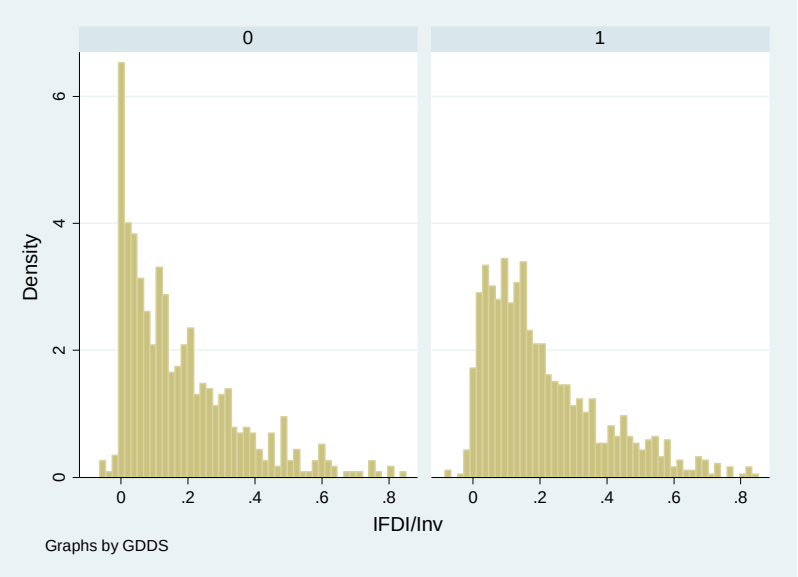
8 The distribution of FDI conditional on GDDS

As a first step in the empirical evaluation of the relationship between GDDS adoption and the foreign direct investment activity in developing and emerging countries, we compare the distribution of the two FDI ratios conditional on whether the country had previously adopted GDDS or not. The results can be seen in Table 3 A and B, for the full sample and the sample after outlier control.

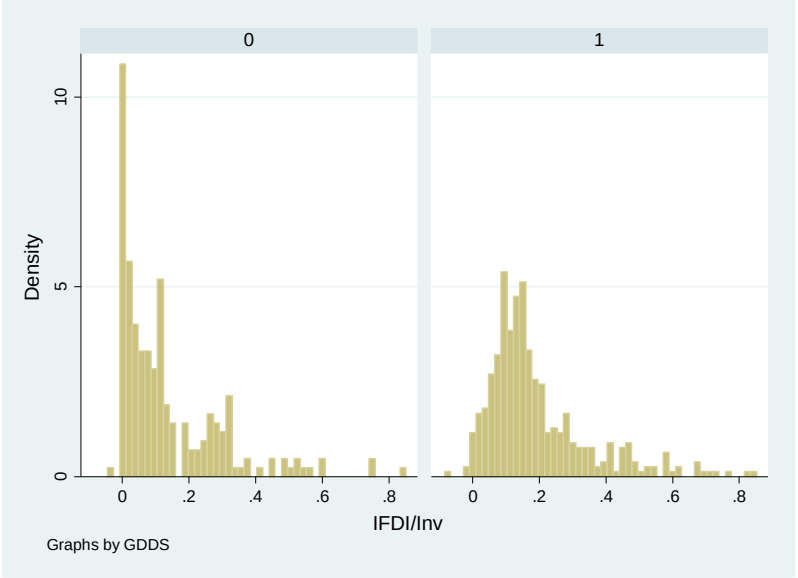
Table 3 makes two comparisons: for the set of all countries and for Sub-Saharan Africa. GDDS episodes (country years) are set against episodes without GDDS. Typically, a given country will be represented in both distributions. Looking first in Table 3A at the comparisons for the full data set (without outlier control), we see marked differences between GDDS episodes and non-GDDS episodes. The mean and, to a lesser extent, also the median of the ratio are clearly larger under GDDS. This is true for both country sets considered in this paper: all countries and Sub-Saharan Africa. The large difference of the means may well be due to the outliers, as some of the large extreme values are GDDS episodes, whereas the difference in medians should be robust.

Eliminating outliers duly reduces the difference of the means; see Table 3B for the data set under outlier control. Graph 1 and Graph 2 show the distribution of net incurrence FDI to total investment for the two sets of countries considered in this paper.

Graph 1: All countries – *IFDI / Inv* under outlier control, conditional on $GDDS = 0$ (left panel) and $GDDS = 1$ (right panel)



Graph 2: Sub-Saharan Africa – *IFDI / Inv* under outlier control, conditional on $GDDS = 0$ (left panel) and $GDDS = 1$ (right panel)



For *IFDI/Inv*, it is 17.3% without GDDS as against 20.9% with GDDS for all countries and 13.2% compared with 19.1% for Sub-Saharan African countries. For Africa, the difference in medians is even larger. For net incurrence FDI as a percentage of GDP, the respective figures are 3.8% compared with 4.9% for the set of all countries and 2.8% as against 4.2% for Sub-Saharan Africa. The difference in medians amounts to 0.7% and 1.4% of GDP for the two sets of countries!

The spike around zero for GDDS = 0 is a cause of concern. Though it is consistent with the effect of information asymmetry, it may also be due to straightforward inability of measuring foreign direct investment.[11] In Table 3C, a third comparison for the log estimation data set is given, where observations with non-positive values have been eliminated. As a consequence, the difference in means and medians is somewhat reduced compared to what is given in Table 3D for the outlier controlled data set.

We perform three non-parametric tests on the equality of the distributions conditional on *GDDS*:[12]

1. The **median test** is based on a count of outcomes from sample 1 larger than the median of the combined sample. Under the null of equal distributions in the two samples, this statistic follows a hypergeometric distribution;
2. The **Mann-Whitney-Wilcoxon test** combines and sorts the outcomes of the two samples and counts the sum of ranks for outcomes of sample 1. If the distribution for sample 1 is situated to the left of the distribution for sample 2, this statistic will be low;
3. The **Kolmogorov-Smirnov test** computes the maximum distance between the empirical distribution functions of two samples. Again, the null distribution of this statistic is calculated under the hypothesis that the samples are drawn from the same distribution.

