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For a new instrument supporting regional integration in Africa to be implemented by the African Development Bank

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For a new instrument supporting regional integration in Africa to be implemented by the African Development Bank

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The views expressed in this document are only those of the authors.

Abstract (short)

There is a big, widely recognised, need for regional integration in Africa. Meeting this need is a priority for the African Development Bank. Although significant progress has been made by this Bank to support regional integration, a new commitment and a specific instrument seem to be necessary. The present document outlines this potential new instrument. Once a total amount of finance for regional integration has been established, the Bank and the African Development Fund would allocate resources to countries according to an Indicator of Need for Regional Integration (INRI). The indicator proposed is an average (preferably geometric) of an index of the size of the domestic market and an index of the distance from export markets, a distance which would itself be adjusted according to the quality of infrastructure. The Regional Drawing Right (RDR) from the amount available would depend on this indicator, on the relative share of population within the eligible countries, and possibly on an index representing the commitment of the country to regional integration.

Résumé (bref)

Il existe un besoin majeur et amplement reconnu d'intégration régionale en Afrique. Répondre à ce besoin est pour la Banque africaine de développement un objectif prioritaire. Bien que des progrès substantiels aient été accomplis dans le soutien à l'intégration régionale, un engagement plus important impliquant un instrument d'appui spécifique semble nécessaire. Le présent document esquisse ce que pourrait être cet instrument. Une fois établie l'enveloppe de ressources que l'on souhaite consacrer à l'intégration régionale, celle-ci serait répartie entre les pays selon leurs besoins d'intégration régionale, la répartition concernerait selon deux enveloppes distinctes les pays seulement BAD et les pays FAD. Le besoin d'intégration régionale serait déterminé en fonction d'un indicateur construit à cette fin. L'indice proposé est une moyenne (de préférence géométrique) d'un indice d'étroitesse du marché intérieur et d'un indice d'éloignement des marchés extérieurs, éloignement lui-même ajusté de la qualité des infrastructures. Le droit de tirage sur l'enveloppe régionale dépendra lui-même de cet indice, de la part de la population du pays dans la population totale des pays éligibles et éventuellement d'un indice représentant l'engagement du pays en matière d'intégration régionale.

Detailed summary:

It is widely recognised that regional integration of African economies is essential to their development, and that the African Development Bank plays a crucial role in this. The present document proposes three measures likely to increase the Bank's impact in this context.

- 1. A new definition of operations of regional interest which would help give more importance to projects' regional impact than to their bi- or multi-national localisation. Regional integration projects would be defined as follows:- they should promote closer economic (financial, commercial or migratory) relations between two or more African countries. If this definition generally fits multinational projects, it is also applicable to projects of national scope.*
- 2. Increased resources dedicated to regional operations are desirable, particularly by mobilising additional funds for this specific goal, both from the African Development Bank and the ADF (these could exceed 20% of the latter's resources). Expanding the notion of regional integration projects beyond their multinational dimension, and systematically analysing their impact on integration could help justify an increase in resources dedicated to regional operations. This increase is a necessary premise for the third measure proposed in this document.*
- 3. The main goal of this document is to outline and propose a new system for the allocation of resources for regional projects, correcting the shortcomings of the system currently in use by the ADF (in particular concerning threshold effects), which would encourage countries to become more involved in regional projects. This system could also be applied to projects set up by countries eligible for ADB resources only.*

This new system is based on a definition of a "need for regional integration" indicator for each country, which would help determine the relative share of regional integration resources it could receive. The country's own contribution towards the regional integration project would no longer be levied from its national allocation, as has been the case so far, but taken out of its "Regional Drawing Right" (RDR). It is proposed that the RDR be primarily determined using two indicators: one determining the size of the domestic market, and the other reflecting the distance from export markets. A third index could be used to take into account the involvement of the countries in regional integration. In this way the indicator used to calculate the need for integration could reflect a need "perceived" by each country.

The adequacy of the proposed measures are tested through a series of simulations applied to ADF recipient countries, and to all African countries (not taking into account the involvement of countries as regards regional integration).

- 4. Finally, we suggest a few further measures to support regional integration, in the form of budget aid for countries in support of the regional coordination of economic policies (this would serve in particular to compensate the fiscal losses associated with the creation of a customs union, or providing support to regional institutions (with no specific guarantees from the national states). These measures would help consolidate the institutional aspect of regional integration.*

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Introduction

Because of the small demographic and economic size of most African countries, the great need for regional integration in Africa is widely recognised. The shortfall in regional infrastructure, be that in telecommunications, transport, or energy supplies, contributes to the low amount of transactions between African countries (even neighbouring countries), and to their relatively low economic growth rates. A recent study on the potential economic gains of more integration of countries within certain African country groupings evaluates these gains to be close to 2%¹. In spite of fifty years of promoting regional integration as a key element for Africa's development, its progress remains stunted by nationalism in fledgling countries as well as their frequent fragility, making them reluctant to get involved in long-term collective projects. Other factors in the slow progress of integration are the unwieldy regional processes and procedures, the absence of reliable analysis of the impact of integration projects, and the insufficient funding dedicated to these projects.

The African Development Bank is in a particularly advantageous position when it comes to overcoming these challenges :

- by respecting the sovereignty of those states which need to take ownership of economic policies
- by taking into account the fragility of certain states
- by proposing simple, straightforward procedures which could mobilise new resources
- by relying on a solid analysis of the expected impacts of integration.

Increasingly, over a number of years, the African Development Bank has financed regional projects, mainly in infrastructure. The proportion of ADF (out of the specific ADF budget and its national allocations) and of ADB window dedicated to regional operations is higher than that of other multilateral institutions (4.6% from the IDA, and 7.2% for IDA allocations to African countries; IDA 2007c Appendix 3, as in 2010 it made up nearly 15% of the total funding.

Three measures could be taken to increase the African Development Bank's contribution towards the regional integration of African economies. First, it would be useful to determine and adopt a new definition for "operations of regional interest", by prioritising operations' regional impact over their bi- or multi-national dimension. Secondly it would be desirable to increase the share of ADF and ADB funding dedicated to regional operations and to mobilise additional resources for these projects. Finally, it would be useful to set up a new system for the allocation of resources devoted to regional projects. This system could correct the shortcomings of the system currently in use by the ADF, encourage states to get involved in regional projects, and also be applied to projects set up by countries eligible for ADB resources only. This new system would be based on the definition of an indicator of "need for regional integration", specific for each country, which would help determine the relative share of funding available to them for regional integration projects.

¹ Ferdi, *Evaluation des gains attendus de l'intégration régionale dans les pays africains de la Zone franc*, A report for the Ministry of Finance of the Franc area, September 2012

1. Broadening and specifying the definition of regional integration projects

Today, a regional integration operation is usually defined as any operation which involves costs and benefits in two or more countries, and which clearly contributes to regional integration or to the supply of regional public goods². Therefore, based on the ADB's information system, multinational operations (which therefore have regional scope), are operations happening within two or more countries. If only those multinational operations which effectively contribute to regional integration are eligible for support from the ADF, it appears that this is not necessarily true of all multinational operations funded by the ADB.³ Moreover some operations done within one country can have considerable regional impact. Typical examples are the improvement of roads, or of ports in coastal countries, which facilitate transport to landlocked countries, or the establishment of nationally based training centres which also attract students from other neighbouring countries.

This is why regional integration projects should be defined as projects leading to an intensification of economic relations, be they financial, commercial or migratory, between two or more African countries⁴. The durability of this intensification is obviously a major consideration. If a project's multinational nature (because of its financing or its implantation) will usually lead to such intensification, national projects can also contribute. It is therefore crucial to take into account the analysis of the expected impact of projects when deciding which are qualified for financing within the budget allocated to regional operations.

Broadening the definition of regional integration projects beyond their multi-nationality and a more systematic analysis of their impact on integration are two reasons to justify a further increase in the share of funding devoted to regional operations by the ADF. As we will see, this increase is essential to the implementation of the instrument proposed in this document.

2. Increasing the share of resources dedicated to regional operations.

Looking at the ADB group's operations as a whole between 2000 and 2010, the percentage of multinational operations increased from 5.9% to 15.4% of the total number of approved projects⁵. The budget for regional operations in countries eligible for ADF funding increased from 5% with ADF-8, to 10% with ADF-9, to 15% with ADF-10, to 17.5% with ADF-11 and 20% with ADF-12. This percentage should remain constant with ADF-13. This evolution in the ADF's budget devoted to regional operations is all the more justifiable since the ADB can no longer cope with the volume of

² CF African Development Bank Group, « Strategic and operational framework for regional operations » ADF/BD/WP/2008/16, p.9

³ African Development Bank Group « Promouvoir l'intégration régionale en Afrique : Evaluation des opérations multinationales du groupe de la Banque sur la période 2000-2010. Rapport de synthèse », Département de l'évaluation des opérations (rapport préparé par Albert-Eneas Gakusi, sous la direction d'Odile Kessler), AFD/BD/WP/2012/70, p.4

⁴ P.Guillaumont « Financement international et intégration régionale : une typologie des actions à caractère régionale » Annexe au rapport *La coopération régionale et le financement des investissements dans l'UMOA*, Banque Ouest Africaine de Développement, January 1978.

⁵ Cf. African Development Bank Group, 2012, *op. cit.*, p. 5.

requests for ADF funding. In 2011, these reached 128% of the planned available funding for the period 2011 to 2013⁶.

It seems then not only desirable to increase the ADF budget for regional operations, but also to create special funding for countries who can only apply for direct funding from the Bank. The ADB budget for multinational operations breaks down as follows: 65% are distributed through the ADF and only 33% are available through the ADB window⁷. 37 countries are eligible for ADF funding, whereas ADB window concerns 13 countries, plus four countries which use both. The funding devoted to regional integration by each window is approximately proportional to the number of countries. However, this comparison is somewhat misleading because middle-income countries have a bigger economy while their inter-regional relations remain limited, especially in Northern Africa⁸. In any event, the amount of money allocated to regional budgets remains a political choice.

To guarantee an effective use of regional funding in middle-income countries, it would be necessary to make loan terms more attractive, either through preferential rates or redemption periods, or specific guarantee terms.⁹ On the other hand, provisions should be made to ensure these advantages do not deplete the ADF's resources.

The ADB's systematic pursuit of partnerships with the European Union (which also promotes regional integration) and the World Bank, and mutual reliance for the management of regional projects are one way for international partners and African states to reduce costs related to project appraisal and follow-up.

The ADF's current funds allocation system is not completely adequate, even though its official goal is to encourage countries to carry out regional integration operations. On the other hand, countries only eligible for ADB window do not receive the same incentives.

3. Designing a new system for the allocation of resources which encourages regional integration, more effectively than the system currently used by the ADF and applicable to countries eligible for ADB resources only.

The current system and its shortcomings

One of the ADF-11 innovations was that a third of the cost of regional operations was to be taken from the national allocation of the countries involved (except for regional public goods). This share

⁶ *Idem* p. 6

⁷ The remaining 2% is directed towards various specialised funds

⁸ ONRI « Financial incentives for regional operations funded from the ADB window" *Approach paper*, 10 April 2012.

⁹ *Idem*

was increased to 40% by the management of ADB over the course of the ADF-12, to make possible the funding of more projects and to meet funding requests¹⁰.

The regional budget, which funds two thirds of regional projects is therefore presented as an incentive for countries to finance integration projects without jeopardizing countries' ownership of these projects. However the share taken from the national allocation is limited to 10% when its total amount represents less than 20 million units of account (UA). This limit affects nine countries. This rule is based on the notion that smaller countries, which receive a smaller allocation, since it is determined by population size, have a greater need for regional integration than larger countries.

However this upper limit for smaller countries has its drawbacks, because it brings about a discrepancy in the incentives normally given to countries to get involved in regional operations. For example, let us suppose that a country's allocation increases from 19 million to 21 million UA (similar to Guinea's former allocation and this country wishes to participate in a regional integration project and contribute 36 million UA. Had this country's allocation remained 19 million, it would have had to draw 1.9 million from its national allocation for this project and would still have 17.1 million UA available for its national projects. However, with a 21 million allocation, the country must finance 40% of 36 million (14.4million) from its national allocation and only 6.6 million would remain for national projects instead of the former 17.1 million.

Moreover, the way each country is assigned a certain share in funding a regional project (share which will determine the amount of their contribution) is not based on the economic benefits the countries will draw from the projects, but on the relative cost of the project which is carried out within their borders. For example, for a road the share would be determined by the distance covered within a country's territory. It is obvious that a coastal country would be forced to contribute a greater amount towards the construction than its neighbouring landlocked country, although the latter, through the road, would open up and benefit more from the project.¹¹ In short, it is very difficult to appraise how much each country involved in regional projects benefits from the regional reserve budget.

A new system for the ADF to promote regional integration

The countries' contribution to regional projects though their national allocation is only one of many conceivable ways to encourage governments to implement this sort of project and engage in those issues. We propose a new allocation system for the regional budget, determined by the relative need for regional integration, which would remain independent of national allocations.

The system would define a potential additional allocation for each country, determined by their regional integration needs. This additional sum would be exclusively dedicated to funding regional operations. Each country would be assigned a "*Regional Drawing Right (RDR)*". This would depend

¹⁰ Although this share should be maintained for the FAD-13, exceptions may be made to allow fragile states to limit their contribution to 33% of the total sum.

¹¹ This problem is exemplified by the road running between Mombasa in Kenya and Kampala in Uganda.

on the country's *need for regional integration*. How this “need” can be measured is specified later in this document. A country's contribution to regional integration projects would no longer come out of its national allocation, as has been the case so far, but be taken from its RDR. The total drawing rights would only represent a certain share of the regional budget. The rest, a non-allocated share of the regional budget, would serve to fund projects which are not tied to a specific country, such as regional public goods, or to further complement funding for particularly relevant projects, in addition to the RDR¹².

In order to keep the amount of funds devoted to regional projects the same with this new system, the regional budget would have to increase by 66% since the 40% levy on national allocations would be discontinued. This increase in regional budget could be subsidised either by reducing the budget devoted to national allocations, or preferably by mobilising additional resources for this specific purpose. The hope is that this new instrument will act as an incentive for funding bodies.

