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Commitment to Development Index (CDI): Critical Comments

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Abstract

In this paper, we critically re-examine the robustness of the CDI ranking. First, we demonstrate the limitations of the CDI in a constructive manner by closely examining the methodologies to compute the main and category scores of the CDI. Particularly, we identify remaining problems of the CDI such as selection criteria of weights for the category scores and methodological problems of constructing each category score. The second aim of our paper is to propose alternative indices such as the Policy Coherence Index (PCI), Refined Commitment to Development Index (RCDI), Contribution to Growth Index (CGI), Comprehensive Commitment to Development Index (CCDI), and Absolute Commitment to Development Index (ACDI). According to our analyses, the CDI ranking can change significantly depending on weights selected, data used for constructing category scores, and the addition of new category scores. Moreover, it is also necessary to link the CDI to other important policy concepts and objectives such as the concept of "policy coherence" and the Millennium Development Goals (MDGs). Especially, the relationship between the CDI and MDGs should be established in future research by incorporating explicit categories to capture contributions to poverty reduction as well as improvements of education and health in developing countries.

1. Introduction

The Commitment to Development Index, hereafter the CDI, constructed by the Center for Global Development quantifies the contributions of the world's 21 richest countries to poverty reduction in the world (Table 1; CGD/FP 2003). The CDI can be regarded as a numerical targeting indicator for the 8th goal of Millennium Development Goals (MDGs). It has stimulated a variety of intensive policy discussions regarding the role of developed countries in helping the world's poor (Table 2). However, as we will discuss in detail, there is large room for quality improvements in the index.

The aims of this paper are twofold. First, we demonstrate in a constructive manner the limitations of the CDI by closely examining the methodologies used to compute the main and category scores of the CDI. Particularly, we identify three outstanding problems of the CDI, which measures development commitment through a composite index of six categories (aid, trade, investment, migration, peacekeeping, and the environment.) The first problem is that the weights attached to the category scores are arbitrary. Instead, these weights should be constructed according to the relative contribution of categories to poverty reduction. The second problem is in the methodologies used to compute each category score. The final problem is that there are various difficulties in aggregating category scores into the CDI. As a result, the second aim of our paper is to propose alternative indices such as the Policy Coherence Index (PCI), Refined Commitment to Development Index (RCDI), and Contribution to Growth Index (CGI).

The remainder of the paper is organized as follows. Sections 2 and 3 examine the limitations and problems of the CDI. Section 4 presents our alternative indicators. Finally, Section 5 discusses the results of the new indices.

2. Six Conceptual Problems of the CDI

While the CDI's quantification of poverty reduction contributions by developed countries may prove meaningful to reducing poverty, the index has several conceptual problems. In the first place, the CDI attempts to create a composite index of some indices concerning contributions by developed countries. In this sense, the CDI is closely related to the 8th goal of MDGs and the concept of "policy coherence." Yet, strictly speaking, the CDI's construction is not sufficient to capture appropriately "policy coherence" because it is an arithmetic average of category indices. An index of the "variation" in the computation of CDI category scores may be a more suitable "policy coherence" index.

Second, the appropriateness of the selected categories in the CDI is not clear and there are valid arguments against including additional criteria such as immigration, peacekeeping

operations, and the environment. For example, if we agree that the MDGs are a desired objective, then the CDI should include categories related to countries' contributions to education and health in the world instead.

Third, creating an "arithmetic average" is based on the assumption that the unit of each index has the same unit of account. However, in the CDI's calculation, GDP or population is used for normalization interchangeably. Moreover, category indices are calculated with or without adjusting variances and the rules of the within-category weights for raw information are not unified and are arbitrary.

Fourth, the CDI's "ranking" technique itself may be problematic. Although the score of each category and the comprehensive score are "quantitative" measures, "ranking" is a "qualitative" indicator. The score differential between the Netherlands, which ranks first, and Denmark, ranked second, is only 0.1. Yet, the score differential between Australia, ranked 19th, and the United States, ranked 20th, is 0.6. The latter score differential is six times larger than the former, but the "ranking differential" is the same.[1]

Fifth, the criteria need to be carefully considered when interpreting the CDI ranking. The CDI is based on "inputs" of policies, but it is not an "outcome" index. Hence, the CDI should be reconstructed as an index that quantifies the contributions to an outcome, such as poverty reduction in developing countries.

Sixth, the practicability of the CDI in actual policy implementations is questionable. The CDI is related loosely to the MDGs and PRSP, but actual policy decisions of advanced nations and developing countries are based on various domestic and international political negotiations, where the CDI might be of little relevance.

3. Problems in Computing Category Scores

In this section, we examine the problems with the category score calculation procedures in detail. A fundamental issue is that the CDI category scores are computed based on resource inputs, rather than contribution to outcomes, such as poverty reduction in poor countries. Hence, this section identifies contributions to economic growth as an important performance criteria, considering the important role of economic growth in poverty reduction (Besley and Burgess 2003;

[1] The same problem is pointed out for the Human Development Index (HDI) of the UNDP. Ray (1998, 28-29) suggested that the comparison of HDI ranking with GDP per capita ranking is informative. Hence, a comparison of different category rankings in the CDI, such as aid and trade category rankings, might be useful.

Dollar and Kraay 2002; Ravallion 2001).

3.1 Aid Category

Can official development assistance (ODA) promote economic growth in countries receiving the aid? According to the research results of Burnside and Dollar (2000), only when the recipient country's economic policies are appropriate can development assistance effectively contribute to economic growth. However, Easterly, Levine, and Roodman (2003a, 2003b) questioned Bunside and Dollor's (2000) results, finding that aid does not work effectively even in the countries with good policies once the data set used by Burnside and Dollar (2000) is extended. This lack of consensus in academic research about whether aid has contributed to poverty reduction in developing countries thus implies that the rationale for including the aid category in the CDI is not strong.

Second, it may not be appropriate to quantify aid only from the viewpoint of pure resource transfers, ignoring the different modalities of assistance (Chang, Fernandez-Arias, and Serven 1998). Aggregating the measurements of grant-in-aid, technical cooperation, and loans may be problematic (in other words, the aggregation of the numbers of apples (grant) and oranges (loans) could be misleading) as there may exist different incentive effects in grant-in-aid, technical cooperation, and loans.

Third, it may not be appropriate to standardize the amount of ODA by GDP for donor countries. An alternative variable to consider may be the ODA per capita of a donor country, since this variable can capture contributions per person more accurately. Furthermore, in the case of a minimum required quantity of ODA, there could be a nonlinear relationship between the amount of ODA and outcomes such as economic growth and/or poverty reduction. Accordingly, the scale of ODA itself provides important information about donors' contributions. Information such as the total amount of ODA and/or ODA per capita of a recipient country is needed in addition to the ODA to GDP ratio.

Finally, strategic aspects of ODA should be properly corrected when we use the aid variable in the CDI. According to recent studies, donor countries largely seem motivated by strategic considerations, rather than altruism or the real needs of the recipient countries (Alesina and Dollar 2000). This may be due to lobbying efforts by ethnic groups in donor countries (Lahiri and Raimondos-Moller 2000). Moreover, aid is likely to enhance a government's consumption or even result in corruption in the recipient country (Boone 1999; Alesina and Weder 2002).[2]

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[2] On the other hand, motivations for multilateral aid can be said to be more transparent.