The tests consider the conditional distributions under $GDDS = 0$ and $GDDS = 1$ as a whole, not focusing on a specific parameter. As may be expected from eyeballing the descriptive statistics and the histograms, all three tests[13] strongly reject the null of the equality of the two distributions, regardless of the group of countries considered and whether or not there was outlier control or elimination of non-positive values for net incurrence FDI.

9 Parametric panel estimates: Fixed effects and quantile regressions

The result of the non-parametric analysis, as clear as it is, may be due to issues that are not related to any causal relationship between the variables considered. Among other things, it may be a consequence of time effects if later years, in which most countries had

[11] Of 1605 observations, 34 or 2.1% have a ratio of zero. The rate is 4.9% without GDDS and 0.4% with GDDS. In Sub-Saharan Africa, exact zeroes are more common: Among 642 observations, 22 or 3.4% are zero. Without GDDS, the rate is 8.9%, and under GDDS, the rate is 0.5%.
[12] For these tests, see, for example, Büning and Trenker (1994).
[13] The test statistics are not reported, but are available from the author.

adopted the GDDS, are generally characterised by more open international capital markets for reasons unrelated to statistical information dissemination. And it may be due to country fixed effects if those countries that adopted the GDDS relatively early on have high rates of foreign direct investment quite generally, unrelated to transparency. Running correlations do indeed show that there is a clear positive relationship between the speed of adopting GDDS and the initial level of *IFDI*.

For a closer investigation of the distribution of *IFDI* conditional on *GDDS*, a more parametric approach is needed. In order to remove time effects and country fixed effects, we make some basic linearity assumptions. We test whether, conditional on $\log Inv$ and $\log GDP$ and a full set of year dummies to control for time effects, as well as on level shift effects that can be identified for the country in question, the mean of $\log IFDI$ is different according to whether $GDDS = 0$ or $GDDS = 1$. Here, $\log GDP$ and $\log Inv$ are meant to control for market size and the overall investment and capital formation activity. It is important to state clearly that we are *not* trying to find and estimate a parametrised economic model for the net incurrence of foreign direct investment liabilities.

The baseline fixed effects regression equation is

$$\log IFDI_{i,t} = \beta_0 GDDS_{i,t} + \beta_1 \log GDP_{i,t} + \beta_2 \log Inv_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \qquad (1)$$

In this equation, the subscript *i* denotes the country, and subscript *t* denotes time. The constant is subsumed in the full set of year dummies, γ_t. This regression will control for pure time effects, identical for all countries, as well as country fixed effects that are identical for all observations on a given country. Such country effects may account for the structural differences between, say, an open and resource-rich country like Nigeria and landlocked Nepal.

Note the presence of the country-specific shift-parameter α_i. Technically, this equation may be estimated either by introducing a full set of country dummies or by first converting all variables to their differences from country-specific means, and then performing OLS.[14] What then enters the regression is the difference of the observations from their "normal" level, the country-specific mean. If *GDDS* has a bearing on foreign direct investment, this should show up in a positive deviation from the country-specific mean in the episodes with $GDDS = 1$.

Fixed effects estimation with a full set of time dummies can be interpreted as a straightforward Difference in Difference treatment evaluation using the panel dimension

[14] To obtain unbiased standard deviations, a correction for the loss of degrees of freedom due to α_i is needed.

for identification under restrictive assumptions. The control group is given by episodes without GDDS treatment. Treatment effects are constrained to be identical over time and over countries. Heterogeneity is modelled by a shift parameter. The time dummies filter out movements over time common to all countries. One of these movements is the real exchange rate of the US dollar, as the variables on both sides of the equation are depicted in nominal USD.

The effects of entering a joint standard for statistical governance may be different for rich and poor countries, depending on the availability of resources, economic structure and/or reputation. Given the weight of Sub-Saharan Africa in the current discussions on economic development, it is also interesting to look specifically at how countries in this region are affected. In order to exploit heterogeneity between countries, a variation of the baseline equation will be used:

$$\log IFDI_{i,t} = \beta_{0j} GDDS_{i,t} \cdot g_{ji} + \beta_1 \log GDP_{i,t} + \beta_2 \log Inv_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}. \quad (2)$$

Here, g_{ji} is an indicator variable for whether or not a country *i* belongs to group *j*.

As a safeguard against outliers, all estimations are performed both on the full log estimation data (that is, conditional on $\log IFDI$, $\log Inv$ and $\log GDP$ to be present), and on an outlier-controlled version where the 2% observations with the largest absolute deviations of $\left(\log IFDI_{i,t} - \log Inv_{i,t}\right)$ from the country mean are removed. Descriptive statistics for these datasets can be found in Tables 2 and 3, panels C and D respectively, for the levels of logs and for the ratios $IFDI/Inv$ and $IFDI/GDP$.

The least squares type fixed effects estimations are augmented by a full set of quantile regressions. By focusing on the quantiles of the distribution, quantile regressions allow better exploiting the tremendous amount of heterogeneity in the direct investment data. Furthermore, quantile regression will also yield a crucial additional protection against outliers. Removing outliers requires defining outliers, and any such definition will always be arbitrary. For reasons related to the underlying estimation principle, quantile estimation is much less affected by outliers than least squares type regression in many circumstances.

While standard regressions will estimate conditional expectations of the LHS variable, quantile regressions focus on conditional quantiles. Consider the conditional distribution $F\left(y|\mathbf{x}\right)$ of a variable y, given a vector of variables x. A median regression, for example, will quantify how the median of the conditional distribution of y is related to the conditioning variables, x:

$$Q_{0.5}\left(y\middle|\mathbf{x}\right)=\mathbf{x}'\beta_{0.5}.$$

Koenker and Bassett (1978) have shown that consistent estimators can be obtained by *minimising the sum of absolute deviations*. Thus, the median estimator is much more robust to outliers than are standard regressions, which focus on conditional means and *minimising squared deviations*. In a similar way, conditional quantile functions for the τ th quantile are defined as

$$Q_{\tau}\left(y\middle|\mathbf{x}\right)=\mathbf{x}'\beta_{\tau},$$

and β_{τ} will be estimated by minimising an appropriately weighted sum of absolute deviations:[15]

$$\hat{\beta}_{\tau}=\arg\min_{\hat{\beta}_{\tau}}\sum_{i:y_i<\mathbf{x}_i'\beta_{\tau}}^{n}\left(1-\tau\right)\left(y_i-\mathbf{x}_i'\beta_{\tau}\right)+\sum_{i:y_i\geq\mathbf{x}_i'\beta_{\tau}}^{n}\tau\left(y_i-\mathbf{x}_i'\beta_{\tau}\right).$$