Thus each country would have a real incentive, in proportion to its need for regional integration, to look for regional integration projects, which would no longer reduce the budget for national projects. Each country or combination of countries would be able to submit integration projects to finance with their drawing rights, and potentially benefit, in a variable proportion from the reserved part of regional budget or the non-allocated RDR. This contribution would vary for each project, depending in particular on the ADF's appraisal of each projects' usefulness to public interest. Compared to the current system, this new system would encourage governments to search more for involvement in projects of regional interest. It should also help the African Development Bank to better promote regional integration projects in which the regional advantages go beyond the total of advantages for each separate country involved. Moreover, countries which are asked to participate in a project which might not be very advantageous for them, would have less of a reason to refuse, since their contribution would be taken from funds specially devoted to regional projects. The ownership by the states of projects of regional scope would result from their obligation to prove the integration effects of their projects when applying for regional funding from the ADF or the ADB.

It might also be appropriate to adjust RDR depending on each country's commitment to regional integration. This would be done by integrating an indicator of commitment to regional integration when calculating the indicator of need for regional integration. The *adapted indicator* would thereby also reflect the country's desire to be involved in regional integration, its “*perceived*” *need for integration*.

It should be pointed out that each country could use their drawing rights on the regional budget to finance not only projects in their own territory, but also projects in another country, if they deem it to be in their interest and the other country agrees. Generally speaking, the sharing of each

¹² If the share of the regional budget devoted to the RDR is not completely depleted, the remaining funds can go to increase the share of the regional budget which is not previously allocated to specific countries.

country's RDR should not automatically be the result of the projects' localisation, but of an agreement between African states, based on each country's interest in seeing the project completed.

Defining an indicator of need for regional integration

This initiative calls for the establishment of an indicator of need for regional integration whose relevance is crucial for the new system to operate. It appears necessary that this indicator should include an *indicator of size of the domestic market*. Small countries have a greater need to increase their potential market in order to benefit from economies of scale. Moreover, small countries lack economic diversity and are more vulnerable to external shocks. They are therefore more dependent on a regional community through which they can undertake greater investments, better absorb shocks thanks to diversification, and share the burden of risks thanks to intraregional flows of private and public capital and migration. This is why the small size of the economy, resulting from the small size of the population and a low income per capita, measured by a low GDP, should figure predominantly in the indicator of need for regional integration.

A second essential criterion when calculating the need for regional integration for each country is obviously their *distance from foreign markets*. This is not only related to a country's geographical remoteness and isolation, but also to the condition of its infrastructure. These causes of reduced competitiveness can be addressed by projects of regional infrastructure. If a suitable indicator for infrastructure could be found, it should be integrated into the indicator of remoteness. The latter would in this way take into account not only the geographical remoteness but also the poor condition of infrastructure.

So the indicator of need for regional integration would be based on two indicators reflecting:

- the size of domestic markets,
- the remoteness from foreign markets, by taking into account both the geographical isolation of the country and the state of infrastructure.

Besides deciding which elements should be taken into account when calculating the indicator of need for regional integration, there is also the question of their standardisation as indicators through a min-max procedure, the question of the weight given to each factor (which will have to be arbitrary), and the question of the type of mean value used for the aggregation of the components. With the simpler option of using two criteria (size of domestic market and remoteness from foreign markets), equal weighting could be an acceptable solution¹³. A method for calculating the need for regional integration and the drawing right on the regional budget is presented in Appendix I.

¹³ If one wanted to keep the current system of drawing part of the funding for regional projects from the national allocations, it would be at least desirable to modify the contribution depending on each country's need for regional integration; instead of being proportional (a third) as it is today and being restricted by an upper limit, the amount taken from the national allocation would be regressive and based on the need for regional integration

If countries' commitment to regional integration is to be taken into account, it could be measured through an indicator of regional integration policy such as is already used by the ADB's CPIA, and similar to that which is considered for the CPIA's new E cluster for ADF-13. In order to calculate the adjusted indicator of (perceived) need for regional integration, the indicator of regional integration policy could be introduced with a variable weighting, depending on the importance it is given. A simple solution would be to make it a third major component of the indicator of need along with size of market and remoteness, giving each one an equal weighting of a third each.

Extension to countries not eligible for ADF funding

This possible formula for allocating funds could be applicable for the ADF, but also for the ADB. It is in fact important that it is applied to the Bank so that all countries potentially participating in regional integration projects receive incentives to commit to projects, in particular when the parties involved are both ADF countries and middle-income countries.

There is currently no system where the Bank's *ex ante* allocations per country are likely to be covered by a regional budget. The allocation results *ex post* from loan demands. As mentioned above, it is conceivable that a budget for regional projects be created in the resources available for loans from the ADB. Its potential distribution amongst countries could be determined using the same criteria as those used for the ADF's regional budget, namely the indicator of need for regional integration for each country. Since it is necessary for ADB borrowing countries to have an interest in using these resources, it would be necessary to create incentives such as those proposed in the ONRI document cited above¹⁴. As well as the technical support already provided, these incentives could come in the form of preferential financial terms for sovereign loans and guarantees for non-sovereign loans, in order to encourage the private sector's engagement in operations of regional interest.

Whichever modalities are chosen, the subsidisation of multinational or regionally-orientated loans will have a cost. To cover these costs, the ADB will have to mobilise resources which will determine the regional budget. In any case, it is desirable that this budget exceed the total amount of funding currently dedicated to multinational projects. Moreover the mobilised resources have to be sufficient to make the incentives effective and, according to an equity principle, to be in proportion with the budget devoted to the ADF's regional operations¹⁵. Once more, the definition of a new instrument for regional integration applicable to countries eligible for ADB window, encouraging the involvement in regional projects for all African countries, would be a way to mobilise further international resources.

¹⁴ Cf. note 8

¹⁵ If the financial conditions of the loans for regional integration are uniform, the distribution of the RDR can be based on the amount of money borrowed. If these conditions are variable, it would be more logical to base the RDR on the amount of subsidies.

Simulations

In order to test the adequacy of the proposed method, simulations were run in four phases. The details are shown in the appendices.

First an indicator of need for regional integration (INRI) was determined, based on an indicator of size of the domestic market and the indicator of remoteness from foreign markets, adjusted for eventual geographical isolation and the condition of the infrastructure, using different methodological variations. This indicator allows us to determine the regional drawing rights (Appendix I).

Secondly, the method and the various options described in Appendix I were applied to calculate the indicator of need for regional integration and corresponding drawing rights for all African countries. This made it possible, as an illustration, to draw up the distribution of Regional Drawing Rights (RDR) for ADF countries, expressed as a percentage of the share of the regional budget reserved for these countries; the same was then done for ADB countries, expressed as a percentage of the share of the budget reserved for them (Appendix II).

If the figures were available, it would be interesting to compare the results of these simulations with the percentages per country of regional operations realised under ADF (ADF-11),

Comments on the main findings

The A Tables, following the methods described in Appendix I, present the indicators of need for regional integration for African countries eligible for ADF funding (table A1), their relative value (table A2), the classification of the ten countries with the highest need for regional integration (table A3), and the ten countries with the lowest need (table A4). Tables A5 and A6 present the classification of countries according to the aforementioned principle, and their regional drawing rights. The B Tables provide the same information for all countries eligible for funding from the ADF or the ADB window.

Equal weight was given to the two criteria for the need for regional integration: size of the domestic market and remoteness from foreign markets. These criteria are combined either arithmetically (A) or geometrically (G and G'). The three elements for calculating the remoteness from foreign economies (distance, isolation and low quality of infrastructure), are combined first geometrically (G), then arithmetically (G'). The first option for each type of indicator gives equal weight to all three components. When it comes to the arithmetic average in A, and the geometric average in G', options 2 and 3 give more weight to isolation, reducing the importance of distance. As for indicator G, option 2 reduces the importance of infrastructure linked to the factor of isolation, and option 3 increases the importance of distance.

Naturally the classification of countries is different, depending on which calculation method is used, but certain elements appear to remain consistent throughout. When taking into account all African countries and the nine calculated indicators of need for regional integration, ten countries

appear to have the greatest needs. These are São Tomé and Príncipe, the Comoros, Lesotho, Guinea Bissau, the Central African Republic, Cape Verde, Zimbabwe, Burundi, Swaziland, and the Seychelles. These are either small island countries or small landlocked countries. Of these countries only Swaziland and the Seychelles are not eligible for ADF funding. In both of these specific cases, they are small countries one of them is landlocked, the other is an island. On the other hand, among the countries least needing regional integration, there are four North African countries (Algeria, Tunisia, Morocco and Libya), the two countries whose domestic market is the largest (South Africa and Egypt), three ADF eligible countries (Ghana, Sudan and Nigeria), and a LDC not eligible for ADF funding (Angola).

4. Supplementary measures to support regional integration

Regional integration and its contribution to African development do not only depend on the realisation of regional interest orientated investment projects by one, two or several countries.

Another way to bolster support for regional integration would be to devote a part of the (increased) regional budget to supporting regional cooperation. Not only would regional projects be funded, but budgetary aid would be given for the countries to support coordination of economic policies, in particular to offset transitional losses of tax revenue incurred by the creation of a customs union.

Moreover, it would be desirable not only for the ADF, but also for the ADB to support regional institutions (without state guarantees), which would reinforce the institutional aspect of regional integration.

Whether dedicated to national budget support in order to incite states to regional operations or to regional institutions, the funding could be drawn from each country's regional allocations, or from the share of the ADF's regional budget not allocated to the countries. However, in the first case, the funding would be taken mostly from the countries' regional allocations, and in the second case, it would be drawn mostly from the regional budget.

Appendix I

Method for calculating the need for regional integration and the corresponding drawing right on the ADF's regional reserve

1 Measuring the need for regional integration

In this document, the Indicator of Need for Regional Integration (INRI) is defined as the geometric mean of two factors: the small size of the domestic market and the remoteness from the world market.

1) The first is an index of the small size of the domestic market: this size is measured using the level of the Gross Domestic Product (GDP). This can be calculated in two ways. In the calculations below, Ind (x) denotes an x variable graduated from 0 to 100 according to a max / min calculation.

A first method for defining the narrowness indicator for the domestic market would be to use the complement to 1 (or to 100) of an index of the log of Y (or GDP), knowing that this indicator can be specific to the range of countries sampled (and therefore to the min and max number of African countries). However, although Y is expressed as log values, as their distribution can be misrepresentative owing to the presence of very small GDP values (e.g. São Tomé and Príncipe), it might be useful to set a lower limit for GDP values:

$$IM_1 = |100 - \text{Ind}(\log Y)|$$

Another way to calculate the indicator could be:

$$IM_2 = \text{Ind}(Y^a)$$

Given that Y represents the GDP, we have $Y = y \cdot P$, where y stands for the GDP per capita, P stands for the population and -a ($-1 < a < 0$) is a coefficient representing the intensity of the handicap resulting from the smallness of the market for the sample countries.

NB: to prevent the relative levels of GDP from being artificially influenced by exchange rates, values are expressed in PPP.

2) The second component of the INRI is an index of remoteness from foreign economies.

This index is calculated following a method developed by the *Fondation pour les études et les recherches sur le développement international* (Ferdi) and the *Centre d'études et de recherches sur le développement international* (Cerdi)¹⁶, and used by the UN DESA¹⁷ to measure economic vulnerability and identify LDCs. It is based on the calculation of the average distance to reach x% of

¹⁶ P. Guillaumont « A Retrospective EVI: Methodological Aspects » Ferdi, *Document de travail série « Indicateurs de développement innovants »*, June 2007.

¹⁷ Committee for Development and United Nations, Department of Economic and Social Affairs, *Handbook on the Least Developed Country Category: Inclusion, Graduation and Special Support Measures*, November 2008.

the world market of imports of goods and services. (e.g. 1/3 with UN DESA), called D. To take into account the decrease in marginal shipping costs with relation to distance, the latter can then be treated in two different ways: either it is expressed as logs (method used by Ferdi and UN DESA), or it is raised to a power less than 1 (for example 0.5 , which means taking its square root). In both cases, the calculated value then has to be converted into an index.

Following the same method developed by Ferdi, this index itself is adapted to take into account the possible landlockness of the country, captured below by a dummy variable (L) using a weighting (r) reflecting the way landlockness increases the costs of shipment related to distance. With regard to distance, it is assumed (as is done in the Ferdi-UN DESA method), that landlockness increases remoteness in an additive way, and not in a multiplicative way. If the distance is expressed in logs to take into account the decrease of the marginal cost of distance, the adjusted remoteness indicator is:-

$$IR_1 = \text{Ind} [(1 - r). \text{Ind} (\log D) + r.L] \quad \text{with } L=100 \text{ if the country is isolated and } 0 \text{ if not.}$$

and for example: $r = 0.15$ or 0.30

If an appropriate infrastructure index (U) is then introduced to take into account the fact that poor infrastructure increases the costs involved to reach foreign markets and thereby increases remoteness (once more, this is an additive and not a multiplicative increase), one can obtain a doubly adjusted measure of remoteness: taking into account a country's possible landlockness and the weakness of its infrastructure (1-U):

$$IR'_1 = \text{Ind} [(1 - r - s). \text{Ind} (\log D) + r.L + s.(1 - U)] \quad \text{with for example } r = 0.2 \text{ et } s = 0.3$$

This additional adjustment to the original Ferdi/UN DESA method seems necessary in the present exercise, both because of the great importance of the weakness of infrastructure on the remoteness of many African countries and the priority given to the improvement of infrastructure in the ADB's strategy.

If one now decides to measure remoteness in a multiplicative way, each element is assigned an exponent representing the elasticity of remoteness with respect to each of them, namely the distance to be crossed to reach a certain proportion of foreign markets (D), the condition of infrastructure (U), and the degree of geographical isolation (L') (which in this case replaces the dummy value L, inoperable in exponential form) measured by an index of distance from the coast with a minimum value of 1. If this measure is called IR_2 ou IR'_2 :

$$IR_2 = \text{Ind} [D^b . L'^k]$$

$$IR'_2 = \text{Ind} [D^b . L'^k . U^v]$$

With $0 < b < 1$; $0 < k < 1$; $-1 < v < 0$

If the landlockness cannot be expressed in the continued form of a degree of isolation, it is possible to resort to a hybrid index of remoteness, which would again associate all the elements multiplicatively, but based on a hypothesis which at first glance may seem less relevant as concerns landlockness, if it is assumed that landlockness is an obstacle to trade in direct relation to distance and D is replaced by $D'=D(1+k'L)$, where $k'>0$. However it is preferable to suppose that landlockness is an obstacle to exchange directly dependent on the weakness of infrastructure, and if U is replaced by $U'=U(1+k''L)$, where $k''<0$. One can then write¹⁸

$$IR''_2 = \text{Ind} [D^b \cdot U^v] = \text{Ind} [D^b \cdot (U(1+k''L))^v]$$

With $0 < b < 1$; $-1 < k'' < 0$; $-1 < v < 0$

In this formulation, the index of remoteness from foreign markets (IR''_2) corresponds to the geometric mean of the average distance to reach an important share of the world market and of an indicator of the structural obstacles limiting access to this market, regardless of distance.