3.2 Trade Category

Existing empirical studies demonstrate a positive contribution of international trade to economic growth and poverty reduction (Harrison 1996; Collier and Dollar 2001). Through an eyeball test, we can verify a positive correlation between long-term economic growth rates and the long-term enhancement of external openness (Figure 1). Nevertheless, there are a couple of theoretical studies, particularly in relation to the existence of increasing returns to scale or strong learning effects, which challenge the positive relationship between trade and growth.[3] Yet, in comparison to other category indices, the overall problems of using trade category data in constructing the CDI are not critical.

3.3 Investment Category

There is an emerging consensus in academic literature that direct investment significantly raises the economic growth rate, and by which poverty is reduced significantly (Borenzstein, De Gregorio, and Lee 1998). While this appears to justify the inclusion of FDI in the investment category, there are two problems to including the regulation to pension fund investment in the category. First, if the index of pension fund investment is included as an indirect investment, bank loans and other portfolio investments should be included as well.

The second problem is related to the robustness of the positive correlation between these international indirect capital flows and economic growth. On the one hand, the negative correlation between the black market premium in foreign exchange markets and the economic growth rate suggests that there is a positive correlation between international capital flows and economic growth (Harrison 1996). However, after the financial crises in the 1990s, there is an emerging view that short-term capital movements are associated with higher risks of sharp recessions. Hence, we may conclude that larger international capital flows will lead to higher average economic growth and larger variances of future income levels.

Multilateral agencies are largely apolitical and more exclusively concerned with development and/or poverty reduction (Cassen et al. 1986, 281; Sawada 1996).

[3] The ideas of "infant industry protection," "export pessimism," and "immiserizing growth" are also related with this view.

3.4 Migration Category

Theoretically, the relationship between immigration and poverty is not monotonic. Although for developing countries, emigration to developed countries creates a "brain drain" for them, there is no consensus about the directional effect of the "brain drain" on developing countries. On the one hand, "brain drain" has a brain creation effect ("brain effect") since people make educational investments in considering a higher income through emigration. These investments will enhance the economic growth rate of developing countries. On the other hand, the "brain drain" also contains an outflow effect, namely a "drain effect," because human resources actually flow out of the country through emigration. Thus, the total effect of the "brain drain" is ambiguous. While a recent empirical analysis supports a beneficial brain drain (BBD) effect (Beine, Docquier, and Rapoport 2001), it is difficult to derive a definite conclusion from the existing literature. Accordingly, it would be problematic to attach a significant weight to a migration-related variable when computing developed countries' contributions to poverty reduction.

3.5 Peacekeeping Category

Compared with the other four categories in the CDI, "peacekeeping" and the "environment" are considered extraneous categories when we try to capture contributions to poverty reduction. Therefore, it is not clear whether these two categories can be treated in the same way as the other four categories. With respect to using peacekeeping as a category, there are two problems. First, selecting a raw data set for this category is arbitrary and may not be justifiable. For example, the "human contribution to NATO" in Kosovo is considered to have contributed to the high ranking of Greece, while other important peacekeeping operations such as in East Timor are not taken into account.

Second, as is pointed out by the CGD/FP (2003), the extent of developed countries' arms sales to developing countries should be considered since such sales will ultimately undermine security in developing countries. As shown in Table 6, there is a cross-country data set concerning arms exports that can be used for the peacekeeping category index. If we assume fewer arms exports leads to higher security in developing countries, Australia and Japan, whose CDI indices rank them 19th and 21st, respectively, would be ranked 1st for a peacekeeping category that is purely based on arms exports.

3.6 Environment

In the "environment" category, the contribution to global commons is used as the evaluation criteria. However, when outcomes such as poverty reduction are taken as the criteria, we may need to consider whether each country's ODA contributes directly to environmental improvements in developing countries. For example, while we can evaluate the amount of technical assistance in transferring clean energy technology though a micro-level analysis, it still may be difficult to construct an aggregate indicator.

Second, including only fishery subsidies per GDP is not persuasive because marine resources are fundamentally reproducible. A better approach would appear to include the subsidies in connection with the consumption of non-reproducible and exhaustive resources such as fossil fuels and mineral resources, instead of fishery subsidies. From such a viewpoint, variables like the ratio of agricultural subsidies to GDP and/or the ratio of industrial subsidies to GDP would provide more appropriate and comprehensive information to construct the environment category index.

Finally, there is no justification to including the amount of electricity generated by wind power only. The environment category index should reflect the amount of electric power generated by other clean methods, such as solar energies and geothermal energies.

4. Toward an alternative CDI

In this subsection, we employ cross-country data sets to refine the CDI and develop the following alternative indices:

(1) Policy Coherence Index (PCI)
(2) Refined Commitment to Development Index (RCDI)
(3) Contribution to Growth Index (CGI)
(4) Comprehensive Commitment to Development Index (CCDI)
(5) Absolute Commitment to Development Index (ACDI)

4.1 CDI and Policy Coherence: Policy Coherence Index (PCI)

The CDI is closely related with the concept of policy coherence. Yet, to capture the consistency of a developed country's policies, we need to quantify the cross-category variability of indices for each category. The following PCIs for developed countries are considered to be such an attempt:

(1) $$PCI^{A} = \frac{1}{\left(\frac{\sqrt{Var(score_j)}}{\frac{1}{N}\sum_{j=1}^{N} score_j} \right) + 1},$$

where *j* represents a category. For example, if a country has perfectly equal category scores, this index takes the maximum value, *1,* and would represent perfect policy coherence. The estimated results are reported in Table 4. According to this table, the Netherlands, whose CDI score is the highest, also receives the highest PCI^{A} score. In the case of Japan, its ranking improves from 21st for the CDI to 17th for the PCI^{A}. The US receives the lowest PCI^{A} ranking while the UK dramatically improves its ranking from 11th to 2nd.

This PCI is an extreme measurement tool since the "levels" of the category scores are not taken into account at all. A more appropriate index, therefore, is a combination of the CDI and PCI^{A}. For example, we can consider the following policy coherence index:[4]

(2) $$PCI^{B} = CDI + \frac{1}{\left(\frac{\sqrt{Var(score_j)}}{\frac{1}{N}\sum_{j=1}^{N} score_j} \right) + 1}.$$

The estimated results of PCI^{B} are reported in Table 3. By construction, the PCI^{B} ranking is closer to the CDI than is the PCI^{A}.

4.2 Contribution of Aid to Economic Growth[5]

To refine the CDI in the direction of an outcome-oriented index, we examine the relationship between aid and growth by using cross-country data. This relationship has become the focal point of research and policies on international aid. One of the most influential papers in this area is that of Burnside and Dollar (2000), hereafter BD, who found that the impact of aid on the

[4] This formula is related with the concept with certainty equivalence.
[5] This section is based on Sawada, Kohama, and Kono (2004).

growth of recipients is positive and conditional on good policies. However, this conditional linkage between aid and poverty reduction through economic growth breaks down once the data is extended. Easterly, Levine, and Roodman (2003), hereafter ELR, who augmented their data from 1970–93 to 1970–97 and filled in missing data for the original period of 1970–93, found that there is no significant relationship between the amount of aid and economic growth of recipient countries, even after controlling for policy variables. Consequently, BD's finding is not as robust once the data set is refined.

By breaking down the aid variable into loans and grants, we further investigated the reason why this conditional linkage between aid and growth disappeared.