The quantile regression version of equation (2) is

$$\log IFDI_{it}=\beta_{\tau 0 j}GDDS_{it}\cdot g_{ji}+\beta_{\tau 1}\log GDP_{it}+\beta_{\tau 2}\log Inv_{it}+\alpha_i+\gamma_{\tau t}+u_{\tau it}, \quad (3)$$

with τ denoting the quantile and $\mathbf{x}_{it}$ the country and time-specific explanatory variables $\log Inv_{it}$ and $\log GDP_{it}$. Concerning the error term $u_{\tau i}$, the identifying general quantile restriction $Q_{\tau}\left(u_{it}\middle|i,t,g_{ji},\mathbf{x}_{it},GDDS_{it}\right)=0$ applies.

Note that, unlike the estimated coefficients, the shift term α_i is *not* assumed to be specific to the quantile to be estimated. Assuming a fixed shifter allows using the two stage procedure developed by Canay (2011). In the first stage, the fixed effect is estimated using an ordinary fixed effects equation, i.e. on the basis of equation (1) or (2). In the second step, it is eliminated from the left-hand side variable, and the equation is estimated using the standard quantile regression routines by Koenker and Basset (1978).[16] Directly conditioning on the country identifier in a quantile regression will lead to a large number of ancillary parameters that will make the estimation inconsistent. Standard deviations are to be computed using the bootstrap for both stages. Standard errors and test statistics are calculated based on a number of 100 replications.

In carrying out the bootstrap, it would not be correct to randomly draw country-year episodes. Even conditional on a fixed effect the error terms for observations *within* a given country cannot assumed to be independent. Assuming arbitrarily high dependence *within*

[15] See Koenker (2005) for a thorough treatment, and Koenker and Hallock (2001) or Cameron and Trivedi (2005), Section 4.6 for introductions.
[16] See Egger et al (2015) for an application in a similar statistical context.

countries but independence *between* countries, a block-bootstrap can be used. In a given resampling step, all observations of country *i* will be either included or excluded. Doing this, the observations of country *i* are effectively being treated as one single observation. The resulting estimates for the standard deviations are rather conservative, as the procedure certainly exaggerates the amount of correlation between different episodes of country *i*, but there is no operational way of explicitly modelling the interdependence of observations. Consistent with this procedure, the standard errors for equations (1) and (2) in the fixed effects setting are also estimated as robust using the country ID as a cluster variable.

10 Results of parametric estimation

Consider first the fixed effects estimates in Table 4 and Table 5 for the full sample and the outlier controlled version, respectively. The number of observations is 1,590 for the full data in Table 4 and 1,558 for the restricted version in Table 5, in both cases from 98 countries. Roughly 40% are from Sub-Saharan Africa: 651 observations in the unconstrained dataset and 627 in the constrained version, from 41 countries. Column 1 in Table 4 and Table 5 each depict the baseline estimate of Equation (2), the subsequent columns 2 to 5 show estimates of Equation (3) allowing for group-specific heterogeneity in the coefficient of GDDS. The first two lines show the estimated coefficients of $\log GDP$ and $\log Inv$. They do not vary very much over the different specifications: the coefficient of $\log GDP$ is slightly below 0.5 and in most cases significant at the 5% level, the coefficient of $\log Inv$ is near unity and strongly significant. Standard deviations in the outlier-controlled version are clearly lower; the values of R squared are higher.

The baseline estimate in column (1) for all countries shows a coefficient on GDDS that is negative, but insignificant for both versions of the dataset. This changes when heterogeneity is considered. Distinguishing first between Sub-Saharan Africa and the rest of the world leads to a GDDS coefficient that is negative and significant for the rest of the world, and positive and insignificant for African countries. The difference of the two coefficients is significant, for the restricted data set only at the 10% level. The GDDs coefficient for Sub-Saharan Africa is much lower in the restricted sample, indicating considerable sensitivity in the estimates on Africa. This has been confirmed in more specific investigations.

This evaluation is repeated for a distinction between rich and poor countries. To minimise endogeneity issues, wealth is measured by the average of PPP per capita income in USD during the first three periods available, in most cases this is the period 1998-2000. A

"richer" country's indicator is above the median, a "poorer" country is situated below. Column (3) shows that this distinction produces a similar picture. Coefficients are negative and significant for richer countries, positive and insignificant in poorer countries. The difference between coefficients is significant at the 5% level for both versions of the data.

It is interesting to check whether these are really different results or rather two views of the same underlying distinction, given that the PPP per capita is low in many parts of Sub Saharan Africa. In Column (4) of Tables 4 and 5, separate results are shown for poorer African countries, richer African countries, poorer countries in the rest of the world and richer countries in the rest of the world. The same distinction between richer and poorer countries holds, with a difference between richer and poorer countries of around 0.3 in Africa and 0.2 elsewhere, with the levels of both being considerably higher in Africa than in the rest of the world. The large negative coefficient for the richer rest of the world is significant at the 1% level, the other coefficients are not significant. The pattern seems to vindicate a more parsimonious specification that features richer countries, poorer countries and a uniform Africa effect. This estimate results in a large and significant negative coefficient on richer countries, a much smaller and insignificant negative effect on poorer countries and a positive shift coefficient on Sub-Saharan Africa, which is significant at the 5% level for the full dataset and insignificant for the restricted version.