3) The *Indicator of need for regional integration (INRI)* can then be calculated by aggregating the index of narrowness of the domestic market and the index of remoteness from foreign markets according to an arithmetic or geometric mean. The first option would be more traditional, and more adapted to the first method of defining the narrowness index (IM_1) and the remoteness index (IR_1). The second option allows us to capture the interaction between the two main components of the need for integration, represented by these two indices. It is also closer to the second method of defining these two indices, the narrowness index (IM_2) and the remoteness index (IR_2). This second option, as demonstrated below, in certain situations allows simplification of the method of calculation of the regional drawing rights. This leads to formulation of two measures of the INRI, depending on whether one chooses to use arithmetic (A) or geometric (B) averages¹⁹, and in the second case depending on the selected method of calculating remoteness; for the sake of homogeneity and coherence, we choose to keep the measure IR''_2 :

$$INRI(A) = \frac{1}{2} [IM_1 + IR_1] = \frac{1}{2} [100 - \text{Ind}(\log Y)] + \frac{1}{2} \text{Ind} [(1 - r - s) \cdot \text{Ind}(\log D) + r \cdot L + s \cdot U]$$

$$INRI(G) = (IM_2 \cdot IR''_2)^{0.5} = [\text{Ind}(Y^a)]^{0.5} \cdot [\text{Ind}(D^b \cdot U^v)]^{0.5} \quad \text{with } U' = U(1+k''L)^{20}$$

4) An *adjusted indicator of need for regional integration* or *indicator of perceived need for regional integration* can then be calculated depending on the country's commitment to regional integration. In fact if it seems advisable to take this commitment into account, this should be done by correcting the INRI by the means of an Index of Commitment to Regional Integration (ICRI). This

¹⁸ Another solution would be to consider the impact of isolation as proportional to the multiplication $D^b \cdot U^v$ and have $IR'''_2 = \text{Ind} [D^b \cdot U^v(1+k''L)]$

¹⁹ Although in this second case, one can use the measure (IR_1) of the index of remoteness according to an arithmetic mean, thus: $INRI(G)' = (IM_1 \cdot IR_1)^{0.5} = [\text{Ind}(Y^a)]^{0.5} \cdot \text{Ind} [(1 - r - s) \cdot \text{Ind} D^b + r \cdot L + s \cdot U]^{0.5}$

²⁰ If, in this last formula, it is decided to give the same absolute value to the exponents of GDP and of remoteness from foreign economies, ($b = -a = 1$), and if the elements Y and D of $INRI(G)$ had not been initially transformed into indices, one would obtain (knowing $a < 0$ et $b > 0$): $INRI(G) = \text{Ind} [(D/Y) \cdot U^v]^{0.5}$

index can be introduced either through the arithmetic mean, INRI(A) or with the geometric mean INRI(G), which seems more logical in this case. Either way this implies reducing the importance given to the indicators IN and IR and transferring it to the ICRI. It would then seem reasonable to award each of these indicators a third of the total weight. For practical reasons related to the need of simplicity in later formulations, and to the unavailability of the necessary data to calculate the ICRI, it is not taken into account in what follows.

2 Calculating regional drawing rights

The principle is to define, for each country (i) which is eligible for regional allocation, a regional drawing right (RDRI), based on:

- (1) the total amount of the regional budget (RB) dedicated to all eligible countries (AER)
- (2) the share of population of country i (P_i) in proportion with the total population of eligible countries (P)
- (3) the country (i) relative need for regional integration, based on the relation of one of the previously mentioned indicators (INRI_i) to its mean value in the total of qualifying countries (INRI); the mean value itself is weighted by the share of the country's population of the total population of qualifying countries.

Thus we have :-

$$RDRI = AER. (P_i/P.). (INRI_i / \underline{INRI})$$

with $AER = z.RB$, the regional budget RB, a part (z) of which is used for RDR allocations and another part (1-z) is spent independently from individual countries' allocations.

And with $\underline{INRI} = \text{sigma of } INRI_i. (P_i/P.)$

If $\hat{A} = AER/(P.)$ is the average regional allocation available per capita for the total of eligible countries, and if $K = \hat{A}/\underline{INRI}$ an identical coefficient for every country

$$RDRI = (\hat{A}/\underline{INRI}). INRI_i. P_i = K. INRI_i. P_i$$

and the relative share of country i in the total of regional allocations is

$$RDRI/AER = (P_i/P.). (INRI_i / \underline{INRI})$$

Two calculation methods are possible, depending on the calculation method (arithmetic or geometric) of the indicator of regional integration.

The first one which uses the arithmetic formula INRI(A), which corresponds to the most common practise in working with indicators, also seems to be the most transparent. Thus one obtains:

$$RDRI(A)/AER = \frac{1}{2} (P_i/P.). [IM_1 + IR_1] / \underline{INRI}$$

$$= \frac{1}{2} [100 - \text{Ind}(\log Y)] + \frac{1}{2} [(1 - r - s) \cdot \text{Ind}(\log D) + r \cdot L + s \cdot U] \cdot (P_i/P) / \underline{\text{INRI}}$$

$$\text{And } \text{RDRi}(A) = \frac{1}{2} \cdot K \cdot [100 - \text{Ind}(\log Y)] + \frac{1}{2} [(1 - r - s) \cdot \text{Ind}(\log D) + r \cdot L + s \cdot U] \cdot P_i$$

The second method, which is based on the multiplicative formula (INRIG(G)), seems to be the most logical solution, because of this indicator's characteristics which capture the interaction between the components of the need for integration (but which is based on hypotheses which might not be as relevant with regard to the impact on remoteness of geographical isolation and infrastructure²¹).

$$\text{RDRi}(G)/\text{AER} = (P_i/P) \cdot (IM_2 \cdot IR''_2)^{0.5} / \underline{\text{INRI}} = [\text{Ind}(Y^a)]^{0.5} \cdot [\text{Ind}(D^b \cdot U^v)]^{0.5} \cdot (P_i/P) / \underline{\text{INRI}}$$

Additionnal note. It is possible to express the formula for determining regional drawing rights in a theoretical and simplified way, using the INRI as calculated with a geometrical average, and by using the constant ratio K ($K = \text{AER} / \underline{\text{INRI}} \cdot P$) mentioned above. This eliminates the need to use the index-based expression of the variables, which are thereby standardised. The regional allocation then presents certain interesting properties which make it formally resemble what is done when calculating normal PBA-based allocations. We have:

$$\text{RDRi}(G) = K \cdot Y_i^{0.5a} \cdot (D_i^b \cdot U_i^v)^{0.5} \cdot P_i = K \cdot Y_i^{0.5a} \cdot D_i^{0.5b} \cdot [U_i(1+k'')]^{0.5v} \cdot P_i$$

Since $Y_i = y_i \cdot P_i$ (y_i : GDP per capita of i)

$$\text{RDRi}(G') = K \cdot (y_i^a \cdot D_i^b \cdot U_i^v)^{0.5} \cdot P_i^{1+0.5a}$$

$$a < 0, \quad b > 0, \quad v < 0$$

Moreover, if one supposes that $a = -b = -1$ as was assumed above (Note 11) when calculating the INRI, then as a result, we have:

$$\text{RDRi}(G') = K \cdot P_i^{0.5} \cdot y_i^{-0.5} \cdot D_i^{0.5} \cdot U_i^{v0.5}$$

$$\text{RDRi}(G') = K \cdot (D_i \cdot P_i / y_i)^{0.5} = K \cdot [(D_i \cdot U_i^v) / y_i]^{0.5} \cdot P_i^{0.5}$$

Following this hypothesis, the regional allocation (the regional drawing right) increases as the square root of the product of the population (P), of distance from the world market (D) and of the inverse of the income per capita (y). One can also say that regional allocation per capita is found to be itself proportional to the product of the remoteness from the world market index (calculated according to a geometrical average between the indicator of distance from the world market and the indicator of structural adversity due to landlockness and infrastructure) on the one hand, and on the other hand of the square root of the total product Y:

$$\text{RDRi}(G') / P_i = K \cdot [(D_i \cdot U_i^v) / Y_i]^{0.5}$$

²¹ Supposing it were possible to express isolation as an indicator L' (degree of isolation) the RDR could be calculated using the following formula $\text{RDRi}(G') = K \cdot Y_i^{-0.5a} \cdot (D_i^b \cdot L'^k \cdot U_i^v)^{0.5} \cdot P_i$.

Appendix II

Details on the method, values and data sources used in calculating the indicator for regional integration needs of African countries and their corresponding drawing rights *

The aim of this appendix is to present the method of calculation of the Indicator of Need for Regional Integration (INRI). These INRI values will then help determine the Regional Drawing Rights (RDR)

1 Calculating the INRI

The data sources used are first introduced, then the two procedures used to transform the data values into indicators. Then, the third part of the Appendix explains the different options chosen for calculating the INRI.

1.1 Data sources

- GDP in PPA dollars (Y) :

The data concerning the different countries' GDP in PPA dollars (Y) are taken from the IMF's « *World Economic Outlook* ». In this source, the GDP figures (in PPA values) for 53 of the 54 concerned countries are available for the year 2011. Somalia's GDP which is not displayed in the WEO, was calculated using the « Penn World Tables » of the University of Pennsylvania (which includes the GDP in dollars per capita in Somalia) The GDP values in PPA are then transformed into indices using the methodology explained in section 1.2.

-Distance (D) and Isolation (L):

The data related to distance from global economies (D) are taken from the index set up by FERDI and CERDI and used by the UN DESA. This index is calculated, first by using the average distance to reach more than 33% of the world market of services and goods. This data is then transformed into logs to take into account the decrease in marginal transport costs with distance. The third step consists in transforming this data into an index (by using the methodology described in section 1.2.), in order to finally obtain the index value for D.

Values for 2010 are available for this indicator for all African countries except South Sudan. This country was an integral part of Sudan until 2011, and up until that time no data existed which distinguishes between these two countries. The value for the indicator of remoteness from foreign economies used for South Sudan is therefore the same as the one calculated for Sudan.*

This appendix was written with the help of Benjamin Coudert who also ran the simulations and is strongly acknowledged.

Developing landlocked countries were identified with two dummy variables L and L' with the values 100 and 1 (0 if the country is not landlocked), depending on the method used when calculating the INRI. Small Island Developing States (SIDS) have been also been identified as if they were landlocked. This is justified by the fact that a country separated from its neighbours by a physical maritime barrier is an isolated country. That is to say that SIDS can be considered to have the same status as landlocked countries.²²

- Infrastructure (U) :

The index used for calculating the state of the infrastructure was developed by Ferdi and the CEPR (Carrère, de Melo et Wilson, 2009²³). This composite indicator is put together by using the databases of David Canning and the World Bank (*World Development Indicators*). It is based of the following four elements (using an arithmetic mean of all the indicators):

- The number of telephone lines (per 1000 workers)
- The extent of the road network (in km per km²)
- The extent of the paved road network (in km per km²)
- The extent of the railway network (in km per km²)

The data for this index are available for the period 1965 to 2006²⁴. In our calculations, only the values for 2006 were taken into account. However, the data for six African countries were not available (out of our sample of 54). This gap in our information was filled by substituting the indices calculated for countries with similar infrastructure:

- The index value for Equatorial Guinea (a country with developed commercial infrastructure) was therefore replaced by the value calculated for South Africa;
- The infrastructure index for Ethiopia was also used for Eritrea and Somalia - two neighbouring countries whose infrastructure is similar (i.e. under-developed)
- The index for South Sudan was replaced by that of Sudan;
- By comparing the WDI data available for the year 2006, we were able to estimate the situation of Libya and São Tomé and Príncipe in respect to the status of other African countries – in regard to the quality of their infrastructure. Thus, the index for Libya corresponds to the average of the values for Burundi and Zambia, and the index for São Tomé and Príncipe corresponds to the average of all 53 other African countries.

²² Database provided by Martine Bouchut (Ferd/Cerdi)

²³ Carrère, by Melo and Wilson (2009), "The Distance Effect and the Regionalization of Trade of Low-Income Countries"

²⁴ Database provided by Céline Carrère (Ferd/CEPR)

Secondly, we used the infrastructure index used by the ADB itself. However its composition is not perfectly adapted to the creation of an index of remoteness from foreign markets, insofar as it does not take into account the rail network, but does include access to safe water. However the results appear to be very similar to those presented here.

1.2. Procedures for transforming indices into indicators:

- Procedure to obtain min/max values :

The random distribution of the indices mentioned previously means the intervals between their values can be very different and compromises the calculations which might take into account indicators of different dimensions. The proposed method consists of using the following formula:-

$$Maxmin(x_i) = \frac{x_i - Min(x_i)}{Max(x_i) - Min(x_i)}$$

Following this transformation, all index values will range between 0 and 1, which would then make the other calculations possible. However, we must try to avoid the value 0 (indicating the weakness of infrastructural conditions in Africa), which would compromise later calculations, especially calculations of geometric means. Therefore it is advisable to transform the indices ranging from 0 to 1 into indices ranging from 1 to 100 by dictating a minimum

- Procedure for transforming an x_i index (ranging between [0 ;1]) into an index X_i (ranging between [1 ;100]):

Let x_i be the gross indicator value as it appears in the database, $Maxmin(x_i)$ lies within the interval [0 ;1]. One chooses $X_i = Ind(x_i)$ included between 1 and 100.

$$0 \leq Maxmin(x_i) \leq 1$$

$$1 \leq X_i \leq 100$$

$$X_i = Min(X_i) + x_i [Max(X_i) - Min(X_i)]$$

$$X_i = 1 + 99x_i$$

Therefore, having been through one transformation, the indexes are processed again so that their values range from 1 to 100. The calculations between the different components become possible through this two step transformation: all the values are then included within the same interval and are not equal to 0. For example, the notation $Ind(Y)$ corresponds to the two step transformation of Y (GDP in PPA dollars): First as a min/max index ranging from 0 and 1, and then as an index not zero ranging from 1 to 100.