Reconsidering ELR's findings

Our data set is identical to the one employed by ELR with the only difference being that we broke down the effective development aid (EDA) variable compiled by Chang *et al.* (1998) into the values of loans and grants. With this aim, we took the following two-step procedure. First, using the 1975–95 data, we regressed the loan variable from EDA's data set on other variables such as net loans, grants, and technical assistance. Then, with the estimated regression coefficients, we extrapolated the loan data for 1970–74 and 1996–97. With respect to grant data, we employed the Organisation for Economic Co-Operation and Development's (OECD) *International Development Statistics* data directly because EDA's grant data is the same as the OECD data.[6] All variables apart from these aid variables are the same as ELR's data set, and we have excluded the outliers identified by ELR (Table 5).

Using the data set for 1970-97, we can replicate ELR's regression results. The first three columns in Table 6 show our replication of ELR's results. As we can see, the coefficients on aid and aid-policy interaction are positive and negative, respectively, but both are statistically insignificant.[7]

However, the ways in which grants and loans work to generate economic growth are likely to be quite different. Columns 4–6 of Table 6 show the results that include the separate effects of loans per GDP and grants per GDP on economic growth. We found that the coefficients of loans are positive and statistically significant when we include the loan-policy interactions (columns 5 and 6).[8]

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[6] EDA's data does not contain data on technical assistance (TA) since donors benefit from payments received in return for the TA supplied. This may greatly reduce the donor's net financial cost. We also estimate the effect of TA on economic growth explicitly by using the OECD data [Table 6, specifications (8) and (9)].

[7] We also conduct the two-stage least squares estimations to cope with a possible endogeneity bias of the aid variables. The results, which are not reported here, are also consistent with ELR's results.

[8] Loans are typically used for infrastructure projects; hence, their impacts are realized with time lags. The fact that the data for loans are disbursement-based might also introduce these lagged effects. To investigate further the effectiveness of loans, we also included the lagged variable of loans. The estimation results, which are not reported here, are also consistent with the results of Table5.

Hence, we may attribute the disappearance of conditional aid effectiveness in the ELR study to an omitted variable bias caused by the assumption of the same coefficient on loan and grant variables.

Yet, all the coefficients of the loan-policy interaction terms shown in Table 6 are negative and mostly insignificant. The total effect of loans on economic growth will be positive in the relevant range, at least if we evaluate the total effect at the average policy level (i.e., 1.423). However, the negative coefficients of the interaction terms imply that the impact of loans on income growth is lower in a country with good policies.

We suspect, nevertheless, that this finding is spurious due to the characteristics of the policy variable constructed by BD and ELR. Their policy variable is based on the regression results of income on fiscal surplus, the inflation rate, and openness. The existing studies on fungibility issues in foreign aid suggest that there is a greater "flypaper effect" with concessional loans than with grants (Feyzioglu, Swaroop, and Zhu 1998). Therefore, the policy variable correlates positively with the loan variable, and as a result, the loan-policy interaction variable can capture squared-loan amounts. In this case, negative coefficients of loan-policy interactions imply a decreasing and marginal impact of loans on growth. In fact, this interpretation also corresponds with the finding of BD (2000), which showed that there are diminishing returns for the impact of aid on growth.[9]

Aid Modality and Growth

Empirically, it is widely known that aid increases consumption rather than investments (Burnside and Dollar 2000; Boone 1999). Easterly (2003) attributed this finding to the classic Samaritan's dilemma, where aid could actually worsen incentives to invest if the recipient believes that future poverty will call forth future aid. This disincentive's effects will be smaller in the case of loans than grants, since future repayments will be required for loans and the net resource transfer is much smaller than the nominal amount. In fact, in the context of Japanese foreign aid, it has been commonly argued that the repayment obligations prevent recipient countries from investing in ineffective projects, thus resulting in discipline being imposed on project selection and management (Kohama 1995). We can find in the literature relevant arguments on the optimal design of public transfers under asymmetric information. For example, the work requirements of workfare programs (Besley and Coate 1992) or in-kind transfers (Blackorby and Donaldson 1988) can be used as self-sorting and incentive enhancement devices. Similarly, repayment requirements for subsidized loans should be an effective solution for incentive problems. On the other hand, there could be an opposite disincentive effect of loan provisions on investments, particularly when the amount of

[9] To test our interpretation, we estimated a model with a squared-loan variable instead of the loan-policy interaction variable. The coefficient of the squared-loan variable is -0.168, with a standard deviation of 0.418. While this coefficient is not statistically significant, its direction is consistent with our interpretation.

outstanding debt becomes excessive. This is known as the debt overhang problem in the literature on sovereign debt (Krugman 1988). Our empirical results suggest that the former incentive effect dominates the latter disincentive effect, in the context of foreign aid.

Reconsidering BD's Findings

We examined BD's findings during the period 1970-73 by breaking down the total loan variable into loans and grants. The descriptive statistics of each variable for the period 1970-93 are represented in Table 7.

As in the previous case, we first replicate BD's findings. As can be seen in specification (2) of Table 10, the coefficients of the aid and policy interaction term is positive and statistically significant. This leads us to conclude that in countries where there is a favorable policy environment, aid has a promotional effect.

Next, we examine the case in which total amount of aid is split into loans, grants, and technical assistance. As can be seen from specification (5), the coefficient of the grant and policy interaction term is positive and statistically significant. Moreover, in specification (9), the interaction term of squared technical assistance and policy variable has a positive and statistically significant coefficient. These results suggest that grants and technical assistance may promote growth under a relatively favorable policy environment.

The above findings demonstrate that the results of the shorter period imply a sample selection bias or a structural change in the latter half of the 1990s.

4.3 Derivation of the Optimal Weights

In this subsection, we estimate cross-country growth regression with aid variables as well as variables related to CDI category scores. Then, with economic growth as our criteria, we derive optimal weights for each category of the CDI. As Chowdhury and Squire (2003) clearly point out, such optimal weights are desired for computing a more accurate CDI. We will utilize the augmented BD-ELR regression model:

$$g_r = \alpha_0 + \alpha_1 x_{1r} + \alpha_2 x_{2r} + \cdots \alpha_N x_{Nr} + X_r \beta + u_r . \tag{3}$$

In this equation, g represents the economic growth rate of a country, r. Variables x_1 , x_1, …, x_N represent explanatory variables to compute weights and X is a set of other control variables. The last term, u, is a well-behaved error term. From equation (3), we can obtain an optimal weight to the variable x_i by using the following formula:

(4) $$w_i = \frac{\hat{\alpha}_i \times \frac{1}{R}\sum_{r=1}^{R} x_{ir}}{\frac{1}{R}\sum_{r=1}^{R} g_r}$$

In this equation (4), R is the number of samples and $\hat{\alpha}_i$ is the coefficient derived from estimating equation (3).

In the actual estimation, we employ the total short-tem and long-term capital inflows for the investment score variable, remittances from overseas migrants for the migration score variable, and CO2 emissions for the environment score variable. These variables are extracted from the World Bank's World Development Indicators. With respect to the trade score, we employ the updated Openness Index used for the policy variable by BD and ELR. Recalling that in ELR's model, the policy variable is constructed by:

(5) Policy = 5.92×budget surplus -1.89×inflation +1.46×openness,

we compute the optimal weight for the trade category by multiplying the coefficient of the policy variable in equation (3) by the openness coefficient, 1.46, in equation (5), and further by the average Openness Index.

With respect to the peacekeeping category, we assume that the number of assassinations variable in the BD-ELR regression is the inverse indicator of peace. Then we compute the fitted value of this indicator as the negative weight of peacekeeping.

Table 9 summarizes the descriptive statistics of variables and Table 10 summarizes the estimation results of regressions. In these specifications for Table 10, the coefficients on aid become statistically insignificant, unlike for BD and ELR. On the other hand, policy and FDI variables are consistently positive and significant. While the coefficients on the short-term capital inflow are consistently positive, they are not statistically significant. Assassinations and CO2 coefficients are mostly negative, although they are not statistically significant.