Now turning to the Canay panel quantile regression estimates in Tables 6 and 7, for each of these specifications there are three estimates for the quantiles 0.25, 0.5 and 0.75, respectively. The basic pattern is consistent with the fixed effects estimation. For the baseline estimation in column (1), *GDDS* coefficients are lower for the higher quantiles, which is loosely in line with the result from fixed effects estimation that the *GDDS* coefficient is lower for richer countries. For the restricted data, we obtain a significant negative coefficient for the 0.75 quantile. Distinguishing between countries in sub-Saharan Africa and in the rest of the world, coefficients are again positive for African countries and negative for the rest of the world. The differences are strongly significant for the full dataset, whereas they are somewhat less marked in the restricted data. For the second distinction we make, the coefficients are clearly negative and significant for rich countries, for all quantiles and for both datasets. Also, the differences between rich and poor are significant, with a value of around 0.3 in the restricted dataset and a somewhat higher value in the full sample. The results from column (4) distinguishing four types according to income and region yield an outcome that is similar to that of the fixed effects estimation, but it is noted that coefficients become smaller with higher quantiles. Specification (5), featuring richer and poorer countries and a shifter for Sub-Saharan Africa, again shows small negative coefficients for poorer countries, as well as large and

significant negative coefficients for richer countries and a numerically strong upward shifter for the African region. Just as in the FE regressions, this shifter is significant at the 5% level for the estimates in the full sample and not significant at conventional levels for the restricted dataset.

The negative regression coefficient of GDDS for richer countries and for countries outside Sub-Saharan Africa is unexpected a priori. It gives reason to worry about endogeneity: The adoption of GDDS may be part of a process of IMF involvement in times of crisis. A crisis may trigger both a decrease in direct investments and IMF involvement, and GDDS adoption may thus be contemporaneously correlated with a reduction of *IFDI*. In order to explore this possibility, an indicator for the existence of any IMF program in a given country-year was constructed from the Dreher (2006 /2017) database on IMF programs. Preliminary tests with FE and QR regressions resulted in coefficients on IMF programs that were negative and insignificant throughout, and did not lead to changes in the pattern of the reported results.[17]

11 What have we learned?

First of all, it is extremely interesting to observe the conflicting messages from the first, descriptive and non-parametric part of the investigation and the second part, where steps were taken to eliminate time effects and country fixed level effects. Eliminating time effects removes common trends in *IFDI* and *GDDS*. Direct investment has been expanding in all parts of the world, and the GDDS standard has become ever more prevalent over time: it was quite an exception at the beginning of the observation propose, and was almost universal at the end. Eliminating fixed effects also takes account of the fact that it was the countries with the highest inward investment activity that first introduced GDDS.

Parametric estimation has several disadvantages: many of the choices that have to be made are essentially deliberate, and many of the technical assumptions are, strictly speaking at least, very unlikely to be true. At a very basic level, however, parametric methods are indispensable for bringing to bear our knowledge of the world on the analysis.

Data cleaning procedures are essential. Even with quantile regression, the choice between the full dataset and the restricted version has a distinctive effect, mostly on the significance of differences. This may be partly due to the fact that the fixed effect in the

[17] Results not reported. The database of Dreher (2006) was updated in 2017. For all countries of the database of this paper except Nauru, it includes the participation in 8 IMF programs by country-year. Program participation is recorded until 2015, leading to a loss 2016 data in the regressions.

Canay (2011) two-stage framework is found by running a regression on mean deviations in the first stage.

Second, there is no uniform effect of GDDS on direct investment activity in developing countries, let alone a positive one. Heterogeneity is important. We have seen that, generally, after eliminating time effects and country fixed effects, there is a negative relationship between the introduction of GDDS and subsequent *IFDI* performance for rich countries and for countries outside Africa, whereas the measured relationship for countries in Sub-Saharan Africa and for poorer countries in general is positive or nil, and insignificant at conventional levels. The difference between the two groups is large and significant in most cases. There is some evidence that the two differential effects are partly independent, i.e. that belonging to the Sub-Saharan African region acts as a kind of shifter effect of GDDS on direct investment. Introducing both differentiations at the same time indicates significant independent effects of the Sub-Saharan Africa region for the full sample and shows insignificant differences in the restricted sample. Using an interaction term of GDDS and the level of purchasing power parity per capita (not shown) leads to similar results: the Africa shifter is significant in the estimates based on the full sample and loses significance in the restricted sample. On the basis of these results, it is not possible to take a firm stand in the debate on whether FDI in Africa is different.[18]

The sizeable difference between rich and poor countries is not surprising. Information asymmetry problems are much graver in poor developing countries, for some of which there is no media coverage and very sparse information apart from official statistics. But how is the negative relationship between GDDS and FDI for more affluent countries and for countries outside Africa to be interpreted on the basis of information economics? Endogeneity of GDDS adoption triggered by IMF involvement does not seem to be the explanation. For richer countries, the relevant alternative to GDDS may not really be refusing to adopt any standard at all, but rather to adopt SDDS, the Special Data Dissemination Standard. SDDS is more stringent than GDDS. By adopting GDDS, countries promise to enter a path that leads to better governance, and to be transparent on methods and plans. But unlike SDDS, there are no immediately binding obligation as to producing certain statistical indicators on the basis of international handbooks and guidelines, following internationally agreed standards. Compared to SDDS, the level of commitment is much lower. Coming back to the initial discussion of information asymmetry and signalling, it is possible that in the case of affluent countries like Saudi Arabia, Kuwait or Bahrein, opting for the less stringent GDDS standard instead of committing to implement international norms is not a positive signal. It is obvious that

[18] See Asiedu (2002).

this can be a bad signal only for those countries that could have done otherwise, not for countries for which the SDDS alternative is, in fact, unattainable.

References

AfDB, IMF, WBG: *The G-20 Compact with Africa.* A Joint AfDB, IMF and WBG Report. G-20 Finance Ministers and Central Bank Governors Meeting . March 17-18, 2017, Baden-Baden, Germany.

Acemoglu, D. and J.A. Robinson, 2012. *Why Nations Fail: the Origins of Power, Prosperity, and Poverty*. New York, Crown Business.

Asiedu, E. 2002. On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different? *World Development* 30 No 1, 107-119.

Bodin, J.L. 2003. The Fundamental Principles of Official Statistics: the Breakthrough of a New Era, in United Nations Statistical Commission and United Nations Economic Commission for Europe: *50 Years of the Conference of European Statisticians: Conference of European Statisticians, Statistical Standards and Studies* – No. ST/CES/54, United Nations, Geneva, Ch 5, 63-77.