1.3 Calculating INRI using the different approaches considered:

The Indicator of Need for Regional Integration is defined as being the arithmetic or geometric average of two components: the index of small domestic market size and the index of distance from foreign economies.

- Index of small size of the domestic market IM :

The IM indicator, which reflects the smallness of domestic markets is calculated using two methods (by calculating the INRI arithmetically or geometrically):

$$IM_1 = 100 - Ind(logY)$$

and $IM_2 = Ind(Y^a)$

- Index of distance from foreign economies IR :

In a similar way as for the IM, this index is calculated in two different ways :

$$IR'_1 = [(1 - r - s).Ind(logD) + r.L + s.(100 - Ind(U))]$$

With L=100 if the country is landlocked isolated and L=0 if it is not.

$$IR''_2 = Ind(Ind(D)^b . Ind(U')^v) = Ind [Ind(D)^b . Ind (U(1 + k'' . L'))^v]$$

With $U'=U.(1+k'' . L')$ and $k''=-0.5$; $L'=1$ if the country is landlocked and $L'=0$ if it is not.

Moreover, depending on the values attached to the coefficients, three options (described below) can be considered to calculate the IR'1 and the IR''2 .

Calculating INRI values :

INRI(A) corresponds to the arithmetic mean of the elements IM_1 and IR'_1 :

$$IBIR(A) = \frac{1}{2} (IM_1 + IR'_1)$$

thus

$$IBIR(A) = \frac{1}{2} [(100 - Ind(logY)) + [(1 - r - s).Ind(logD) + r.L + s.(100 - Ind(U))]]$$

Three options are proposed to calculate this depending on the values attached to the coefficients:-

Option 1	Option 2	Option 3
$(1-s-r)=0.6$	$(1-s-r)=0.5$	$(1-s-r)=0.4$
$s=0.2$	$s=0.2$	$s=0.2$
$r=0.2$	$r=0.3$	$r=0.4$

INRI(G) is the indicator for the geometric mean of the elements IM_2 et IR''_2 . It is calculated as follows:-

$$IBIR(G) = (IM_2 \cdot IR''_2)^{0.5}$$

thus

$$IBIR(G) = [Ind(Y^a) \cdot Ind(Ind(D)^b \cdot Ind(U')^v)]^{0.5}$$

As is the case in the first INRI above, different options were considered, depending on the value of the various coefficients:-

Option 1	Option 2	Option 3
$a = -1$	$a = -1$	$a = -1$
$b = 1$	$b = 1$	$b = 1.5$
$v = -1$	$v = -0.5$	$v = -0.5$

Finally, **INRI(G')** is calculated by finding the geometric average of the two elements used when calculating the arithmetic INRI(A):

$$IBIR(G') = (IM_1 \cdot IR'_1)^{0.5}$$

Three options were chosen to calculate the INRI(G'), which correspond to the three options previously used to calculate the l'INRI(A) :

Option 1	Option 2	Option 3
(1-s-r)=0.6	(1-s-r)=0.5	(1-s-r)=0.4
s=0.2	s=0.2	s=0.2
r=0.2	r=0.3	r=0.4

The INRI(A) and (G') – calculated using the same indices of small size of domestic markets and of distance from foreign economies – have similar values. This is the case whether one chooses to use an arithmetic or a geometric mean. Similar results are obtained when ordering African countries according to INRI(A) and (G'). On the other hand, the values obtained when calculating the INRI(G) are very different to those obtained with the two other calculation methodologies. However all three INRI.classification remains very similar (with a few exceptions).

2 Calculating the RDR

As mentioned above, a Regional Drawing Right (RDR) is established for each country (i) eligible for ADF funding. It is determined using three components:-

- (i) The relative need for integration of each country i ($IBIR_i$ relatif) ;
- (ii) The share of each i country's population i (P_i) within the total 'population of all eligible countries ($P_.$), which makes $\frac{P_i}{P_}$ (this information is taken from the World Bank's *World Development Indicators* database) ;
- (iii) The sum of regional money devoted to eligible countries within the regional budget (BR).

When calculating the RDR, only the first option for each of the INRI (see previous section) is taken into account. In order to determine the RDR for each of the eligible countries, it is advisable to first calculate the relative need for regional integration for each country by using the following formula:-

$$IBIR_i \text{ relatif} = \frac{IBIR_i}{\overline{IBIR}}$$

with \overline{IBIR} the average of all INRI weighted by the population, thus:

$$\overline{IBIR} = \sum IBIR_i \cdot \frac{P_i}{P_}$$

A share (z) of the ADF's regional budget is used for the RDR allocations, and another share (1-z) is kept for the regional reserve fund, separate from countries' individual allocations. Let AER be the share used for RDR allocations, then:-

$$AER = z.RB$$

Therefore, by calculating the relative INRI for each country, it is possible to define the Regional Drawing Rights for each country within the ADF's total regional budget:

$$\frac{RDI_i}{AER} = INRI_i \text{ relatif} \cdot \frac{P_i}{P}$$

thus

$$\frac{RDI_i}{AER} = \frac{INRI_i}{\overline{INRI}} \cdot \frac{P_i}{P}$$

Two methods for calculating the RDR are considered, depending on whether the INRI were calculated using an arithmetic or a geometric mean.

For the **RDR (A)**, based on the arithmetic formula used to calculate the INRI (A), the equation is as follows:-

$$\frac{RDI(A)_i}{AER} = \frac{INRI(A)_i}{\overline{INRI}} \cdot \frac{P_i}{P}$$

and

$$\frac{RDI(A)_i}{AER} = \frac{1}{2} \cdot \frac{(IM_1 + IR'_1)}{\overline{INRI}} \cdot \frac{P_i}{P}$$

$$\frac{RDI(A)_i}{AER} = \frac{1}{2} \cdot \frac{(100 - Ind(\log(y)) + [(1 - r - s) \cdot Ind(\log(D) + r \cdot L + s \cdot (100 - Ind(U))]}{\overline{INRI}} \cdot \frac{P_i}{P}$$

The **RDR (G)**, which is based on the geometric formula used for the INRI (G), is calculated using the following equation:-

$$\frac{RDI(G)_i}{AER} = \frac{INRI(G)_i}{\overline{INRI}} \cdot \frac{P_i}{P}$$

thus

$$\frac{RDI(G)_i}{AER} = \frac{(IM_2 \cdot IR''_2)^{0,5}}{\overline{INRI}} \cdot \frac{P_i}{P}$$

and

$$\frac{RDI(G)_i}{AER} = \frac{[Ind(Y^a).Ind(Ind(D)^b .Ind(U')^v)]^{0,5}}{\overline{INRI}} \cdot \frac{P_i}{P}$$

Finally, the **RDR (G')** which uses the geometric formula of the INRI (G) with the components of the INRI(A) was calculated as follows:-

$$\frac{RDI(G')_i}{AER} = \frac{INRI (G')_i}{\overline{INRI}} \cdot \frac{P_i}{P}$$

thus

$$\frac{RDI(G')_i}{AER} = \frac{(IM_1 IR'_1)^{0,5}}{\overline{INRI}} \cdot \frac{P_i}{P}$$

Annexe III

Tables displaying the results of the simulations

Table

Tables A - Countries eligible for ADF funding

Table A1: Indicator of Need for Regional Integration

AFD eligible countries	INRI (A)			INRI (G)			INRI (G')		
	INRI (A)= Ind [1/2*(IM1+IR'1)]			INRI (G)=Ind [(IM2*IR'2)^0,5]			INRI (G')= Ind [(IM1*IR'1)^0,5]		
Countries	Option1	Option2	Option3	Option1	Option2	Option3	Option1	Option2	Option3
Benin	43,4 (29)	46,1 (31)	32,4 (32)	4,43 (33)	7,42 (30)	7,26 (30)	43,2 (29)	46,1 (30)	39,12 (30)
Burkina Faso	46,5 (27)	50,3 (25)	47,4 (16)	7,60 (17)	10,32 (22)	9,75 (22)	46,2 (27)	49,5 (24)	44,35 (22)
Burundi	67,9 (5)	69,2 (6)	61,6 (7)	8,95 (14)	15,23 (13)	15,94 (11)	67,6 (5)	68,8 (6)	61,81 (6)
Cameroon	37,1 (37)	39,8 (37)	35,4 (27)	4,43 (32)	7,01 (31)	7,00 (31)	36,5 (37)	38,7 (35)	32,91 (36)
Cape Verde	64,1 (11)	65,7 (10)	46,4 (19)	5,07 (26)	5,38 (37)	4,38 (38)	63,1 (9)	65,1 (8)	59,05 (8)
Central African Republic	65,9 (9)	68,8 (7)	56,6 (11)	30,20 (1)	33,37 (2)	33,37 (2)	65,9 (7)	68,8 (7)	61,52 (7)
Chad	42,0 (33)	46,9 (30)	40,4 (25)	15,40 (7)	15,38 (12)	13,90 (14)	42,0 (30)	46,8 (29)	41,85 (27)
Comoros	84,7 (1)	84,4 (2)	65,9 (6)	10,53 (12)	20,51 (7)	23,48 (5)	84,6 (1)	84,3 (1)	76,03 (1)
Congo, Dem. Rep.	47,1 (25)	49,1 (26)	43,0 (21)	7,21 (22)	10,75 (21)	11,15 (21)	46,5 (26)	48,1 (25)	41,22 (28)
Congo, Rep.	49,5 (23)	51,4 (23)	42,9 (23)	7,58 (18)	11,56 (19)	11,99 (20)	49,2 (20)	50,9 (22)	43,62 (24)
Cote d'Ivoire	38,9 (35)	41,5 (35)	35,1 (28)	3,98 (34)	6,59 (32)	6,58 (32)	38,7 (33)	40,9 (32)	34,81 (32)
Djibouti	55,7 (15)	57,0 (15)	29,4 (36)	4,99 (29)	6,35 (33)	6,26 (34)	52,7 (15)	54,4 (15)	46,63 (17)
Eritrea	51,2 (18)	54,7 (16)	31,1 (35)	15,50 (6)	21,28 (6)	20,61 (7)	49,1 (21)	53,6 (17)	45,14 (18)
Ethiopia	43,0 (31)	45,8 (32)	56,7 (10)	7,51 (19)	9,50 (25)	9,52 (23)	36,9 (36)	38,4 (36)	34,38 (34)
Gambia, The	51,4 (16)	54,2 (18)	28,3 (38)	6,11 (25)	9,75 (23)	9,07 (25)	48,4 (22)	52,2 (20)	44,13 (23)
Ghana	32,6 (38)	35,1 (38)	33,3 (30)	2,64 (38)	4,50 (38)	4,45 (37)	31,4 (38)	33,3 (38)	28,31 (38)
Guinea	45,5 (28)	48,2 (27)	32,9 (31)	5,01 (28)	8,39 (27)	8,24 (27)	45,2 (28)	48,1 (26)	40,84 (29)
Guinea-Bissau	67,4 (6)	70,7 (5)	52,4 (13)	18,50 (4)	27,13 (3)	26,48 (3)	66,9 (6)	70,5 (5)	63,10 (5)
Kenya	40,0 (34)	41,6 (34)	42,9 (22)	3,65 (36)	6,26 (34)	6,57 (33)	37,0 (35)	38,1 (37)	32,71 (37)
Lesotho	82,2 (3)	81,8 (3)	78,2 (1)	13,47 (8)	22,65 (4)	25,27 (4)	80,7 (2)	80,3 (3)	71,97 (3)
Liberia	58,4 (13)	61,0 (12)	35,7 (26)	12,31 (10)	20,15 (9)	20,17 (8)	56,6 (13)	59,9 (13)	50,95 (13)
Madagascar	67,2 (7)	67,6 (8)	74,4 (2)	7,51 (20)	11,93 (18)	13,02 (17)	62,5 (10)	62,8 (10)	56,18 (10)
Malawi	66,6 (8)	67,2 (9)	69,3 (5)	7,24 (21)	12,06 (17)	13,01 (18)	64,0 (8)	64,4 (9)	57,80 (9)
Mali	49,6 (22)	53,3 (19)	49,7 (14)	13,25 (9)	15,15 (14)	14,58 (12)	49,3 (19)	52,6 (19)	47,03 (16)
Mauritania	43,0 (32)	47,2 (29)	25,5 (40)	11,77 (11)	15,68 (11)	14,56 (13)	40,4 (31)	46,0 (31)	38,31 (31)
Mozambique	58,4 (14)	58,4 (14)	57,4 (9)	6,74 (24)	11,09 (20)	12,27 (19)	55,5 (14)	55,5 (14)	48,08 (15)
Niger	50,1 (21)	54,3 (17)	46,4 (18)	20,37 (3)	20,36 (8)	19,22 (9)	50,1 (17)	54,2 (16)	48,47 (14)
Nigeria	19,7 (40)	22,4 (40)	32,2 (33)	2,31 (39)	3,87 (39)	3,79 (39)	0,0 (40)	0,0 (40)	0,00 (40)
Rwanda	50,7 (19)	48,0 (28)	42,5 (24)	1,89 (40)	1,89 (40)	2,49 (40)	50,6 (16)	48,0 (27)	45,07 (19)
Sao Tome and Principe	82,2 (2)	84,6 (1)	56,5 (12)	27,60 (2)	46,52 (1)	46,94 (1)	80,5 (3)	83,4 (2)	74,78 (2)
Senegal	37,1 (36)	40,4 (36)	29,2 (37)	3,77 (35)	6,11 (35)	5,79 (35)	37,1 (34)	40,4 (33)	34,02 (35)
Sierra Leone	50,4 (20)	53,2 (20)	34,7 (29)	8,49 (15)	13,45 (15)	13,36 (15)	49,7 (18)	52,9 (18)	44,94 (20)
Somalia	59,1 (12)	61,0 (13)	43,8 (20)	15,60 (5)	22,07 (5)	22,93 (6)	59,0 (12)	60,9 (11)	52,22 (12)
South Sudan	46,9 (26)	50,6 (24)	47,8 (15)	6,82 (23)	9,64 (24)	9,14 (24)	46,6 (25)	49,8 (23)	44,63 (21)
Sudan	27,1 (39)	30,8 (39)	27,8 (39)	3,57 (37)	5,47 (36)	5,14 (36)	26,6 (39)	29,5 (39)	24,73 (39)
Tanzania	43,2 (30)	44,5 (33)	46,9 (17)	4,62 (31)	7,54 (29)	8,01 (29)	39,4 (32)	40,3 (34)	34,63 (33)
Togo	49,1 (24)	51,6 (22)	32,0 (34)	5,03 (27)	8,51 (26)	8,34 (26)	48,1 (23)	51,1 (21)	43,39 (25)
Uganda	51,3 (17)	53,1 (21)	60,9 (8)	4,98 (30)	7,90 (28)	8,17 (28)	46,8 (24)	48,0 (28)	43,03 (26)
Zambia	64,5 (10)	65,2 (11)	71,2 (4)	8,22 (16)	12,37 (16)	13,32 (16)	60,3 (11)	60,8 (12)	54,41 (11)
Zimbabwe	73,2 (4)	73,5 (4)	71,5 (3)	9,33 (13)	15,87 (10)	17,30 (10)	71,6 (4)	71,8 (4)	64,43 (4)
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
	(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4	a = -1	a = -1	a = -1	(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4
	s = 0,2	s = 0,2	s = 0,2	b = 1	b = 1	b = 1,5	s = 0,2	s = 0,2	s = 0,2
	r = 0,2	r = 0,3	r = 0,4	v = -1	v = -0,5	v = -0,5	r = 0,2	r = 0,3	r = 0,4

Note : In brackets – countries are ranked according to their need for regional integration (highest to lowest).