From the above estimation results, the optimal weight will be setting estimated weights for the trade and investment categories. We will consider an extended version of this optimal weight by adding the weights for aid or for all variables, although they are not necessary significant. For the following computations, we employ Table 10, specification (5).

4.4 Refined Commitment to Development Index (RCDI)

In Table 11, we present the Refined Commitment to Development Index (RCDI). The RCDI is a slightly revised version of the original CDI, which uses equal weights for each of its six

categories. As the original CDI has errors in the score of the investment category, we first report the total ranking after correcting those errors [Table 11, specification (A)].

If we presume that each category ranking in the CDI is accurate, there are some countries whose rankings are remarkably changed by using the optimal weights described above [Table 11, specification (B)]. For example, Denmark (2nd), Portugal (3rd), Switzerland (5th), Sweden (8th), Norway (10th), Greece (13th), Australia (19th), and the United States (20th) all experienced wide movements in their rankings. The reason for this is that these countries all have uneven scores across the six categories. On the other hand, since Japan ranks below 15th in all the categories except investment (7th), using different weightings has only a limited influence on its ranking. For instance, if we put equal weights on only aid, trade, and investment, Japan's ranking slightly rises to 20th, and Greece is 21st.

Two comments can be made about the aid category in the CDI. First, the aid score is based on the donors' aid values to their GDP ratio. This variable could be interpreted as "Contribution to Worthily Burden," where rich countries should pay more. Second, the aid scores in the CDI exclude interest payments and thus countries such as Japan, whose ODA consists of a large proportion of loans, have a lower ranking by nature.

Considering these problems, we develop another two indices. The first index uses aid per population instead of aid per GDP. In this case, though Japan's ranking in the aid category improves to 13th, its ranking in the total score is still the lowest, as shown in Table 11, specification (C). The second index uses net disbursements for the aid variables, which do not deduct interest payments from ODA, to compute the aid score. Table 11, specification (D) shows this index does not change Japan's ranking.

Table 11 suggests that Japan's policy coherence is at a low level among the developed countries no matter which concept we use.

4.5 Contribution to Growth Index (CGI)

As a next step, we use the "optimal weight" derived from the results of cross-country regression discussed in Section 4.3 and reported in Table 10, specification (5) to calculate the Contribution to Growth Index (CGI), which is an index based on the degree of contribution to economic growth in developing countries.

We should note that the aid index used in the CDI is imperfect as the proxy variable for "the degree of contribution to growth of developing countries." Hence, to overcome this issue, first we should define a variable that quantifies the degree of contribution. Ideally, what donors should maximize is the weighted sum of economic growth of the aid recipient countries, as:

(6) Weighted sum of economic growth in developing countries = $\sum_{r=1}^{R} w_r g_r$,

where r expresses the aid recipient countries and w is the weight on that country based on its population. As the results of BD-ELR and our Tables 6 and 8 show, the amount of aid received relative to the GDP of recipient countries is an important policy variable. Hence, the variable that captures the contribution of donor d's aid to growth in developing countries can be expressed by:

$$(7) \qquad \text{Index of contribution of donor } d\text{'s aid to growth} = \sum_{r=1}^{R} w_r \frac{AID_{rd}}{GDP_r},$$

where AID_{rd} is the aid value of donor d to recipient country r. Note that since grants and loans have different effects on economic growth, we set the inter-aid variable weights of grants and loans to 0.45 and 0.55, respectively, to derive the weight of aid, w_r. Further, to derive worthily the burden of each donor, we divide the value derived by (7) by a donor's GDP to yield the aid index. In this case, Japan's aid ranking is 14th and the lowest ranked country is the United States.

As for investment, we set the weights of foreign direct investment and regulation on pension funds, which is the proxy for foreign indirect investment, as 0.82 and 0.18, respectively, based on the results of the regression.

On trade, migration, and the environment, we employ the original CDI category variables without any change.

On peacekeeping, we replace the category index in the CDI by the donor's arms export to total export ratio. We extract data from the World Bank's World Development Indicators and utilize an average variable over 1998 and 1999.

In Table 12, specification (1), we show the ranking where we replace the index in each category by the CGI described above, while putting equal weight on all the six categories like in the CDI. This modification raises Japan's ranking to 17th, mainly because its non-export of arms gives Japan the highest peacekeeping score.

Second, in Table 14, specification (2), we compute the CGI with the assumption that the optimal weight is:

$$(8) \quad \text{(Aid, Trade, Investment, Migration, Peacekeeping, Environment)} = (0.27, 0.26, 0.31, 0.07, 0.09, 0.01),$$

based on the results of Table 10, specification (5). In this case, Japan's ranking becomes lower than Table 12, specification (1), due to a decrease in the weight on peacekeeping.

Third, we also take into account the statistical significance of the variable. According to the results from Table 5, specification (5), only the trade policy variable, which is contained in the policy variable, and foreign direct investment are statistically significant. Hence, we utilize the following weights:

(9) (Aid, Trade, Investment, Migration, Peacekeeping, Environment) = (0, 0.26, 0.25, 0, 0, 0)

as the optimal weights. The results with these weights are reported in specification (3). In this case, Japan ranks 20th.

Finally, we compute the CGI when we put the positive weights on the important economic variables of aid and international indirect capital flows in addition to trade and FDI:

(10) (Aid, Trade, Investment, Migration, Peacekeeping, Environment) = (0.27, 0.26, 0.31, 0, 0, 0).

The results are reported in Table 14, specification (4). Japan still ranks 20th, reflecting the country's low aid category ranking.

4.6 Introducing New Categories: Comprehensive Commitment to Development Index (CCDI)

As we already pointed out, CDI is interpreted as a trial to quantify and evaluate the international contribution of each developed country from a synthetic point of view. International contribution of developed countries, however, is not restricted to aid, trade, investment, migration, peacekeeping, and the environment. In this subsection, we propose a Comprehensive Commitment to Development Index (CCDI) by introducing the new categories of culture and social development.

The provision of aid by developed countries to promote cultural activities in developing countries should be considered an important form of international cooperation. Since available data on aid for the promotion of cultural activities is limited, we yield a new index that computes the contribution of developed countries to the United Nations Educational, Scientific and Cultural Organization (UNESCO), which plays an important role in preserving legacy all over the world and supporting international cultural exchange. Note that the contribution of the United States to UNESCO is zero as it only returned to UNESCO in October 2003, after an absence of 19 years.

In addition, to take into account developed countries' contributions to achieve the MDGs, we include another new category index for contributions to social sector development by each donor's aid for social infrastructure and service in 2001, dividing it by the donor's GDP in the same year.[10]

As for the migration index, the possibility of a brain drain implies that using the number of migrants as an index for international contribution is misleading. Therefore, we focus on refugees to make a new index for migration, computed by dividing each donor's contribution to the UNHCR by its GDP.

[10] It will be possible to interpret the usage of this information as capturing its contribution to the HDI made by the UNDP.

We summarize the results of introducing these new categories and new migration index in Table 13. We call these indices the Comprehensive Commitment to Development Index (CCDI). Table 13, specification (5) shows the ranking when we take an arithmetic mean of the eight categories, with equal weights for all the categories. As Japan contributes a great deal to UNESCO, its ranking improves to 13th. Table 13, specification (6) is the result when we reduce the weights for the new cultural cooperation and social development categories by 20 percent. In specification (7), we use the CDI's original category index for migration with optimal weights for the CDI's six categories by adding the two new categories with 12.5 percent weights. In those cases, Japan still has a low ranking.