Büning, H. and G. Trenker 1994. *Nichtparametrische statistische Methoden.* second edition, Walther de Gruyter, Berlin, New York.

Cameron, A.C. and P.K. Trivedi 2005. *Microeconometrics: Methods and Applications.* Cambridge University Press, Cambridge et al.

Canay, I.A., 2011. A simple approach to quantile regression for panel data. *Econometrics Journal* 14 (3), 368–386.

Chemutai, V. and H. Escaith 2017. Measuring World Trade Organization (WTO) Accession Commitments and their Economic Effect. *Journal of International Commerce, Economics and Policy* 8, No 2, pp 1-27.

Choi, S. and Y. Hashimoto 2017. *The Effects of Data Transparency Policy Reforms on Emerging Market Sovereign Bond Spreads.* IMF Working Paper WP 17/74.

Daude, C. and M. Fratzscher 2008. The pecking order of cross-border investment. *Journal of International Economics* 74, 94-119.

Dreher, Axel, IMF and Economic Growth 2006 / 2017. The Effects of Programs, Loans, and Compliance with Conditionality, *World Development* 34 (5), 769-788, update database 2017.

Egger, P.H., F. Seliger and M. Woerter 2016. On the distribution of patent citations and its fundamentals. *Economic Letters* 147(C), 72-77.

Gelos, R.G. and S.J. Wei 2005. Transparency and international portfolio holdings, *The Journal of Finance*, 9 (6), 1445-1475.

Harding, T. and B.S. Javorcik 2011. Roll out the red carpet and they will come: investment promotion and FDI inflows. *The Economic Journal* 121, 1445-1476.

Hashimoto, Y. and K.M. Wacker 2016. The role of risk and information for international capital flows: New evidence from the SDDS. *Review of World Economics* 155(3), 529-557.

Holmström, B. and J. Tirole 1997. Financial intermediation, loanable funds and the real sector. *Quarterly Journal of Economics* 112, 663-692.

Jensen, M.C. and W.H. Meckling 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4): 305–360.

Koenker, R. 2005, *Quantile regression*. Cambridge University Press, Cambridge et al.

Koenker, R. and G. Bassett 1978. Regression quantiles. *Econometrica* 46, 33-50.

Koenker, R. and K.F. Hallock 2001. Quantile regression. *Journal of Economic Perspectives* 15, 143-156.

Seltzer W. 1994, *Politics and Statistics: Independence, Dependence of Interaction?* United Nations Department for Economic and Social Information and Policy Analysis, Working Paper Series No. 6, United Nations, New York.

Stiglitz, J. and A. Weiss 1981. Credit rationing in markets with imperfect information. *American Economic Review* 71, 393-410.

Tirole, J., 2006. *The Theory of Corporate Finance.* Princeton University Press, Princeton and Oxford.

Table 1: Country data in the evaluation dataset

Country	Year of GDDS adoption	Year of SDDS adoption	Country	Year of GDDS adoption	Year of SDDS adoption	Country	Year of GDDS adoption	Year of SDDS adoption
Bolivia	2000		Sri Lanka	2000	2015	Mauritania	2004	
Dominican Republic	2005		Timor-Leste, Dem. Rep. of	2012		Mauritius	2000	2012
Guatemala	2004		Maldives	2011		Mozambique	2003	
Haiti	2009		Nepal	2001		Niger	2002	
Honduras	2005		Pakistan	2003		Nigeria	2003	
Nicaragua	2005		Palau	2013		Zimbabwe	2002	
Panama	2000		Vietnam	2003		Rwanda	2003	
Paraguay	2001		Djibouti	2012		Sao Tome and Principe	2004	
Venezuela, Rep. Bol.	2001		Algeria	2009		Seychelles	2006	2015
Bahamas, The	2003		Angola	2004		Senegal	2001	
Barbados	2000		Botswana	2002		Sierra Leone	2003	
Grenada	2001		Burundi	2011		Namibia	2002	
Guyana	2011		Cameroon	2000		Sudan	2003	
Belize	2006		Cape Verde	2004		Swaziland	2003	
Jamaica	2003		Central African Rep.	2004		Tanzania	2001	
St. Kitts and Nevis	2000		Chad	2002		Togo	2001	
St. Lucia	2000		Comoros	2013		Uganda	2000	
St. Vincent and the Grenadines	2000		Congo, Republic of	2003		Burkina Faso	2001	
Suriname	2004		Congo, Democratic Republic of	2004		Zambia	2002	
Trinidad and Tobago	2004		Benin	2001		Solomon Islands	2011	
Bahrain, Kingdom of	2008		Equatorial Guinea	-		Fiji	2000	
Iran, Islamic Republic of	2012		Eritrea	-		Armenia	2001	2003
Iraq	2009		Ethiopia	2002		Azerbaijan	2001	
Jordan	2000	2010	Gabon	2002		Albania	2000	
Kuwait	2000		Gambia, The	2000		Georgia	2006	2010
Lebanon	2003		Ghana	2005		Kazakhstan	2000	2003
Saudi Arabia	2008		Guinea	2003		Kyrgyz Republic	2001	2004
Afghanistan, I.R. of	2006		Cote d`Ivoire	2000		Moldova	2003	2006
Bangladesh	2001		Kenya	2002		China,P.R., Mainland	2002	2015
Bhutan	2010		Lesotho	2003		Serbia, Republic of	2009	
Brunei Darussalam	2004		Madagascar	2004		Bosnia and Herzegovina	2013	
Myanmar	2013		Malawi	2002		Kosovo, Republic of	2011	
Cambodia	2002		Mali	2001				