Table A2: Relative INRI for ADF countries

ADF eligible countries	Relative INRI (A)			Relative INRI (G)			Relative INRI (G')		
Countries	Option1	Option2	Option3	Option1	Option2	Option3	Option1	Option2	Option3
Benin	1,05 (29)	1,05 (31)	0,73 (32)	0,72 (33)	0,84 (30)	0,81 (30)	1,21 (29)	5,23 (30)	1,21 (30)
Burkina Faso	1,12 (27)	1,15 (25)	1,07 (16)	1,24 (17)	1,17 (22)	1,09 (22)	1,29 (27)	5,61 (24)	1,37 (22)
Burundi	1,64 (5)	1,58 (6)	1,39 (7)	1,47 (14)	1,73 (13)	1,78 (11)	1,89 (5)	7,81 (6)	1,90 (6)
Cameroon	0,89 (37)	0,91 (37)	0,80 (27)	0,72 (32)	0,80 (31)	0,78 (31)	1,02 (37)	4,39 (35)	1,01 (36)
Cape Verde	1,54 (11)	1,50 (10)	1,04 (19)	0,83 (26)	0,61 (37)	0,49 (38)	1,77 (9)	7,38 (8)	1,82 (8)
Central African Republic	1,59 (9)	1,57 (7)	1,27 (11)	4,94 (1)	3,78 (2)	3,73 (2)	1,85 (7)	7,80 (7)	1,90 (7)
Chad	1,01 (33)	1,07 (30)	0,91 (25)	2,52 (7)	1,74 (12)	1,56 (14)	1,18 (30)	5,31 (29)	1,29 (27)
Comoros	2,04 (1)	1,93 (2)	1,48 (6)	1,72 (12)	2,33 (7)	2,63 (5)	2,37 (1)	9,56 (1)	2,34 (1)
Congo, Dem. Rep.	1,14 (25)	1,12 (26)	0,97 (21)	1,18 (22)	1,22 (21)	1,25 (21)	1,30 (26)	5,46 (25)	1,27 (28)
Congo, Rep.	1,19 (23)	1,17 (23)	0,96 (23)	1,24 (18)	1,31 (19)	1,34 (20)	1,38 (20)	5,77 (22)	1,34 (24)
Cote d'Ivoire	0,94 (35)	0,95 (35)	0,79 (28)	0,65 (34)	0,75 (32)	0,74 (32)	1,08 (33)	4,64 (32)	1,07 (32)
Djibouti	1,34 (15)	1,30 (15)	0,66 (36)	0,82 (29)	0,72 (33)	0,70 (34)	1,48 (15)	6,17 (15)	1,44 (17)
Eritrea	1,23 (18)	1,25 (16)	0,70 (35)	2,54 (6)	2,41 (6)	2,31 (7)	1,38 (21)	6,07 (17)	1,39 (18)
Ethiopia	1,04 (31)	1,05 (32)	1,27 (10)	1,23 (19)	1,08 (25)	1,06 (23)	1,03 (36)	4,36 (36)	1,06 (34)
Gambia, The	1,24 (16)	1,24 (18)	0,64 (38)	1,00 (25)	1,11 (23)	1,02 (25)	1,36 (22)	5,92 (20)	1,36 (23)
Ghana	0,78 (38)	0,80 (38)	0,75 (30)	0,43 (38)	0,51 (38)	0,50 (37)	0,88 (38)	3,78 (38)	0,87 (38)
Guinea	1,10 (28)	1,10 (27)	0,74 (31)	0,82 (28)	0,95 (27)	0,92 (27)	1,27 (28)	5,46 (26)	1,26 (29)
Guinea-Bissau	1,63 (6)	1,61 (5)	1,18 (13)	3,03 (4)	3,08 (3)	2,96 (3)	1,87 (6)	7,99 (5)	1,94 (5)
Kenya	0,96 (34)	0,95 (34)	0,97 (22)	0,60 (36)	0,71 (34)	0,73 (33)	1,04 (35)	4,32 (37)	1,01 (37)
Lesotho	1,98 (3)	1,87 (3)	1,76 (1)	2,21 (8)	2,57 (4)	2,83 (4)	2,26 (2)	9,10 (3)	2,22 (3)
Liberia	1,41 (13)	1,39 (12)	0,80 (26)	2,01 (10)	2,28 (9)	2,26 (8)	1,59 (13)	6,79 (13)	1,57 (13)
Madagascar	1,62 (7)	1,54 (8)	1,67 (2)	1,23 (20)	1,35 (18)	1,46 (17)	1,75 (10)	7,12 (10)	1,73 (10)
Malawi	1,60 (8)	1,53 (9)	1,56 (5)	1,19 (21)	1,37 (17)	1,46 (18)	1,79 (8)	7,31 (9)	1,78 (9)
Mali	1,19 (22)	1,22 (19)	1,12 (14)	2,17 (9)	1,72 (14)	1,63 (12)	1,38 (19)	5,96 (19)	1,45 (16)
Mauritania	1,04 (32)	1,08 (29)	0,57 (40)	1,93 (11)	1,78 (11)	1,63 (13)	1,13 (31)	5,22 (31)	1,18 (31)
Mozambique	1,41 (14)	1,33 (14)	1,29 (9)	1,10 (24)	1,26 (20)	1,37 (19)	1,56 (14)	6,30 (14)	1,48 (15)
Niger	1,21 (21)	1,24 (17)	1,04 (18)	3,33 (3)	2,31 (8)	2,15 (9)	1,40 (17)	6,15 (16)	1,49 (14)
Nigeria	0,47 (40)	0,51 (40)	0,72 (33)	0,38 (39)	0,44 (39)	0,42 (39)	0,00 (40)	0,00 (40)	0,00 (40)
Rwanda	1,22 (19)	1,10 (28)	0,96 (24)	0,31 (40)	0,21 (40)	0,28 (40)	1,42 (16)	5,44 (27)	1,39 (19)
Sao Tome and Principe	1,98 (2)	1,93 (1)	1,27 (12)	4,52 (2)	5,28 (1)	5,25 (1)	2,26 (3)	9,46 (2)	2,30 (2)
Senegal	0,89 (36)	0,92 (36)	0,66 (37)	0,62 (35)	0,69 (35)	0,65 (35)	1,04 (34)	4,58 (33)	1,05 (35)
Sierra Leone	1,21 (20)	1,21 (20)	0,78 (29)	1,39 (15)	1,53 (15)	1,49 (15)	1,39 (18)	6,00 (18)	1,38 (20)
Somalia	1,42 (12)	1,39 (13)	0,99 (20)	2,55 (5)	2,50 (5)	2,57 (6)	1,65 (12)	6,91 (11)	1,61 (12)
South Sudan	1,13 (26)	1,16 (24)	1,08 (15)	1,12 (23)	1,09 (24)	1,02 (24)	1,31 (25)	5,65 (23)	1,38 (21)
Sudan	0,65 (39)	0,70 (39)	0,63 (39)	0,58 (37)	0,62 (36)	0,58 (36)	0,75 (39)	3,34 (39)	0,76 (39)
Tanzania	1,04 (30)	1,02 (33)	1,05 (17)	0,76 (31)	0,86 (29)	0,90 (29)	1,10 (32)	4,57 (34)	1,07 (33)
Togo	1,18 (24)	1,18 (22)	0,72 (34)	0,82 (27)	0,97 (26)	0,93 (26)	1,35 (23)	5,79 (21)	1,34 (25)
Uganda	1,24 (17)	1,21 (21)	1,37 (8)	0,81 (30)	0,90 (28)	0,91 (28)	1,31 (24)	5,44 (28)	1,33 (26)
Zambia	1,55 (10)	1,49 (11)	1,60 (4)	1,35 (16)	1,40 (16)	1,49 (16)	1,69 (11)	6,89 (12)	1,68 (11)
Zimbabwe	1,76 (4)	1,68 (4)	1,61 (3)	1,53 (13)	1,80 (10)	1,94 (10)	2,01 (4)	8,15 (4)	1,99 (4)

Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4	a = -1	a = -1	a = -1	(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4
s = 0,2	s = 0,2	s = 0,2	b = 1	b = 1	b = 1,5	s = 0,2	s = 0,2	s = 0,2
r = 0,2	r = 0,3	r = 0,4	v = -1	v = -1	v = -1	r = 0,2	r = 0,3	r = 0,4

Table A3: TOP 10 relative INRI for ADF countries using the different options

TOP 10 Relative INRI			AFD countries					
INRI (A)								
Option 1			Option 2		Option 3			
Comoros	2,04	(1)	Sao Tome and Principe	1,93	(1)	Lesotho	1,76	(1)
Sao Tome and Principe	1,98	(2)	Comoros	1,93	(2)	Madagascar	1,67	(2)
Lesotho	1,98	(3)	Lesotho	1,87	(3)	Zimbabwe	1,61	(3)
Zimbabwe	1,76	(4)	Zimbabwe	1,68	(4)	Zambia	1,60	(4)
Burundi	1,64	(5)	Guinea-Bissau	1,61	(5)	Malawi	1,56	(5)
Guinea-Bissau	1,63	(6)	Burundi	1,58	(6)	Comoros	1,48	(6)
Madagascar	1,62	(7)	Central African Republic	1,57	(7)	Burundi	1,39	(7)
Malawi	1,60	(8)	Madagascar	1,54	(8)	Uganda	1,37	(8)
Central African Republic	1,59	(9)	Malawi	1,53	(9)	Mozambique	1,29	(9)
Zambia	1,55	(10)	Cape Verde	1,50	(10)	Ethiopia	1,27	(10)

INRI (G)								
Option 1			Option 2		Option 3			
Central African Republic	4,94	(1)	Sao Tome and Principe	5,28	(1)	Sao Tome and Principe	5,25	(1)
Sao Tome and Principe	4,52	(2)	Central African Republic	3,78	(2)	Central African Republic	3,73	(2)
Niger	3,33	(3)	Guinea-Bissau	3,08	(3)	Guinea-Bissau	2,96	(3)
Guinea-Bissau	3,03	(4)	Lesotho	2,57	(4)	Lesotho	2,83	(4)
Somalia	2,55	(5)	Somalia	2,50	(5)	Comoros	2,63	(5)
Eritrea	2,54	(6)	Eritrea	2,41	(6)	Somalia	2,57	(6)
Chad	2,52	(7)	Comoros	2,33	(7)	Eritrea	2,31	(7)
Lesotho	2,21	(8)	Niger	2,31	(8)	Liberia	2,26	(8)
Mali	2,17	(9)	Liberia	2,28	(9)	Niger	2,15	(9)
Liberia	2,01	(10)	Zimbabwe	1,80	(10)	Zimbabwe	1,94	(10)

INRI (G')								
Option 1			Option 2		Option 3			
Comoros	2,37	(1)	Comoros	9,56	(1)	Comoros	2,34	(1)
Lesotho	2,26	(2)	Sao Tome and Principe	9,46	(2)	Sao Tome and Principe	2,30	(2)
Sao Tome and Principe	2,26	(3)	Lesotho	9,10	(3)	Lesotho	2,22	(3)
Zimbabwe	2,01	(4)	Zimbabwe	8,15	(4)	Zimbabwe	1,99	(4)
Burundi	1,89	(5)	Guinea-Bissau	7,99	(5)	Guinea-Bissau	1,94	(5)
Guinea-Bissau	1,87	(6)	Burundi	7,81	(6)	Burundi	1,90	(6)
Central African Republic	1,85	(7)	Central African Republic	7,80	(7)	Central African Republic	1,90	(7)
Malawi	1,79	(8)	Cape Verde	7,38	(8)	Cape Verde	1,82	(8)
Cape Verde	1,77	(9)	Malawi	7,31	(9)	Malawi	1,78	(9)
Madagascar	1,75	(10)	Madagascar	7,12	(10)	Madagascar	1,73	(10)

Table A4: BOTTOM 10 relative INRI for ADF countries using the different options

BOTTOM 10 Relative INRI

INRI (A)					
Option 1		Option 2		Option 3	
<i>Ethiopia</i>	1,04 (31)	<i>Benin</i>	1,05 (31)	<i>Guinea</i>	0,74 (31)
<i>Mauritania</i>	1,04 (32)	<i>Ethiopia</i>	1,05 (32)	<i>Benin</i>	0,73 (32)
<i>Chad</i>	1,01 (33)	<i>Tanzania</i>	1,02 (33)	<i>Nigeria</i>	0,72 (33)
<i>Kenya</i>	0,96 (34)	<i>Kenya</i>	0,95 (34)	<i>Togo</i>	0,72 (34)
<i>Cote d'Ivoire</i>	0,94 (35)	<i>Cote d'Ivoire</i>	0,95 (35)	<i>Eritrea</i>	0,70 (35)
<i>Senegal</i>	0,89 (36)	<i>Senegal</i>	0,92 (36)	<i>Djibouti</i>	0,66 (36)
<i>Cameroon</i>	0,89 (37)	<i>Cameroon</i>	0,91 (37)	<i>Senegal</i>	0,66 (37)
<i>Ghana</i>	0,78 (38)	<i>Ghana</i>	0,80 (38)	<i>Gambia, The</i>	0,64 (38)
<i>Sudan</i>	0,65 (39)	<i>Sudan</i>	0,70 (39)	<i>Sudan</i>	0,63 (39)
<i>Nigeria</i>	0,47 (40)	<i>Nigeria</i>	0,51 (40)	<i>Mauritania</i>	0,57 (40)