4.7 Using Absolute Values: Absolute Commitment to Development Index (ACDI)

Finally, we show the rankings when we use a country's absolute values of aid, foreign direct investment, contributions to UNESCO and the UNHCR, and aid for social infrastructure, instead of dividing these category totals by the country's GDP. According to equation (6), these indices are supposed to quantify a donor's contribution to economic development of low-income countries in *absolute* terms. In Table 14, we present the absolute value version of the CDI, in which we do not divide category values by GDP. Table 14, specifications (8) ~ (10) show that Japan is listed among the highly ranked countries.

Judging from the overall rankings described above, Japan has a strong presence in the contribution to growth of developing countries in absolute values, but it ranks at a lower level if we adjust for the size of its economy as CGD/FP (2003) pointed out.

5. Conclusion

In this paper, we have critically re-examined the robustness of the CDI ranking. The ranking of the CDI can be changed significantly depending on weights selected, data used for constructing category scores, and the addition of new category scores.

It is also necessary to link the CDI to other important policy concepts and objectives such as "policy coherence" and the MDGs. Especially, the relationship between the CDI and MDGs is not necessarily clear. Although poverty reduction as well as improvements to education and health are explicitly included in the MDGs, these categories are not incorporated into the CDI. Possible future refinements of the CDI should be directed toward quantifying developed countries' contributions to achieve the MDGs.

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Table 1 Basic Sources of the CDI

1. Magazine Articles

CGD/FP (2003), "Ranking the Rich," *Foreign Policy*, May/June 2003, pro-poor, 56-66.
http://www.foreignpolicy.com/story/story.php?storyID=13656

2. Basic Data: http://www.cgdev.org/rankingtherich/details.html

Technical Paper: Nancy Birdsall and David Roodman, Center for Global Development

Background Papers

Aid component: David Roodman

The aid component was influenced by an earlier paper by William Easterly, Center for Global Development.

Trade component: William Cline, Center for Global Development

Investment component: John Williamson and Josh Catlin, Institute for International Economics

Migration component: Kimberly Hamilton and Elizabeth Grieco, Migration Policy Institute

Peacekeeping component: Michael O'Hanlon, Brookings Institution

Environmental performance: David Roodman, Center for Global Development

Data Sets

Summary background data: compiled by David Roodman

Detailed background data: compiled by David Roodman

Table 2 Related Articles in English or Japanese

1. "Tojokoku Shien Nihon Saika-i – Enjo, Toshi nado 6 Bunya no Sougoten" ("Japan in the lowest place for aid to developing countries – looking from overall six categories including aid and investment"), *Asahi Shimbun*, April 30, 2003, 2.

http://www.asahi.com/business/update/0429/026.html

2. Nancy Birdsall and Moises Naim, "Ranking donor nations - When the rich talk aid, the poor don't always get it."

International Herald Tribune, April 29, 2003, 6.

http://www.iht.com/articles/94678.html

3. Economics focus: "Gauging generosity - Which rich countries do most to help poor countries?"

May 1, 2003.

The Economist (print edition)

http://www.economist.com/printedition/displayStory.cfm?Story_ID=1748607

4. "An Economist in Search of a 'Global Social Contract' to Reduce Poverty."

By Nora Boustany

Washington Post, Friday, May 9, 2003, A32.

http://www.washingtonpost.com/wp-dyn/articles/A32760-2003May8.html

5. LEADERS & LETTERS: "A focus on effective aid for the poor"

By Robert Picciotto

Financial Times, May 17, 2003.

http://search.ft.com/search/article.html?id=030517001240&query=Picciotto&vsc_appId=totalSearch&state=Form

6. Furuta, Hajime (2003), "Tojokoku Enjo – Nihon no Koken, Tadashiku Hyoka wo" ("Aid to developing countries – Correct evaluation of Japan's contribution"), *Asahi Shimbun*, July 16, 2003, 14.

7. Furuta, Hajime (2003), "The Rich Respond," *Foreign Policy*, October 2003, 6 and 8.

Table 3
Total Arms Exports, 1997

	Total Arms Exports (US dollars)
United States	95,524,597,287
United Kingdom	17,474,744,644
France	11,728,089,259
Italy	1,779,248,555
Canada	1,677,373,436
Spain	1,648,297,711
Sweden	1,640,168,844
Netherlands	1,199,553,737
Germany	941,247,834
Belgium	310,196,881
Greece	200,967,216
Switzerland	126,754,279
Finland	76,104,324
Australia	0
Austria	0
Denmark	0
Ireland	0
Japan	0
New Zealand	0
Norway	0
Portugal	0

Sources: World Bank (http://www.fas.org/asmp/profiles/WBarmsexports2.htm) for the total export of arms to total trade ratio, and Penn World Table Mark 6（http://pwt.econ.upenn.edu/）for the total trade data.

Table 4 Policy Coherence Index (PCI)

		Index A		Index B
Rank	Country	Score	Country	Score
1	Netherlands	0.78	Netherlands	6.66
2	United Kingdom	0.74	Denmark	6.35
3	Belgium	0.72	Switzerland	6.03
4	Austria	0.71	New Zealand	5.78
5	Denmark	0.69	Portugal	5.64
6	Ireland	0.67	Germany	5.36
7	Sweden	0.66	Austria	5.32
8	Norway	0.66	Spain	5.32
9	Portugal	0.64	Sweden	5.30
10	Spain	0.64	Norway	5.19
11	Germany	0.64	United Kingdom	5.00
12	New Zealand	0.64	Belgium	4.82
13	France	0.62	Greece	4.40
14	Finland	0.62	France	4.37
15	Canada	0.61	Ireland	4.28
16	Switzerland	0.60	Italy	4.18
17	Japan	0.60	Canada	4.14
18	Italy	0.59	Finland	4.11
19	Australia	0.58	Australia	3.67
20	Greece	0.53	Japan	3.08
21	United States	0.50	United States	3.07

Table 5
Reconsidering the Easterly, Levine, and Roodman (2003) Model:
Descriptive Statistics of the Variables

Variable name	Obs.	Mean	Std. Dev.	Min	Max
GDP/capita growth	344	1.353	3.435	-12.693	10.076
ln (initial GDP)	344	7.499	0.759	5.429	9.339
Policy	344	1.423	1.048	-4.740	3.720
Ethnic Frac.	344	0.468	0.297	0.000	0.900
Assassinations	344	0.492	1.274	0.000	11.500
Ethnic* Assas.	344	0.189	0.606	0.000	7.360
Institution	344	4.324	1.543	1.580	8.140
M2/GDP	344	26.175	14.478	4.580	120.308
Aid	344	1.189	1.478	-0.049	7.312
Loans	344	0.366	0.490	-1.224	2.382
Grants	344	0.823	1.184	-0.002	6.696
Technical Assistance	344	0.463	0.537	0.009	2.831

Data sources: See the text.