Table 2: Descriptive Statistics

	# countr	n	mean	sd	min	max	p1	p5	p10	p25	med	p75	p90	p95	p99
A. Episodes, total															
as calculated from WEO data															
IFDI / Inv	98	1689	0.239	0.747	-2.180	22.159	-0.199	0.000	0.012	0.059	0.149	0.297	0.494	0.622	1.126
IFDI / GDP	98	1704	0.056	0.176	-0.462	5.316	-0.039	0.000	0.002	0.012	0.033	0.069	0.113	0.162	0.296
B. Episodes with outlier control															
removing 2 upper and lower pctiles of IFDI / Inv and IFDI / GDP															
IFDI / Inv	98	1605	0.195	0.173	-0.083	0.853	-0.014	0.002	0.018	0.061	0.148	0.284	0.452	0.551	0.727
IFDI / GDP			0.045	0.043	-0.014	0.238	-0.002	0.000	0.003	0.013	0.032	0.067	0.101	0.128	0.199
C. Log estimation data, total															
conditioning on existence of log IFDI, log GDP															
log IFDI	98	1590	-1.409	2.064	-10.362	5.673	-7.305	-5.086	-3.862	-2.622	-1.305	-0.072	0.934	1.580	3.898
log Inv			0.593	1.865	-3.931	8.485	-3.396	-2.239	-1.711	-0.671	0.610	1.596	2.924	3.826	6.131
log GDP			2.113	1.796	-2.628	9.327	-1.671	-0.608	-0.201	0.950	2.116	3.068	4.365	5.261	7.203
GDDS (share in episodes)			63.4%												
Among which: Sub-Sahara Africa															
log IFDI	41	651	-1.938	2.091	-10.362	4.092	-8.213	-5.684	-4.495	-3.009	-1.758	-0.568	0.461	1.061	2.146
log Inv			0.113	1.517	-3.922	4.451	-3.586	-2.479	-1.807	-0.907	0.269	1.080	1.890	2.404	4.056
log GDP			1.710	1.444	-2.628	6.343	-1.910	-0.535	-0.139	0.686	1.828	2.615	3.290	3.864	5.911
GDDS (share in episodes)			67.3%												
D. Log estimation data with outlier control															
removing largest 2% of abs deviations of log IFDI - log Inv from country mean															
log IFDI	98	1558	-1.352	1.967	-8.517	5.673	-6.771	-4.770	-3.735	-2.568	-1.278	-0.066	0.927	1.538	3.790
log Inv			0.608	1.865	-3.931	8.485	-3.383	-2.231	-1.707	-0.643	0.622	1.607	2.937	3.828	6.131
log GDP			2.125	1.800	-2.628	9.327	-1.671	-0.615	-0.223	0.967	2.125	3.074	4.377	5.305	7.203
GDDS (share in episodes)			63.7%												
Among which: Sub-Sahara Africa															
log IFDI	41	627	-1.849	1.888	-8.517	2.228	-7.444	-5.262	-4.241	-2.940	-1.675	-0.568	0.417	0.966	1.798
log Inv			0.142	1.515	-3.922	4.451	-3.584	-2.459	-1.802	-0.854	0.289	1.118	1.912	2.411	4.056
log GDP			1.732	1.454	-2.628	6.343	-1.910	-0.547	-0.144	0.709	1.859	2.643	3.330	3.867	5.911
GDDS (share in episodes)			68.3%												

Table 3: Comparing GDDS episodes and non-GDDS episodes

A. Full data set without outlier control

	n	mean	median	min	max
Net incurrence FDI / total investment (IFDI / Inv)					
All countries					
GDDS = 0	639	0.1793	0.1243	-0.7131	1.9629
GDDS = 1	1050	0.2755	0.1612	-2.1800	22.1588
Sub-Sahara Africa					
GDDS = 0	241	0.1647	0.0840	-0.3576	1.9629
GDDS = 1	455	0.3432	0.1517	-2.1800	22.1588
Net incurrence FDI / GDP (IFDI / GDP)					
All countries					
GDDS = 0	643	0.0399	0.0276	-0.1169	0.4020
GDDS = 1	1061	0.0656	0.0363	-0.4619	5.3161
Sub-Sahara Africa					
GDDS = 0	245	0.0347	0.0174	-0.0870	0.4020
GDDS = 1	466	0.0782	0.0312	-0.4619	5.3161

B. Ratios with outlier control

	n	mean	median	min	max
Net incurrence FDI / total investment (IFDI / Inv)					
All countries					
GDDS = 0	613	0.1730	0.1253	-0.0615	0.8523
GDDS = 1	992	0.2093	0.1592	-0.0832	0.8531
Sub-Sahara Africa					
GDDS = 0	226	0.1320	0.0794	-0.0366	0.8523
GDDS = 1	416	0.1914	0.1486	-0.0832	0.8531
Net incurrence FDI / GDP (IFDI / GDP)					
All countries					
GDDS = 0	613	0.0384	0.0282	-0.0110	0.2381
GDDS = 1	992	0.0492	0.0351	-0.0141	0.2290
Sub-Sahara Africa					
GDDS = 0	226	0.0281	0.0164	-0.0079	0.1918
GDDS = 1	416	0.0422	0.0304	-0.0141	0.2084

Table 3 (continued)

C. Log estimation data, total (log IFDI and log Inv existing)

	n	mean	median	min	max
Net incurrence FDI / total investment (IFDI / Inv)					
All countries					
GDDS = 0	582	0.2038	0.1413	0.0001	1.9629
GDDS = 1	1008	0.2941	0.1698	0.0005	22.1588
Sub-Sahara Africa					
GDDS = 0	213	0.1910	0.1041	0.0001	1.9629
GDDS = 1	438	0.3677	0.1573	0.0017	22.1588
Net incurrence FDI / GDP (IFDI / GDP)					
All countries					
GDDS = 0	582	0.0451	0.0315	0.0000	0.4020
GDDS = 1	1008	0.0702	0.0384	0.0001	5.3161
Sub-Sahara Africa					
GDDS = 0	213	0.0405	0.0200	0.0000	0.4020
GDDS = 1	438	0.0845	0.0334	0.0003	5.3161

D. Log estimation data, with outlier control

	n	mean	median	min	max
Net incurrence FDI / total investment (IFDI / Inv)					
All countries					
GDDS = 0	565	0.2090	0.1479	0.0012	1.9629
GDDS = 1	993	0.2390	0.1705	0.0012	1.8941
Sub-Sahara Africa					
GDDS = 0	199	0.2038	0.1075	0.0012	1.9629
GDDS = 1	428	0.2383	0.1571	0.0017	1.8941
Net incurrence FDI / GDP (IFDI / GDP)					
All countries					
GDDS = 0	565	0.0461	0.0325	0.0002	0.4020
GDDS = 1	993	0.0577	0.0389	0.0002	0.4515
Sub-Sahara Africa					
GDDS = 0	199	0.0433	0.0208	0.0002	0.4020
GDDS = 1	428	0.0551	0.0334	0.0003	0.4209