INRI (G)					
Option 1		Option 2		Option 3	
<i>Tanzania</i>	0,76 (31)	<i>Cameroon</i>	0,80 (31)	<i>Cameroon</i>	0,78 (31)
<i>Cameroon</i>	0,72 (32)	<i>Cote d'Ivoire</i>	0,75 (32)	<i>Cote d'Ivoire</i>	0,74 (32)
<i>Benin</i>	0,72 (33)	<i>Djibouti</i>	0,72 (33)	<i>Kenya</i>	0,73 (33)
<i>Cote d'Ivoire</i>	0,65 (34)	<i>Kenya</i>	0,71 (34)	<i>Djibouti</i>	0,70 (34)
<i>Senegal</i>	0,62 (35)	<i>Senegal</i>	0,69 (35)	<i>Senegal</i>	0,65 (35)
<i>Kenya</i>	0,60 (36)	<i>Sudan</i>	0,62 (36)	<i>Sudan</i>	0,58 (36)
<i>Sudan</i>	0,58 (37)	<i>Cape Verde</i>	0,61 (37)	<i>Ghana</i>	0,50 (37)
<i>Ghana</i>	0,43 (38)	<i>Ghana</i>	0,51 (38)	<i>Cape Verde</i>	0,49 (38)
<i>Nigeria</i>	0,38 (39)	<i>Nigeria</i>	0,44 (39)	<i>Nigeria</i>	0,42 (39)
<i>Rwanda</i>	0,31 (40)	<i>Rwanda</i>	0,21 (40)	<i>Rwanda</i>	0,28 (40)

INRI (G')					
Option 1		Option 2		Option 3	
<i>Mauritania</i>	1,13 (31)	<i>Mauritania</i>	5,22 (31)	<i>Mauritania</i>	1,18 (31)
<i>Tanzania</i>	1,10 (32)	<i>Cote d'Ivoire</i>	4,64 (32)	<i>Cote d'Ivoire</i>	1,07 (32)
<i>Cote d'Ivoire</i>	1,08 (33)	<i>Senegal</i>	4,58 (33)	<i>Tanzania</i>	1,07 (33)
<i>Senegal</i>	1,04 (34)	<i>Tanzania</i>	4,57 (34)	<i>Ethiopia</i>	1,06 (34)
<i>Kenya</i>	1,04 (35)	<i>Cameroon</i>	4,39 (35)	<i>Senegal</i>	1,05 (35)
<i>Ethiopia</i>	1,03 (36)	<i>Ethiopia</i>	4,36 (36)	<i>Cameroon</i>	1,01 (36)
<i>Cameroon</i>	1,02 (37)	<i>Kenya</i>	4,32 (37)	<i>Kenya</i>	1,01 (37)
<i>Ghana</i>	0,88 (38)	<i>Ghana</i>	3,78 (38)	<i>Ghana</i>	0,87 (38)
<i>Sudan</i>	0,75 (39)	<i>Sudan</i>	3,34 (39)	<i>Sudan</i>	0,76 (39)
<i>Nigeria</i>	0,00 (40)	<i>Nigeria</i>	0,00 (40)	<i>Nigeria</i>	0,00 (40)

Table A5: Regional Drawing Rights for ADF countries

[illegible]

Table A6: TOP 10 and BOTTOM 10 Regional Drawing Rights for ADF countries

TOP 10 RDR			AFD countries					
RDR (A)			RDR (G)		RDR (G')			
Ethiopia	11,0%	(1)	Ethiopia	13,1%	(1)	Congo, Dem. Rep.	11,1%	(1)
Nigeria	9,7%	(2)	Congo, Dem. Rep.	10,0%	(2)	Ethiopia	11,0%	(2)
Congo, Dem. Rep.	9,7%	(3)	Nigeria	7,7%	(3)	Tanzania	6,4%	(3)
Tanzania	6,0%	(4)	Niger	6,7%	(4)	Uganda	5,7%	(4)
Uganda	5,3%	(5)	Tanzania	4,4%	(5)	Kenya	5,4%	(5)
Kenya	5,0%	(6)	Mali	4,3%	(6)	Madagascar	4,7%	(6)
Madagascar	4,3%	(7)	Chad	3,6%	(7)	Mozambique	4,7%	(7)
Mozambique	4,2%	(8)	Uganda	3,5%	(8)	Malawi	3,5%	(8)
Malawi	3,1%	(9)	Mozambique	3,3%	(9)	Sudan	3,2%	(9)
Zimbabwe	2,8%	(10)	Madagascar	3,3%	(10)	Zimbabwe	3,2%	(10)

BOTTOM 10 RDR								
RDR (A)			RDR (G)		RDR (G')			
Liberia	0,7%	(31)	Congo, Rep.	0,6%	(31)	Congo, Rep.	0,7%	(31)
Congo, Rep.	0,6%	(32)	Togo	0,6%	(32)	Lesotho	0,6%	(32)
Lesotho	0,5%	(33)	Lesotho	0,6%	(33)	Mauritania	0,5%	(33)
Mauritania	0,5%	(34)	Guinea-Bissau	0,6%	(34)	Guinea-Bissau	0,4%	(34)
Guinea-Bissau	0,3%	(35)	Rwanda	0,4%	(35)	Gambia, The	0,3%	(35)
Gambia, The	0,3%	(36)	Gambia, The	0,2%	(36)	Comoros	0,2%	(36)
Comoros	0,2%	(37)	Comoros	0,2%	(37)	Djibouti	0,2%	(37)
Djibouti	0,2%	(38)	Sao Tome and Principe	0,1%	(38)	Cape Verde	0,1%	(38)
Cape Verde	0,1%	(39)	Djibouti	0,1%	(39)	Sao Tome and Principe	0,0%	(39)
Sao Tome and Principe	0,0%	(40)	Cape Verde	0,1%	(40)	Nigeria	0,0%	(40)

Tables B: All African countries

Table B1: INRI all African countries

Africa	INRI (A)			INRI (G)			INRI (G')		
	INRI (A)= Ind [1/2*(IM1+IR'1)]			INRI (G)=Ind [(IM2*IR'2)^0,5]			INRI (G)'= Ind [(IM1*IR'1)^0,5]		
Countries	Option1	Option2	Option3	Option1	Option2	Option3	Option1	Option2	Option3
Algeria	14,7 (54)	18,9 (54)	18,6 (53)	1,16 (53)	1,39 (53)	1,12 (54)	14,0 (52)	16,8 (51)	13,82 (51)
Angola	45,1 (45)	45,8 (45)	52,5 (26)	6,44 (36)	8,88 (40)	9,23 (38)	38,3 (46)	38,7 (46)	33,42 (46)
Benin	54,1 (35)	55,2 (34)	45,3 (40)	6,35 (37)	10,73 (33)	10,64 (33)	53,9 (33)	54,9 (32)	47,25 (34)
Botswana	67,7 (14)	67,3 (15)	76,4 (3)	7,37 (30)	11,32 (32)	12,22 (29)	61,7 (20)	61,4 (22)	55,09 (18)
Burkina Faso	59,6 (26)	61,4 (24)	63,4 (17)	9,72 (20)	12,14 (28)	11,67 (31)	57,5 (28)	58,8 (26)	52,69 (24)
Burundi	74,5 (10)	74,9 (8)	69,6 (10)	12,33 (14)	19,40 (10)	20,03 (10)	73,7 (10)	74,0 (9)	66,46 (9)
Cameroon	47,4 (44)	48,6 (42)	47,2 (34)	6,04 (39)	8,91 (38)	8,91 (39)	45,2 (41)	46,2 (41)	39,72 (42)
Cape Verde	74,6 (9)	74,6 (9)	59,9 (20)	8,80 (27)	18,57 (12)	18,39 (13)	74,6 (8)	74,6 (7)	67,48 (6)
Central African Republic	75,3 (7)	76,7 (5)	68,3 (11)	32,86 (2)	33,40 (3)	33,40 (3)	75,0 (7)	76,3 (5)	68,22 (5)
Chad	58,0 (30)	60,4 (26)	60,2 (19)	15,64 (10)	15,09 (20)	13,89 (25)	56,6 (29)	58,6 (28)	52,41 (25)
Comoros	88,1 (2)	87,3 (2)	70,2 (8)	16,55 (9)	34,67 (2)	36,76 (2)	88,1 (2)	87,3 (2)	78,70 (2)
Congo, Dem. Rep.	54,5 (34)	55,4 (33)	51,2 (29)	9,41 (21)	12,52 (27)	12,88 (27)	53,1 (35)	53,8 (34)	46,37 (35)
Congo, Rep.	56,8 (31)	57,7 (31)	51,2 (30)	9,98 (17)	13,61 (25)	14,01 (24)	55,9 (31)	56,6 (31)	48,80 (32)
Cote d'Ivoire	49,1 (42)	50,2 (40)	46,9 (36)	5,57 (40)	8,84 (41)	8,85 (40)	47,6 (40)	48,5 (39)	41,74 (40)
Djibouti	65,1 (17)	64,9 (18)	41,3 (47)	8,58 (28)	18,27 (14)	18,32 (14)	64,4 (15)	64,1 (17)	55,62 (17)
Egypt, Arab Rep.	19,7 (52)	21,5 (53)	30,5 (50)	1,83 (52)	3,52 (51)	3,10 (51)	6,1 (53)	6,4 (53)	5,48 (53)
Equatorial Guinea	50,7 (39)	50,3 (39)	41,0 (48)	3,41 (46)	7,35 (44)	7,39 (44)	50,5 (38)	50,1 (37)	43,51 (37)
Eritrea	62,6 (20)	64,3 (19)	45,4 (39)	19,74 (6)	24,70 (8)	24,14 (8)	62,4 (18)	64,2 (16)	55,09 (19)
Ethiopia	53,2 (37)	54,6 (35)	68,1 (12)	9,11 (24)	10,34 (35)	10,36 (35)	44,5 (43)	45,2 (42)	40,48 (41)
Gabon	53,3 (36)	54,2 (37)	48,6 (32)	6,71 (34)	10,48 (34)	10,63 (34)	52,2 (36)	53,0 (36)	45,70 (36)
Gambia, The	62,7 (19)	63,7 (21)	42,5 (46)	9,34 (23)	17,52 (15)	17,19 (17)	62,3 (19)	63,3 (19)	54,55 (21)
Ghana	43,3 (46)	44,3 (46)	45,6 (37)	3,85 (44)	6,71 (46)	6,70 (47)	40,2 (45)	40,8 (45)	35,16 (45)
Guinea	56,0 (33)	57,1 (32)	45,6 (38)	7,14 (31)	11,95 (29)	11,87 (30)	55,9 (32)	56,9 (31)	48,99 (31)
Guinea-Bissau	78,0 (4)	79,6 (4)	65,9 (14)	24,30 (3)	32,76 (4)	32,25 (4)	78,0 (4)	79,5 (4)	71,21 (4)
Kenya	47,4 (43)	48,1 (43)	50,8 (31)	5,09 (42)	8,10 (42)	8,36 (42)	43,2 (44)	43,6 (44)	37,67 (44)
Lesotho	82,9 (3)	82,4 (3)	78,2 (1)	18,04 (7)	26,60 (5)	28,98 (5)	81,5 (3)	81,1 (3)	72,70 (3)
Liberia	67,6 (15)	68,8 (13)	47,2 (33)	16,96 (8)	26,28 (6)	26,34 (6)	67,4 (12)	68,6 (11)	59,05 (12)
Libya	32,5 (49)	36,3 (48)	25,0 (52)	2,86 (48)	4,28 (50)	3,14 (50)	32,2 (48)	36,3 (48)	30,32 (48)
Madagascar	70,2 (12)	70,3 (12)	76,9 (2)	9,92 (18)	13,84 (23)	14,84 (22)	65,4 (14)	65,5 (14)	58,64 (13)
Malawi	70,9 (11)	71,0 (11)	73,7 (7)	9,78 (19)	14,54 (21)	15,40 (19)	67,8 (11)	67,9 (12)	60,87 (11)
Mali	62,0 (21)	63,8 (20)	64,8 (15)	15,03 (11)	15,80 (19)	15,31 (20)	60,1 (23)	61,5 (21)	55,00 (20)
Mauritania	56,6 (32)	58,7 (30)	42,6 (45)	14,94 (12)	18,43 (13)	17,51 (15)	56,6 (30)	58,7 (27)	50,22 (29)
Mauritius	51,5 (38)	47,2 (44)	38,7 (49)	2,71 (49)	6,66 (47)	7,15 (45)	51,2 (37)	47,2 (40)	42,06 (39)
Morocco	23,1 (51)	26,3 (51)	25,3 (51)	1,88 (51)	3,18 (52)	2,47 (52)	22,2 (49)	24,5 (49)	20,55 (49)
Mozambique	60,3 (24)	60,2 (28)	58,3 (22)	9,00 (25)	12,99 (26)	14,06 (23)	57,6 (27)	57,6 (29)	49,89 (30)
Namibia	61,6 (22)	61,3 (25)	55,8 (23)	6,72 (33)	11,86 (30)	12,76 (28)	60,1 (22)	59,9 (24)	51,94 (27)
Niger	63,7 (18)	65,8 (17)	63,2 (18)	20,42 (4)	19,59 (9)	18,65 (11)	62,7 (17)	64,5 (15)	57,65 (14)
Nigeria	31,4 (50)	32,5 (50)	45,1 (41)	3,35 (47)	5,73 (48)	5,69 (48)	15,4 (51)	15,7 (52)	13,52 (52)
Rwanda	58,4 (29)	54,6 (36)	51,3 (28)	3,50 (45)	7,91 (43)	8,13 (43)	57,8 (25)	54,4 (33)	50,62 (28)
Sao Tome and Principe	90,5 (1)	91,5 (1)	67,5 (13)	38,58 (1)	62,45 (1)	62,90 (1)	90,1 (1)	91,2 (1)	81,75 (1)
Senegal	49,3 (40)	50,7 (38)	43,8 (43)	5,38 (41)	8,89 (39)	8,68 (41)	48,7 (39)	49,9 (38)	42,90 (38)
Seychelles	75,2 (8)	72,1 (10)	58,4 (21)	6,92 (32)	16,54 (18)	17,36 (16)	75,2 (6)	72,0 (10)	66,20 (10)
Sierra Leone	60,3 (23)	61,6 (22)	46,9 (35)	11,54 (15)	17,11 (16)	17,05 (18)	60,3 (21)	61,6 (20)	52,97 (22)
Somalia	65,7 (16)	66,6 (16)	51,7 (27)	19,80 (5)	24,80 (7)	25,58 (7)	65,7 (13)	66,6 (13)	57,41 (16)
South Africa	36,2 (48)	34,4 (49)	52,5 (25)	2,27 (50)	5,04 (49)	5,49 (49)	0,0 (54)	0,0 (54)	0,00 (54)
South Sudan	59,8 (25)	61,5 (23)	63,4 (16)	8,91 (26)	11,67 (31)	11,26 (32)	57,7 (26)	59,0 (25)	52,82 (23)
Sudan	40,4 (47)	42,1 (47)	43,4 (44)	4,92 (43)	7,32 (45)	7,07 (46)	37,4 (47)	38,5 (47)	33,03 (47)
Swaziland	77,5 (5)	76,3 (6)	74,3 (6)	9,38 (22)	17,02 (17)	18,47 (12)	75,7 (5)	74,8 (6)	67,35 (7)
Tanzania	49,3 (41)	49,8 (41)	53,0 (24)	6,25 (38)	9,16 (37)	9,58 (37)	44,7 (42)	45,1 (43)	38,92 (43)
Togo	59,4 (27)	60,3 (27)	44,6 (42)	7,49 (29)	13,69 (24)	13,61 (26)	59,4 (24)	60,3 (23)	51,95 (26)
Tunisia	18,7 (53)	22,0 (52)	13,8 (54)	1,14 (54)	1,14 (54)	1,14 (53)	18,1 (50)	21,9 (50)	17,93 (50)
Uganda	59,2 (28)	59,9 (29)	69,7 (9)	6,70 (35)	9,63 (36)	9,88 (36)	53,2 (34)	53,6 (35)	48,09 (33)
Zambia	68,5 (13)	68,8 (14)	75,1 (4)	10,67 (16)	14,08 (22)	14,95 (21)	64,0 (16)	64,1 (18)	57,44 (15)
Zimbabwe	76,4 (6)	76,3 (7)	74,7 (5)	12,64 (13)	19,18 (11)	20,47 (9)	74,6 (9)	74,5 (8)	66,82 (8)

Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4	a = -1	a = -1	a = -1	(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4
s = 0,2	s = 0,2	s = 0,2	b = 1	b = 1	b = 1,5	s = 0,2	s = 0,2	s = 0,2
r = 0,2	r = 0,3	r = 0,4	v = -1	v = -0,5	v = -0,5	r = 0,2	r = 0,3	r = 0,4

Table B2: relative INRI for all African countries

Africa	Relative INRI (A)			Relative INRI (G)			Relative INRI (G')		
Countries	Option1	Option2	Option3	Option1	Option2	Option3	Option1	Option2	Option3
Algeria	0,33 (54)	0,41 (54)	0,37 (53)	0,18 (53)	0,15 (53)	0,12 (54)	0,37 (52)	1,83 (51)	0,41 (51)
Angola	1,00 (45)	0,99 (45)	1,05 (26)	0,98 (36)	0,97 (40)	1,00 (38)	1,02 (46)	4,21 (46)	1,00 (46)
Benin	1,20 (35)	1,20 (34)	0,90 (40)	0,97 (37)	1,17 (33)	1,15 (33)	1,43 (33)	5,98 (32)	1,41 (34)
Botswana	1,50 (14)	1,46 (15)	1,52 (3)	1,12 (30)	1,23 (32)	1,32 (29)	1,64 (20)	6,69 (22)	1,65 (18)
Burkina Faso	1,32 (26)	1,33 (24)	1,26 (17)	1,48 (20)	1,32 (28)	1,26 (31)	1,53 (28)	6,41 (26)	1,57 (24)
Burundi	1,65 (10)	1,62 (8)	1,39 (10)	1,88 (14)	2,11 (10)	2,17 (10)	1,96 (10)	8,06 (9)	1,99 (9)
Cameroon	1,05 (44)	1,05 (42)	0,94 (34)	0,92 (39)	0,97 (38)	0,96 (39)	1,20 (41)	5,03 (41)	1,19 (42)
Cape Verde	1,65 (9)	1,61 (9)	1,19 (20)	1,34 (27)	2,02 (12)	1,99 (13)	1,99 (8)	8,12 (7)	2,02 (6)
Central African Republic	1,67 (7)	1,66 (5)	1,36 (11)	5,01 (2)	3,64 (3)	3,61 (3)	2,00 (7)	8,30 (5)	2,04 (5)
Chad	1,28 (30)	1,31 (26)	1,20 (19)	2,39 (10)	1,64 (20)	1,50 (25)	1,51 (29)	6,38 (28)	1,57 (25)
Comoros	1,95 (2)	1,89 (2)	1,40 (8)	2,53 (9)	3,77 (2)	3,98 (2)	2,35 (2)	9,50 (2)	2,35 (2)
Congo, Dem. Rep.	1,21 (34)	1,20 (33)	1,02 (29)	1,44 (21)	1,36 (27)	1,39 (27)	1,41 (35)	5,86 (34)	1,39 (35)
Congo, Rep.	1,26 (31)	1,25 (31)	1,02 (30)	1,52 (17)	1,48 (25)	1,52 (24)	1,49 (31)	6,16 (31)	1,46 (32)
Cote d'Ivoire	1,09 (42)	1,09 (40)	0,93 (36)	0,85 (40)	0,96 (41)	0,96 (40)	1,27 (40)	5,28 (39)	1,25 (41)
Djibouti	1,44 (17)	1,40 (18)	0,82 (47)	1,31 (28)	1,99 (14)	1,98 (14)	1,71 (15)	6,98 (17)	1,66 (17)
Egypt, Arab Rep.	0,44 (52)	0,46 (53)	0,61 (50)	0,28 (52)	0,38 (51)	0,34 (51)	0,16 (53)	0,70 (53)	0,16 (53)
Equatorial Guinea	1,12 (39)	1,09 (39)	0,82 (48)	0,52 (46)	0,80 (44)	0,80 (44)	1,34 (38)	5,46 (37)	1,30 (37)
Eritrea	1,39 (20)	1,39 (19)	0,90 (39)	3,01 (6)	2,69 (8)	2,61 (8)	1,66 (18)	6,99 (16)	1,65 (19)
Ethiopia	1,18 (37)	1,18 (35)	1,36 (12)	1,39 (24)	1,13 (35)	1,12 (35)	1,19 (43)	4,93 (42)	1,21 (41)
Gabon	1,18 (36)	1,17 (37)	0,97 (32)	1,02 (34)	1,14 (34)	1,15 (34)	1,39 (36)	5,77 (36)	1,37 (36)
Gambia, The	1,39 (19)	1,38 (21)	0,85 (46)	1,42 (23)	1,91 (15)	1,86 (17)	1,66 (19)	6,90 (19)	1,63 (21)
Ghana	0,96 (46)	0,96 (46)	0,91 (37)	0,59 (44)	0,73 (46)	0,72 (47)	1,07 (45)	4,44 (45)	1,05 (45)
Guinea	1,24 (33)	1,24 (32)	0,91 (38)	1,09 (31)	1,30 (29)	1,28 (30)	1,49 (32)	6,20 (30)	1,46 (31)
Guinea-Bissau	1,73 (4)	1,72 (4)	1,31 (14)	3,71 (3)	3,57 (4)	3,49 (4)	2,08 (4)	8,66 (4)	2,13 (4)
Kenya	1,05 (43)	1,04 (43)	1,01 (31)	0,78 (42)	0,88 (42)	0,91 (42)	1,15 (44)	4,75 (44)	1,13 (44)
Lesotho	1,84 (3)	1,78 (3)	1,56 (1)	2,75 (7)	2,90 (5)	3,14 (5)	2,17 (3)	8,83 (3)	2,17 (3)
Liberia	1,50 (15)	1,49 (13)	0,94 (33)	2,59 (8)	2,86 (6)	2,85 (6)	1,79 (12)	7,47 (11)	1,76 (12)
Libya	0,72 (49)	0,79 (48)	0,50 (52)	0,44 (48)	0,47 (50)	0,34 (50)	0,86 (48)	3,96 (48)	0,91 (48)
Madagascar	1,56 (12)	1,52 (12)	1,53 (2)	1,51 (18)	1,51 (23)	1,61 (22)	1,74 (14)	7,13 (14)	1,75 (13)
Malawi	1,57 (11)	1,54 (11)	1,47 (7)	1,49 (19)	1,58 (21)	1,67 (19)	1,81 (11)	7,39 (12)	1,82 (11)
Mali	1,37 (21)	1,38 (20)	1,29 (15)	2,29 (11)	1,72 (19)	1,66 (20)	1,60 (23)	6,69 (21)	1,64 (20)
Mauritania	1,26 (32)	1,27 (30)	0,85 (45)	2,28 (12)	2,01 (13)	1,89 (15)	1,51 (30)	6,39 (27)	1,50 (29)
Mauritius	1,14 (38)	1,02 (44)	0,77 (49)	0,41 (49)	0,73 (47)	0,77 (45)	1,36 (37)	5,14 (40)	1,26 (39)
Morocco	0,51 (51)	0,57 (51)	0,50 (51)	0,29 (51)	0,35 (52)	0,27 (52)	0,59 (49)	2,66 (49)	0,61 (49)
Mozambique	1,34 (24)	1,30 (28)	1,16 (22)	1,37 (25)	1,41 (26)	1,52 (23)	1,53 (27)	6,27 (29)	1,49 (30)
Namibia	1,36 (22)	1,33 (25)	1,11 (23)	1,02 (33)	1,29 (30)	1,38 (28)	1,60 (22)	6,52 (24)	1,55 (27)
Niger	1,41 (18)	1,42 (17)	1,26 (18)	3,12 (4)	2,13 (9)	2,02 (11)	1,67 (17)	7,02 (15)	1,72 (14)
Nigeria	0,70 (50)	0,70 (50)	0,90 (41)	0,51 (47)	0,62 (48)	0,62 (48)	0,41 (51)	1,71 (52)	0,40 (52)
Rwanda	1,29 (29)	1,18 (36)	1,02 (28)	0,53 (45)	0,86 (43)	0,88 (43)	1,54 (25)	5,92 (33)	1,51 (28)
Sao Tome and Principe	2,01 (1)	1,98 (1)	1,35 (13)	5,89 (1)	6,80 (1)	6,81 (1)	2,40 (1)	9,93 (1)	2,44 (1)
Senegal	1,09 (40)	1,10 (38)	0,87 (43)	0,82 (41)	0,97 (39)	0,94 (41)	1,30 (39)	5,44 (38)	1,28 (38)
Seychelles	1,67 (8)	1,56 (10)	1,16 (21)	1,06 (32)	1,80 (18)	1,88 (16)	2,00 (6)	7,84 (10)	1,98 (10)
Sierra Leone	1,34 (23)	1,33 (22)	0,93 (35)	1,76 (15)	1,86 (16)	1,84 (18)	1,61 (21)	6,70 (20)	1,58 (22)
Somalia	1,46 (16)	1,44 (16)	1,03 (27)	3,02 (5)	2,70 (7)	2,77 (7)	1,75 (13)	7,25 (13)	1,72 (16)
South Africa	0,80 (48)	0,74 (49)	1,05 (25)	0,35 (50)	0,55 (49)	0,59 (49)	0,00 (54)	0,00 (54)	0,00 (54)
South Sudan	1,33 (25)	1,33 (23)	1,26 (16)	1,36 (26)	1,27 (31)	1,22 (32)	1,54 (26)	6,42 (25)	1,58 (23)
Sudan	0,90 (47)	0,91 (47)	0,87 (44)	0,75 (43)	0,80 (45)	0,76 (46)	1,00 (47)	4,19 (47)	0,99 (47)
Swaziland	1,72 (5)	1,65 (6)	1,48 (6)	1,43 (22)	1,85 (17)	2,00 (12)	2,02 (5)	8,14 (6)	2,01 (7)
Tanzania	1,09 (41)	1,08 (41)	1,06 (24)	0,95 (38)	1,00 (37)	1,04 (37)	1,19 (42)	4,91 (43)	1,16 (43)
Togo	1,32 (27)	1,30 (27)	0,89 (42)	1,14 (29)	1,49 (24)	1,47 (26)	1,58 (24)	6,56 (23)	1,55 (26)
Tunisia	0,41 (53)	0,48 (52)	0,27 (54)	0,17 (54)	0,12 (54)	0,12 (53)	0,48 (50)	2,39 (50)	0,54 (50)
Uganda	1,31 (28)	1,30 (29)	1,39 (9)	1,02 (35)	1,05 (36)	1,07 (36)	1,42 (34)	5,84 (35)	1,44 (33)
Zambia	1,52 (13)	1,49 (14)	1,50 (4)	1,63 (16)	1,53 (22)	1,62 (21)	1,70 (16)	6,98 (18)	1,72 (15)
Zimbabwe	1,69 (6)	1,65 (7)	1,49 (5)	1,93 (13)	2,09 (11)	2,21 (9)	1,99 (9)	8,11 (8)	2,00 (8)
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
	(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4	a = -1	a = -1	a = -1	(1-s-r) = 0,6	(1-s-r) = 0,5	(1-s-r) = 0,4
	s = 0,2	s = 0,2	s = 0,2	b = 1	b = 1	b = 1	s = 0,2	s = 0,2	s = 0,2
	r = 0,2	r = 0,3	r = 0,4	v = -1	v = -1	v = -1	r = 0,2	r = 0,3	r = 0,4