Table 6
Reconsidering the Easterly, Levine, and Roodman (2003) Model
Replication of ELR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	-0.42	-0.37	-0.34	-0.38	-0.38	-0.36	-0.39	-0.42	-0.52
ln (initial GDP)	(-1.12)	(-0.96)	(-0.86)	(-1.01)	(-0.98)	(-0.90)	(-1.02)	(-1.09)	(-1.35)
	1.04***	1.26***	1.22***	1.05***	1.19***	1.17***	1.05***	1.07***	1.44***
Policy	(5.25)	(5.54)	(5.16)	(5.34)	(5.49)	(5.17)	(5.32)	(5.00)	(5.74)
	-0.01	0.03	0.06	-0.02	0.09	0.08	-0.03	0.10	-0.12
Ethnic Frac.	(-0.02)	(0.04)	(0.08)	(-0.03)	(0.13)	(0.12)	(-0.04)	(0.15)	(-0.18)
	-0.34	-0.37	-0.37	-0.32	-0.34	-0.33	-0.32	-0.34	-0.35
Assassinations	(-1.34)	(-1.45)	(-1.43)	(-1.27)	(-1.31)	(-1.27)	(-1.26)	(-1.31)	(-1.29)
	0.12	0.20	0.19	0.10	0.15	0.13	0.10	0.14	0.14
Ethnic* Assas.	(0.19)	(0.31)	(0.30)	(0.16)	(0.23)	(0.21)	(0.16)	(0.22)	(0.21)
	0.32***	0.32**	0.32**	0.33***	0.33**	0.33**	0.33***	0.33***	0.28**
Institution	(2.63)	(2.56)	(2.58)	(2.69)	(2.60)	(2.57)	(2.68)	(2.66)	(2.27)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
M2/GDP	(0.23)	(0.21)	(0.20)	(0.27)	(0.06)	(0.00)	(0.26)	(0.34)	(0.48)
Sub-Saharan	-1.61***	-1.65***	-1.69***	-1.64***	-1.63***	-1.62***	-1.60***	-1.40**	-1.09*
Africa	(-2.92)	(-2.96)	(-2.96)	(-2.95)	(-2.93)	(-2.80)	(-2.68)	(-2.32)	(-1.84)
	1.35***	1.12**	1.16**	1.34***	1.28**	1.32**	1.34**	1.34**	0.96*
East Asia	(2.62)	(2.18)	(2.22)	(2.62)	(2.51)	(2.48)	(2.60)	(2.56)	(1.82)
	-0.04	0.24	0.26						
Aid	(-0.25)	(0.83)	(0.88)						
		-0.18	-0.12						
Aid* Policy		(-1.24)	(-0.54)						
			-0.01						
Aid^2* Policy			(-0.36)						
				0.34	1.29*	1.40*	0.35	1.57*	1.74*
Loans				(0.66)	(1.67)	(1.69)	(0.65)	(1.94)	(1.95)
					-0.72*	-0.54		-0.88**	-0.73*
Loan* Policy					(-1.72)	(-1.43)		(-2.03)	(-1.70)
						-0.20			-0.25
$Loan^2$* Policy						(-0.79)			(-1.01)
				-0.14	-0.18	-0.20	-0.13	0.54	0.28
Grants				(-0.73)	(-0.44)	(-0.47)	(-0.50)	(0.96)	(0.52)
					0.02	0.06		-0.40	0.08
Grant* Policy					(0.11)	(0.21)		(-1.38)	(0.18)
						0.00			-0.06
$Grant^2$* Policy						(-0.05)			(-0.88)
Technical							-0.08	-2.25**	-2.08*
Assistance (TA)							(-0.12)	(-1.97)	(-1.96)
								1.25**	-1.07
TA* Policy								(2.17)	(-1.32)
									1.02***
TA^2* Policy									(3.18)
Observations	344	344	344	344	344	344	344	344	344
R-squared	0.33	0.33	0.33	0.33	0.34	0.34	0.33	0.35	0.37

Note: *, **, and *** represent 10%, 5%, and 1% statistical significance, respectively.

Table 7
Reconsidering the Burnside and Dollar (2000) Model
Descriptive Statistics of the Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDP/capita growth	268	1.328	3.477	-12.693	10.076
ln (initial GDP)	268	7.535	0.711	5.743	9.339
Policy	268	1.346	1.280	-3.910	3.720
Ethnic Frac.	268	0.459	0.300	0.000	0.900
Assassinations	268	0.465	1.265	0.000	11.500
Ethnic* Assas.	268	0.181	0.614	0.000	7.360
Institution	268	4.396	1.519	1.580	8.140
M2/GDP	268	24.210	11.393	4.580	81.641
Aid	268	1.027	1.285	-0.049	6.682
Loans	268	0.366	0.486	-1.224	2.382
Grants	268	0.662	0.952	-0.002	4.607
Technical Assistance	268	0.438	0.521	0.009	2.831

Data sources* See the text.

Table 8
Reconsidering Burnside and Dollar (2000) Model

	Replication of BD-ELR								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (initial GDP)	-0.04	-0.19	-0.25	-0.07	-0.19	-0.22	-0.08	-0.23	-0.34
	(-0.08)	(-0.41)	(-0.50)	(-0.17)	(-0.40)	(-0.47)	(-0.17)	(-0.51)	(-0.71)
Policy	1.00***	0.70***	0.74***	0.99***	0.72***	0.78***	1.02***	0.71***	0.97***
	(5.73)	(3.86)	(4.05)	(5.66)	(3.94)	(4.25)	(5.74)	(3.79)	(4.75)
Ethnic Frac.	-0.53	-0.50	-0.57	-0.53	-0.39	-0.51	-0.55	-0.42	-0.44
	(-0.73)	(-0.66)	(-0.74)	(-0.71)	(-0.52)	(-0.67)	(-0.73)	(-0.55)	(-0.59)
Assassinations	-0.54*	-0.51*	-0.51*	-0.56*	-0.54*	-0.53*	-0.58*	-0.55*	-0.56*
	(-1.82)	(-1.69)	(-1.69)	(-1.84)	(-1.75)	(-1.71)	(-1.89)	(-1.79)	(-1.81)
Ethnic* Assas.	0.92*	0.82	0.81	0.93*	0.85	0.84	0.97*	0.87*	0.86*
	(1.83)	(1.60)	(1.59)	(1.84)	(1.65)	(1.62)	(1.91)	(1.68)	(1.69)
Institution	0.34**	0.37***	0.35**	0.34**	0.37***	0.33**	0.34***	0.37***	0.32**
	(2.56)	(2.72)	(2.53)	(2.53)	(2.66)	(2.37)	(2.63)	(2.70)	(2.34)
M2/GDP	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02
	(1.09)	(1.40)	(1.44)	(1.10)	(1.07)	(1.17)	(1.02)	(0.96)	(0.88)
Sub-Saharan	-1.45**	-1.53**	-1.48**	-1.49**	-1.57**	-1.42**	-1.18*	-1.04	-0.92
Africa	(-2.28)	(-2.39)	(-2.29)	(-2.37)	(-2.47)	(-2.19)	(-1.75)	(-1.50)	(-1.37)
East Asia	0.79	1.17**	1.11*	0.79	1.28**	1.13*	0.72	1.25**	0.92
	(1.34)	(1.98)	(1.88)	(1.33)	(2.14)	(1.89)	(1.20)	(2.08)	(1.54)
Aid	0.23	-0.20	-0.33						
	(1.03)	(-0.64)	(-0.86)						
Aid* Policy		0.35**	0.21						
		(2.39)	(0.91)						
Aid^2* Policy			0.05						
			(0.67)						
Loans				-0.07	0.48	0.56	0.01	0.92	1.10
				(-0.13)	(0.59)	(0.65)	(0.02)	(1.03)	(1.15)
Loan*Policy					-0.19	-0.05		-0.39	-0.42
					(-0.57)	(-0.13)		(-1.06)	(-1.05)
$Loan^2$*Policy						-0.08			-0.06
						(-0.83)			(-0.44)
Grants				0.35	-0.40	-0.64	0.60	0.19	-0.04
				(1.18)	(-0.85)	(-1.25)	(1.52)	(0.32)	(-0.06)
Grant* Policy					0.48***	0.10		0.23	0.71
					(2.68)	(0.29)		(0.72)	(1.40)
$Grant^2$* Policy						0.16			-0.10
						(1.52)			(-0.61)
Technical							-0.78	-2.01	-1.94
Assistance (TA)							(-1.00)	(-1.61)	(-1.57)
TA* Policy								0.68	-1.40
								(1.21)	(-1.58)
TA^2* Policy									0.98**
									(2.38)
Observations	268	268	268	268	268	268	268	268	268
R-squared	0.38	0.39	0.39	0.38	0.40	0.40	0.39	0.41	0.42

Note: *, **, and *** represent 10%, 5% and 1% statistical significance, respectively.