Table 4: Fixed effects estimation, full sample
Dependent variable: log net incurrence direct investment liabilities

Specification	**1**			**2**			**3**			**4**			**5**		
	coeff	std	*pval %*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*
log GDP	-0.467	0.238	*5.23*	-0.464	0.245	*6.06*	-0.511	0.235	*3.24*	-0.485	0.245	*5.02*	-0.487	0.243	*4.84*
log Inv	1.064	0.144	*0.00*	1.037	0.142	*0.00*	1.000	0.140	*0.00*	1.010	0.141	*0.00*	1.009	0.140	*0.00*
GDDS all crtr	-0.105	0.132	*42.95*												
GDDS Sub-Sahara Africa				0.309	0.214	*15.16*							0.525	0.208	*1.32*
GDDS rest of the world				-0.324	0.121	*0.84*									
Δ				0.633	0.210	*0.32*									
GDDS poorer ctr							0.148	0.188	*43.48*				-0.161	0.176	*36.37*
GDDS richer ctr							-0.332	0.128	*1.12*				-0.401	0.129	*0.25*
Δ							0.480	0.184	*1.05*				-0.240	0.170	*16.20*
GDDS poorer S.S. Africa										0.376	0.246	12.98			
GDDS richer S.S. Africa										0.091	0.289	75.45			
GDDS poorer r.o.w.										-0.179	0.174	30.60			
GDDS richer r.o.w.										-0.392	0.138	0.54			
R-sq within		0.511			0.525			0.519			0.526			0.526	
# obs		1590			1590			1590			1590			1590	
# countries		98			98			98			98			98	

All regressions include a full set of year dummies. Standard deviations are robust with country IDs as cluster variable

Table 5: Fixed effects estimation, outlier controlled sample
Dependent variable: log net incurrence direct investment liabilities

Specification	**1**			**2**			**3**			**4**			**5**		
	coeff	std	*pval %*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*
log GDP	-0.435	0.193	*2.64*	-0.432	0.199	*3.27*	-0.465	0.193	*1.80*	-0.453	0.200	*2.55*	-0.455	0.198	*2.40*
log Inv	1.055	0.112	*0.00*	1.041	0.115	*0.00*	1.009	0.113	*0.00*	1.014	0.115	*0.00*	1.013	0.115	*0.00*
GDDS all crtr	-0.137	0.104	*19.11*												
GDDS Sub-Sahara Africa				0.076	0.174	*66.15*							0.209	0.163	*20.22*
GDDS rest of the world				-0.243	0.103	*1.97*									
Δ				0.319	0.175	*7.15*									
GDDS poorer ctr							0.045	0.151	*76.88*				-0.075	0.144	*60.43*
GDDS richer ctr							-0.296	0.109	*0.75*				-0.322	0.112	*0.48*
Δ							0.341	0.158	*3.30*				-0.247	0.141	*8.22*
GDDS poorer S.S Africa										0.151	0.203	45.89			
GDDS richer S.S. Africa										-0.167	0.175	34.05			
GDDS poorer r.o.w.										-0.102	0.164	53.42			
GDDS richer r.o.w.										-0.310	0.116	0.89			
R-sq within		0.585			0.589			0.590			0.591			0.591	
# obs		1558			1558			1558			1558			1558	
# countries		98			98			98			98			98	

All regressions include full set of year dummies. Standard deviations are robust with country IDs as cluster variable

Table 6: Quantile regressions -- Canay fixed effects estimation, full sample
Dependent variable: log net incurrence direct investment liabilities

Spec	**1**									**2**									**3**								
Quant	**0.25**			**0.5**			**0.75**			**0.25**			**0.5**			**0.75**			**0.25**			**0.5**			**0.75**		
	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*
log GDP	-0.56	0.21	*0.89*	-0.46	0.21	*3.33*	-0.33	0.21	*12.06*	-0.57	0.22	*0.92*	-0.47	0.22	*2.90*	-0.32	0.23	*16.00*	-0.60	0.22	*0.61*	-0.50	0.21	*1.73*	-0.35	0.21	*9.95*
log Inv	1.17	0.14	*0.00*	1.06	0.13	*0.00*	0.91	0.13	*0.00*	1.15	0.13	*0.00*	1.05	0.12	*0.00*	0.88	0.13	*0.00*	1.11	0.14	*0.00*	0.99	0.12	*0.00*	0.83	0.14	*0.00*
GDDS	-0.07	0.14	*59.79*	-0.15	0.11	*17.62*	-0.20	0.13	*12.88*																		
GDDS Sub-Sahara Africa										0.31	0.21	*13.77*	0.29	0.20	*16.07*	0.21	0.23	*36.38*									
GDDS rest of the world										-0.24	0.14	*7.64*	-0.26	0.11	*1.47*	-0.42	0.13	*0.08*									
Δ										0.55	0.20	*0.54*	0.55	0.20	*0.66*	0.63	0.24	*0.73*									
GDDS poorer ctr																			0.19	0.18	*29.09*	0.12	0.18	*48.63*	0.03	0.20	*88.52*
GDDS richer ctr																			-0.31	0.14	*3.10*	-0.27	0.12	*2.95*	-0.42	0.14	*0.35*
Δ																			0.50	0.18	*0.64*	0.39	0.18	*3.00*	0.45	0.21	*3.36*
GDDS poorer S.S Africa																											
GDDS richer S.S. Africa																											
GDDS poorer r.o.w.																											
GDDS richer r.o.w.																											
# obs	1590									1590									1590								
# ctr	98									98									98								

All regressions include full set of year dummies. Standard errors obtained by 100 replications of a block-bootstrap with country ID as cluster variable.