Table B3: TOP 10 relative INRI for all African countries using the different options

TOP 10 Relative INRI

		INRI (A)			
Option 1		Option 2		Option 3	
Sao Tome and Principe	2,01 (1)	Sao Tome and Principe	1,98 (1)	Lesotho	1,56 (1)
Comoros	1,95 (2)	Comoros	1,89 (2)	Madagascar	1,53 (2)
Lesotho	1,84 (3)	Lesotho	1,78 (3)	Botswana	1,52 (3)
Guinea-Bissau	1,73 (4)	Guinea-Bissau	1,72 (4)	Zambia	1,50 (4)
Swaziland	1,72 (5)	Central African Republic	1,66 (5)	Zimbabwe	1,49 (5)
Zimbabwe	1,69 (6)	Swaziland	1,65 (6)	Swaziland	1,48 (6)
Central African Republic	1,67 (7)	Zimbabwe	1,65 (7)	Malawi	1,47 (7)
Seychelles	1,67 (8)	Burundi	1,62 (8)	Comoros	1,40 (8)
Cape Verde	1,65 (9)	Cape Verde	1,61 (9)	Uganda	1,39 (9)
Burundi	1,65 (10)	Seychelles	1,56 (10)	Burundi	1,39 (10)

		INRI (G)			
Option 1		Option 2		Option 3	
Sao Tome and Principe	5,89 (1)	Sao Tome and Principe	6,80 (1)	Sao Tome and Principe	6,81 (1)
Central African Republic	5,01 (2)	Comoros	3,77 (2)	Comoros	3,98 (2)
Guinea-Bissau	3,71 (3)	Central African Republic	3,64 (3)	Central African Republic	3,61 (3)
Niger	3,12 (4)	Guinea-Bissau	3,57 (4)	Guinea-Bissau	3,49 (4)
Somalia	3,02 (5)	Lesotho	2,90 (5)	Lesotho	3,14 (5)
Eritrea	3,01 (6)	Liberia	2,86 (6)	Liberia	2,85 (6)
Lesotho	2,75 (7)	Somalia	2,70 (7)	Somalia	2,77 (7)
Liberia	2,59 (8)	Eritrea	2,69 (8)	Eritrea	2,61 (8)
Comoros	2,53 (9)	Niger	2,13 (9)	Zimbabwe	2,21 (9)
Chad	2,39 (10)	Burundi	2,11 (10)	Burundi	2,17 (10)

		INRI (G')			
Option 1		Option 2		Option 3	
Sao Tome and Principe	2,40 (1)	Sao Tome and Principe	9,93 (1)	Sao Tome and Principe	2,44 (1)
Comoros	2,35 (2)	Comoros	9,50 (2)	Comoros	2,35 (2)
Lesotho	2,17 (3)	Lesotho	8,83 (3)	Lesotho	2,17 (3)
Guinea-Bissau	2,08 (4)	Guinea-Bissau	8,66 (4)	Guinea-Bissau	2,13 (4)
Swaziland	2,02 (5)	Central African Republic	8,30 (5)	Central African Republic	2,04 (5)
Seychelles	2,00 (6)	Swaziland	8,14 (6)	Cape Verde	2,02 (6)
Central African Republic	2,00 (7)	Cape Verde	8,12 (7)	Swaziland	2,01 (7)
Cape Verde	1,99 (8)	Zimbabwe	8,11 (8)	Zimbabwe	2,00 (8)
Zimbabwe	1,99 (9)	Burundi	8,06 (9)	Burundi	1,99 (9)
Burundi	1,96 (10)	Seychelles	7,84 (10)	Seychelles	1,98 (10)

Table B4: BOTTOM 10 relative INRI for all African countries using the different options

BOTTOM 10 Relative INRI

INRI (A)					
Option 1		Option 2		Option 3	
Angola	1,00 (45)	Angola	0,99 (45)	Mauritania	0,85 (45)
Ghana	0,96 (46)	Ghana	0,96 (46)	Gambia, The	0,85 (46)
Sudan	0,90 (47)	Sudan	0,91 (47)	Djibouti	0,82 (47)
South Africa	0,80 (48)	Libya	0,79 (48)	Equatorial Guinea	0,82 (48)
Libya	0,72 (49)	South Africa	0,74 (49)	Mauritius	0,77 (49)
Nigeria	0,70 (50)	Nigeria	0,70 (50)	Egypt, Arab Rep.	0,61 (50)
Morocco	0,51 (51)	Morocco	0,57 (51)	Morocco	0,50 (51)
Egypt, Arab Rep.	0,44 (52)	Tunisia	0,48 (52)	Libya	0,50 (52)
Tunisia	0,41 (53)	Egypt, Arab Rep.	0,46 (53)	Algeria	0,37 (53)
Algeria	0,33 (54)	Algeria	0,41 (54)	Tunisia	0,27 (54)

INRI (G)					
Option 1		Option 2		Option 3	
Rwanda	0,53 (45)	Sudan	0,80 (45)	Mauritius	0,77 (45)
Equatorial Guinea	0,52 (46)	Ghana	0,73 (46)	Sudan	0,76 (46)
Nigeria	0,51 (47)	Mauritius	0,73 (47)	Ghana	0,72 (47)
Libya	0,44 (48)	Nigeria	0,62 (48)	Nigeria	0,62 (48)
Mauritius	0,41 (49)	South Africa	0,55 (49)	South Africa	0,59 (49)
South Africa	0,35 (50)	Libya	0,47 (50)	Libya	0,34 (50)
Morocco	0,29 (51)	Egypt, Arab Rep.	0,38 (51)	Egypt, Arab Rep.	0,34 (51)
Egypt, Arab Rep.	0,28 (52)	Morocco	0,35 (52)	Morocco	0,27 (52)
Algeria	0,18 (53)	Algeria	0,15 (53)	Tunisia	0,12 (53)
Tunisia	0,17 (54)	Tunisia	0,12 (54)	Algeria	0,12 (54)

INRI (G')					
Option 1		Option 2		Option 3	
Ghana	1,07 (45)	Ghana	4,44 (45)	Ghana	1,05 (45)
Angola	1,02 (46)	Angola	4,21 (46)	Angola	1,00 (46)
Sudan	1,00 (47)	Sudan	4,19 (47)	Sudan	0,99 (47)
Libya	0,86 (48)	Libya	3,96 (48)	Libya	0,91 (48)
Morocco	0,59 (49)	Morocco	2,66 (49)	Morocco	0,61 (49)
Tunisia	0,48 (50)	Tunisia	2,39 (50)	Tunisia	0,54 (50)
Nigeria	0,41 (51)	Algeria	1,83 (51)	Algeria	0,41 (51)
Algeria	0,37 (52)	Nigeria	1,71 (52)	Nigeria	0,40 (52)
Egypt, Arab Rep.	0,16 (53)	Egypt, Arab Rep.	0,70 (53)	Egypt, Arab Rep.	0,16 (53)
South Africa	0,00 (54)	South Africa	0,00 (54)	South Africa	0,00 (54)

Table B5: RDR for all African countries

Africa	Pi/P.	RDR (A)/AER	RDR (G)/AER	RDR (G')/AER
Countries		Option1	Option1	Option1
Algeria	3,4%	1,1% (30)	0,6% (36)	1,3% (29)
Angola	1,9%	1,9% (21)	1,8% (20)	1,9% (19)
Benin	0,9%	1,0% (31)	0,8% (33)	1,2% (30)
Botswana	0,2%	0,3% (43)	0,2% (44)	0,3% (42)
Burkina Faso	1,6%	2,1% (15)	2,4% (14)	2,5% (13)
Burundi	0,8%	1,4% (24)	1,5% (25)	1,6% (23)
Cameroon	1,9%	2,0% (19)	1,8% (21)	2,3% (17)
Cape Verde	0,0%	0,1% (51)	0,1% (51)	0,1% (50)
Central African Republic	0,4%	0,7% (35)	2,2% (18)	0,9% (34)
Chad	1,1%	1,4% (23)	2,6% (12)	1,7% (21)
Comoros	0,1%	0,1% (48)	0,2% (45)	0,2% (47)
Congo, Dem. Rep.	6,5%	7,8% (3)	9,3% (2)	9,2% (2)
Congo, Rep.	0,4%	0,5% (37)	0,6% (37)	0,6% (36)
Cote d'Ivoire	1,9%	2,1% (16)	1,6% (23)	2,4% (14)
Djibouti	0,1%	0,1% (50)	0,1% (49)	0,1% (49)
Egypt, Arab Rep.	7,9%	3,4% (8)	2,2% (16)	1,3% (28)
Equatorial Guinea	0,1%	0,1% (52)	0,0% (53)	0,1% (51)
Eritrea	0,5%	0,7% (34)	1,6% (24)	0,9% (33)
Ethiopia	8,1%	9,6% (2)	11,3% (1)	9,6% (1)
Gabon	0,1%	0,2% (47)	0,2% (47)	0,2% (46)
Gambia, The	0,2%	0,2% (45)	0,2% (42)	0,3% (44)
Ghana	2,4%	2,3% (13)	1,4% (26)	2,6% (12)
Guinea	1,0%	1,2% (29)	1,1% (28)	1,5% (27)
Guinea-Bissau	0,1%	0,3% (44)	0,5% (40)	0,3% (43)
Kenya	4,0%	4,2% (6)	3,1% (9)	4,6% (6)
Lesotho	0,2%	0,4% (41)	0,6% (38)	0,5% (40)
Liberia	0,4%	0,6% (36)	1,0% (29)	0,7% (35)
Libya	0,6%	0,4% (38)	0,3% (41)	0,5% (37)
Madagascar	2,0%	3,2% (9)	3,1% (10)	3,6% (7)
Malawi	1,5%	2,3% (12)	2,2% (17)	2,7% (10)
Mali	1,5%	2,1% (17)	3,5% (6)	2,4% (15)
Mauritania	0,3%	0,4% (39)	0,8% (34)	0,5% (38)
Mauritius	0,1%	0,1% (49)	0,1% (52)	0,2% (48)
Morocco	3,1%	1,6% (22)	0,9% (32)	1,8% (20)
Mozambique	2,3%	3,1% (10)	3,1% (8)	3,5% (8)
Namibia	0,2%	0,3% (42)	0,2% (43)	0,4% (41)
Niger	1,5%	2,2% (14)	4,8% (4)	2,6% (11)
Nigeria	15,6%	10,8% (1)	8,0% (3)	6,4% (3)
Rwanda	1,0%	1,4% (25)	0,6% (39)	1,6% (22)
Sao Tome and Principe	0,0%	0,0% (53)	0,1% (50)	0,0% (52)
Senegal	1,2%	1,3% (26)	1,0% (31)	1,6% (25)
Seychelles	0,0%	0,0% (54)	0,0% (54)	0,0% (53)
Sierra Leone	0,6%	0,8% (33)	1,0% (30)	0,9% (32)
Somalia	0,9%	1,3% (27)	2,8% (11)	1,6% (24)
South Africa	4,8%	3,9% (7)	1,7% (22)	0,0% (54)
South Sudan	1,0%	1,3% (28)	1,3% (27)	1,5% (26)
Sudan	3,3%	2,9% (11)	2,5% (13)	3,3% (9)
Swaziland	0,1%	0,2% (46)	0,1% (48)	0,2% (45)
Tanzania	4,4%	4,8% (4)	4,2% (5)	5,3% (4)
Togo	0,6%	0,8% (32)	0,7% (35)	0,9% (31)
Tunisia	1,0%	0,4% (40)	0,2% (46)	0,5% (39)
Uganda	3,3%	4,3% (5)	3,4% (7)	4,7% (5)
Zambia	1,3%	2,0% (20)	2,1% (19)	2,2% (18)
Zimbabwe	1,2%	2,1% (18)	2,4% (15)	2,4% (16)

Table B6: TOP 10 and BOTTOM 10 RDR for all African countries

TOP 10 RDR

RDR (A)			RDR (G)			RDR (G')		
Nigeria	10,8%	(1)	Ethiopia	11,3%	(1)	Ethiopia	9,6%	(1)
Ethiopia	9,6%	(2)	Congo, Dem. Rep.	9,3%	(2)	Congo, Dem. Rep.	9,2%	(2)
Congo, Dem. Rep.	7,8%	(3)	Nigeria	8,0%	(3)	Nigeria	6,4%	(3)
Tanzania	4,8%	(4)	Niger	4,8%	(4)	Tanzania	5,3%	(4)
Uganda	4,3%	(5)	Tanzania	4,2%	(5)	Uganda	4,7%	(5)
Kenya	4,2%	(6)	Mali	3,5%	(6)	Kenya	4,6%	(6)
South Africa	3,9%	(7)	Uganda	3,4%	(7)	Madagascar	3,6%	(7)
Egypt, Arab Rep.	3,4%	(8)	Mozambique	3,1%	(8)	Mozambique	3,5%	(8)
Madagascar	3,2%	(9)	Kenya	3,1%	(9)	Sudan	3,3%	(9)
Mozambique	3,1%	(10)	Madagascar	3,1%	(10)	Malawi	2,7%	(10)

BOTTOM 10 RDR

RDR (A)			RDR (G)			RDR (G')		
Gambia, The	0,2%	(45)	Comoros	0,2%	(45)	Swaziland	0,2%	(45)
Swaziland	0,2%	(46)	Tunisia	0,2%	(46)	Gabon	0,2%	(46)
Gabon	0,2%	(47)	Gabon	0,2%	(47)	Comoros	0,2%	(47)
Comoros	0,1%	(48)	Swaziland	0,1%	(48)	Mauritius	0,2%	(48)
Mauritius	0,1%	(49)	Djibouti	0,1%	(49)	Djibouti	0,1%	(49)
Djibouti	0,1%	(50)	Sao Tome and Principe	0,1%	(50)	Cape Verde	0,1%	(50)
Cape Verde	0,1%	(51)	Cape Verde	0,1%	(51)	Equatorial Guinea	0,1%	(51)
Equatorial Guinea	0,1%	(52)	Mauritius	0,1%	(52)	Sao Tome and Principe	0,0%	(52)
Sao Tome and Principe	0,0%	(53)	Equatorial Guinea	0,0%	(53)	Seychelles	0,0%	(53)
Seychelles	0,0%	(54)	Seychelles	0,0%	(54)	South Africa	0,0%	(54)



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