Table 9
Estimation of the Optimal CDI Category Weights
Descriptive Statistics of Variables

Variable	CDI Category	Obs.	Mean	Std. Dev.	Min	Max
GDP/capita growth		220	0.66	3.49	-12.69	10.08
ln (initial GDP)		220	7.54	0.78	5.43	9.34
Policy	(Trade)	220	1.41	1.12	-4.74	3.72
Ethnic Frac.		220	0.47	0.30	0.00	0.90
Assassinations	Peacekeeping	220	0.52	1.32	0.00	11.50
Ethnic* Assas.		220	0.19	0.66	0.00	7.36
Institution		220	4.31	1.59	1.58	8.14
M2/GDP		220	28.06	15.52	6.09	120.31
Aid	Aid	220	1.35	1.56	-0.05	7.00
Loan	Aid	220	0.39	0.51	-1.22	2.38
Grant	Aid	220	0.95	1.23	0.00	6.18
Technical Assistance	Aid	220	1.47	1.70	0.01	6.69
Portfolio Investment/GDP	Investment	220	0.51	0.58	0.01	2.83
Net FDI/GDP	Investment	220	0.27	0.70	-0.80	3.91
Remittances/GDP	Migration	220	1.06	1.43	-2.69	9.69
CO2 emissions/GDP	Environment	220	1.66	3.26	0.00	22.10
Openness	(Trade)	220	1.69	2.45	0.04	15.72

Note: We use portfolio investment, net FDI, remittances, and CO2 emissions data for 2000, taken from the *World Development Indicators 2002*. These are figures divided by GDP.

Table 10
Estimation of the Optimal CDI Category Weights

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (initial GDP)	-0.99	-0.98	-1.00	-0.90	-1.00	-0.98	-0.90	-1.04	-1.07
	(-1.51)	(-1.45)	(-1.40)	(-1.38)	(-1.44)	(-1.36)	(-1.37)	(-1.53)	(-1.49)
Policy	0.94***	0.94***	0.96***	0.93***	0.85***	0.83***	0.91***	0.75***	1.15***
	(3.55)	(3.50)	(3.26)	(3.64)	(3.41)	(3.15)	(3.54)	(3.06)	(3.80)
Ethnic Frac.	-0.93	-0.93	-0.95	-0.91	-0.85	-0.82	-0.89	-0.70	-0.80
	(-1.03)	(-1.02)	(-1.02)	(-1.00)	(-0.93)	(-0.88)	(-0.98)	(-0.76)	(-0.92)
Assassinations	-0.35	-0.35	-0.36	-0.34	-0.33	-0.33	-0.34	-0.31	-0.42
	(-1.30)	(-1.30)	(-1.29)	(-1.23)	(-1.16)	(-1.18)	(-1.22)	(-1.12)	(-1.46)
Ethnic* Assas.	0.19	0.19	0.19	0.18	0.16	0.17	0.18	0.14	0.27
	(0.28)	(0.29)	(0.29)	(0.27)	(0.24)	(0.25)	(0.26)	(0.21)	(0.38)
Institution	0.40**	0.40**	0.40**	0.42**	0.43**	0.44**	0.43**	0.45**	0.42**
	(2.37)	(2.34)	(2.32)	(2.42)	(2.39)	(2.40)	(2.41)	(2.52)	(2.40)
M2/GDP	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.66)	(-0.66)	(-0.62)	(-0.69)	(-0.76)	(-0.76)	(-0.55)	(-0.54)	(-0.52)
Sub-Saharan Africa	-1.83**	-1.83**	-1.83**	-1.82**	-1.85**	-1.88**	-2.03**	-1.96**	-1.72**
	(-2.42)	(-2.41)	(-2.40)	(-2.42)	(-2.45)	(-2.49)	(-2.58)	(-2.42)	(-2.12)
East Asia	1.59*	1.59**	1.56*	1.59*	1.76**	1.77**	1.60*	1.81**	1.42*
	(1.96)	(2.03)	(1.88)	(1.97)	(2.26)	(2.17)	(1.96)	(2.29)	(1.78)
Aid	-0.21	-0.21	-0.22						
	(-1.06)	(-0.63)	(-0.65)						
Aid* Policy		0.00	-0.03						
		(-0.01)	(-0.09)						
Aid^2* Policy			0.01						
			(0.12)						
Loans				0.25	0.70	0.59	0.12	0.94	1.12
				(0.50)	(0.92)	(0.78)	(0.22)	(1.04)	(1.11)
Loan* Policy					-0.36	-0.43		-0.58	-0.75
					(-0.90)	(-1.10)		(-1.29)	(-1.57)
$Loan^2$* Policy						0.12			-0.04
						(0.67)			(-0.21)
Grants				-0.34	-0.61	-0.59	-0.41	-0.05	-0.27
				(-1.33)	(-1.13)	(-1.05)	(-1.32)	(-0.06)	(-0.34)
Grant* Policy					0.17	0.19		-0.19	0.35
					(0.64)	(0.56)		(-0.47)	(0.59)
$Grant^2$* Policy						-0.01			-0.07
						(-0.15)			(-0.70)
Technical Assistance							0.41	-1.35	-1.26
(TA)							(0.59)	(-0.85)	(-0.87)
TA*Policy								1.01	-1.46
								(1.38)	(-1.22)
TA^2* Policy									1.04**
									(2.58)
Portfolio Investment	0.41	0.41	0.40	0.39	0.39	0.39	0.40	0.45	0.37
	(1.25)	(1.25)	(1.21)	(1.20)	(1.22)	(1.19)	(1.22)	(1.37)	(1.10)
Net FDI/GDP	0.46***	0.46***	0.46***	0.48***	0.45***	0.45***	0.47***	0.42***	0.38***
	(3.18)	(3.24)	(3.24)	(3.25)	(3.03)	(3.01)	(3.31)	(2.95)	(2.73)
Remittances	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.09	0.12
	(0.77)	(0.73)	(0.68)	(0.87)	(0.80)	(0.79)	(0.79)	(0.92)	(1.09)
CO2 emissions	-0.02	-0.02	-0.02	-0.03	-0.01	-0.01	-0.03	0.01	-0.02
	(-0.15)	(-0.15)	(-0.16)	(-0.19)	(-0.07)	(-0.10)	(-0.20)	(0.04)	(-0.11)
Observations	220	220	220	220	220	220	220	220	220
R-squared	0.42	0.42	0.42	0.42	0.43	0.43	0.42	0.43	0.45

Notes: We employed the results of specification (5) to compute the optimal weights. In the case of the aid variable, not all figures are significant. Yet, when calculating weights, in Table 8, specification (5) for the 1970 to 1993 data, the Grant* Policy coefficient is significant. Therefore, we employed the coefficient of Grant* Policy in Table 10. In addition, although the coefficients of loans for 1970-1993 data are not significant, in Table 6 for 1970 to 1997, they become significant. Accordingly, we conclude that weights computed using the loan coefficient in Table 10 are valid.
*, **, and *** are statistically significant at 10%, 5% and 1%, respectively.