Table 6 (Continued)
Dependent variable: log net incurrence direct investment liabilities

Spec	**4**									**5**								
Quant	**0.25**			**0.5**			**0.75**			**0.25**			**0.5**			**0.75**		
	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*
log GDP	-0.58	0.23	*1.19*	-0.48	0.23	*3.23*	-0.34	0.23	*13.29*	-0.58	0.23	*1.12*	-0.49	0.22	*2.87*	-0.32	0.23	*16.16*
log Inv	1.13	0.14	*0.00*	1.01	0.12	*0.00*	0.86	0.13	*0.00*	1.12	0.14	*0.00*	1.01	0.12	*0.00*	0.83	0.13	*0.00*
GDDS																		
GDDS Sub-Sahara Africa										0.41	0.20	*4.01*	0.49	0.21	*1.91*	0.53	0.24	*2.67*
GDDS rest of the world																		
Δ																		
GDDS poorer ctr										-0.04	0.18	*83.14*	-0.16	0.17	*34.33*	-0.29	0.20	*13.62*
GDDS richer ctr										-0.34	0.15	*1.96*	-0.34	0.12	*0.53*	-0.52	0.14	*0.03*
Δ										-0.31	0.20	*0.04*	-0.17	0.19	*0.35*	-0.22	0.21	*30.26*
GDDS poorer S.S Africa	0.37	0.23	11.27	0.32	0.24	17.20	0.28	0.27	29.20									
GDDS richer S.S. Africa	0.07	0.34	84.06	0.15	0.30	61.84	-0.06	0.36	86.62									
GDDS poorer r.o.w.	-0.07	0.18	68.87	-0.13	0.18	45.27	-0.32	0.19	8.92									
GDDS richer r.o.w.	-0.35	0.15	1.88	-0.34	0.13	0.96	-0.50	0.15	0.10									
# obs				1590									1590					
# ctr				98									98					

All regressions include full set of year dummies. Standard errors obtained by 100 replications of a block-bootstrap with country ID as cluster variable.

Table 7: Quantile regressions -- Canay fixed effects estimation, outlier controlled sample
Dependent variable: log net incurrence direct investment liabilities

Spec	**1**									**2**									**3**								
Quant	**0.25**			**0.5**			**0.75**			**0.25**			**0.5**			**0.75**			**0.25**			**0.5**			**0.75**		
	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*
log GDP	-0.52	0.18	*0.43*	-0.45	0.18	*1.25*	-0.35	0.18	*4.47*	-0.53	0.19	*0.51*	-0.45	0.19	*1.66*	-0.35	0.18	*5.81*	-0.56	0.19	*0.26*	-0.48	0.18	*0.83*	-0.38	0.17	*2.95*
log Inv	1.16	0.11	*0.00*	1.08	0.11	*0.00*	0.96	0.11	*0.00*	1.16	0.11	*0.00*	1.07	0.11	*0.00*	0.94	0.11	*0.00*	1.12	0.11	*0.00*	1.03	0.11	*0.00*	0.90	0.12	*0.00*
GDDS	-0.13	0.11	*23.39*	-0.17	0.10	*9.50*	-0.28	0.11	*1.51*																		
GDDS Sub-Sahara Africa										0.08	0.16	*60.69*	0.06	0.16	*71.75*	-0.05	0.18	*78.46*									
GDDS rest of the world										-0.22	0.12	*7.71*	-0.24	0.10	*1.83*	-0.35	0.11	*0.18*									
Δ										0.30	0.17	*7.64*	0.30	0.16	*6.16*	0.31	0.18	*8.81*									
GDDS poorer ctr																			0.07	0.15	*63.75*	0.03	0.15	*83.20*	-0.06	0.16	*72.96*
GDDS richer ctr																			-0.26	0.13	*4.05*	-0.25	0.12	*3.33*	-0.39	0.13	*0.24*
Δ																			0.33	0.16	*3.85*	0.28	0.16	*7.80*	0.33	0.18	*6.00*
GDDS poorer S.S Africa																											
GDDS richer S.S. Africa																											
GDDS poorer r.o.w.																											
GDDS richer r.o.w.																											
# obs	1558									1558									1558								
# ctr	98									98									98								

All regressions include full set of year dummies. Standard errors. obtained by 100 replications of a block-bootstrap with country ID as cluster variable.

Table 7 (Continued)
Dependent variable: log net incurrence direct investment liabilities

Spec	**4**									**5**								
Quant	**0.25**			**0.5**			**0.75**			**0.25**			**0.5**			**0.75**		
	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*	coeff	std	*pval%*
log GDP	-0.54	0.20	*0.72*	-0.47	0.19	*1.42*	-0.34	0.18	*6.67*	-0.55	0.19	*0.44*	-0.46	0.19	*1.50*	-0.34	0.18	*6.51*
log Inv	1.12	0.12	*0.00*	1.04	0.11	*0.00*	0.88	0.12	*0.00*	1.13	0.11	*0.00*	1.02	0.11	*0.00*	0.88	0.12	*0.00*
GDDS																		
GDDS Sub-Sahara Africa										0.17	0.16	*27.38*	0.20	0.16	*19.19*	0.19	0.16	*24.10*
GDDS rest of the world																		
Δ																		
GDDS poorer ctr										-0.04	0.15	*77.28*	-0.08	0.15	*57.57*	-0.15	0.15	*31.94*
GDDS richer ctr										-0.29	0.14	*3.26*	-0.26	0.12	*2.53*	-0.41	0.13	*0.23*
Δ										-0.25	0.16	*0.27*	-0.18	0.15	*0.24*	-0.25	0.17	*12.74*
GDDS poorer S.S Africa	0.13	0.20	49.65	0.13	0.19	49.78	0.07	0.23	76.23									
GDDS richer S.S. Africa	-0.07	0.26	79.22	-0.08	0.21	69.99	-0.29	0.20	14.37									
GDDS poorer r.o.w.	-0.01	0.16	96.36	-0.06	0.18	74.91	-0.21	0.17	21.70									
GDDS richer r.o.w.	-0.29	0.14	3.56	-0.27	0.12	2.62	-0.39	0.14	0.59									
# obs				1558									1558					
# ctr				98									98					

All regressions include full set of year dummies. Standard errors obtained by 100 replications of a block-bootstrap with country ID as cluster variable.