Table 11
Refined Commitment to the Development Index (RCDI)

	(A) Revised CDI after minor corrections		(B) Refined CDI (A) with Optimal Weights		(C) Index (A) revised by using Aid per population estimate		(D) Index (A) without interest payments	
Rank	Country	Score	Rank	Country	Score	Country	Score	Country	Score
1	Netherlands	5.88	1	Netherlands	6.70	Denmark	5.66	Netherlands	5.89
2	Denmark	5.66	2	Denmark	5.64	Netherlands	5.61	Denmark	5.66
3	Switzerland	5.43	2	Portugal	5.55	Switzerland	5.50	Switzerland	5.43
4	New Zealand	5.14	4	Switzerland	5.39	New Zealand	4.97	New Zealand	5.14
5	Portugal	5.00	5	Spain	5.34	Portugal	4.77	Portugal	5.00
6	Germany	4.72	6	Sweden	4.87	Norway	4.76	Germany	4.75
7	Spain	4.68	7	Norway	4.51	Germany	4.63	Spain	4.68
8	Sweden	4.64	8	New Zealand	4.38	Austria	4.49	Austria	4.65
9	Austria	4.61	8	United Kingdom	4.37	Spain	4.47	Sweden	4.64
10	Norway	4.53	10	Austria	4.33	Sweden	4.38	Norway	4.53
11	United Kingdom	4.26	11	Belgium	3.90	United Kingdom	4.14	United Kingdom	4.26
12	Belgium	4.10	11	Ireland	3.86	Belgium	3.94	Belgium	4.10
13	Greece	3.88	13	Germany	3.71	Greece	3.72	Greece	3.88
14	France	3.74	13	France	3.65	France	3.60	France	3.76
15	Ireland	3.61	15	Canada	3.62	Ireland	3.56	Ireland	3.61
16	Italy	3.59	16	Finland	3.43	Italy	3.51	Italy	3.60
17	Canada	3.53	17	Italy	3.23	Canada	3.45	Canada	3.53
18	Finland	3.50	17	Australia	3.20	Finland	3.38	Finland	3.50
19	Australia	3.08	19	United States	3.15	Australia	2.98	Australia	3.08
20	United States	2.57	19	Greece	3.05	United States	2.59	United States	2.57
21	Japan	2.48	21	Japan	2.64	Japan	2.50	Japan	2.56

Table 12
Contribution to the Growth Index (CGI)

	(1) CGI with Equal Weights for All Six Revised Categories		(2) CGI with Optimal Weights for All Six Revised Categories		(3) CGI with Optimal Weights for Trade and Investment Categories Only / Other Weights Are Set to Zero		(4) CGI with Optimal Weights for Aid, Trade, and Investment Categories Only / Other Weights Are Set to Zero	
Rank	Country	Score	Country	Score	Country	Score	Country	Score
1	Switzerland	6.83	Netherlands	6.97	Spain	7.47	Netherlands	7.00
2	Netherlands	6.66	Switzerland	6.10	Portugal	7.07	Portugal	5.68
3	Denmark	5.98	Denmark	5.81	Netherlands	6.62	Denmark	5.59
4	Austria	5.62	Portugal	5.66	Switzerland	6.47	Switzerland	5.56
5	Germany	5.48	Spain	5.56	Austria	5.19	Spain	5.53
6	Spain	5.45	Sweden	5.09	Sweden	4.75	Sweden	4.98
7	Sweden	5.38	Austria	4.81	United Kingdom	4.67	Austria	4.22
8	Portugal	5.33	Belgium	4.61	United States	4.56	Belgium	4.15
9	New Zealand	5.16	Norway	4.22	Belgium	4.32	United Kingdom	4.13
10	Belgium	5.16	United Kingdom	4.20	Canada	4.28	Norway	3.70
11	Norway	4.57	Ireland	4.19	Denmark	4.25	Ireland	3.68
12	Ireland	4.44	Germany	4.12	Finland	4.24	Finland	3.56
13	Finland	4.44	New Zealand	3.97	France	4.23	France	3.45
14	United Kingdom	4.41	Finland	3.89	New Zealand	4.19	Germany	3.31
15	Canada	4.33	Canada	3.77	Germany	4.15	United States	3.11
16	Italy	4.02	France	3.48	Ireland	3.92	Canada	3.08
17	Japan	3.77	Italy	3.28	Italy	3.91	New Zealand	3.02
18	France	3.69	Australia	3.21	Australia	3.47	Italy	2.86
19	Australia	3.69	Japan	3.13	Greece	3.35	Australia	2.68
20	Greece	3.58	Greece	2.77	Japan	3.11	Japan	2.62
21	United States	2.19	United States	2.76	Norway	2.16	Greece	2.29

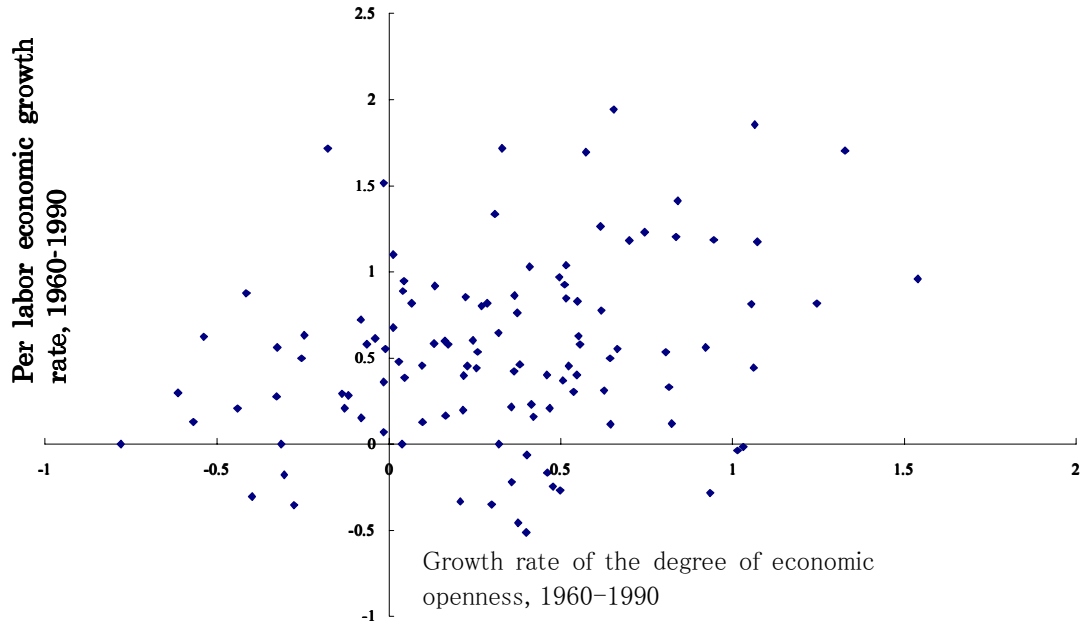
Table 13
Comprehensive Commitment to Development Index (CCDI)
Based on Eight Categories
By Introducing Cultural Cooperation and Social Development Categories

	(5) With Equal Weights for the Eight Categories (UNHCR Contribution for the Migration Category)		(6) With Equal Weights for the Six Original Categories and Reduced Weights for the Two New Categories By 20%		(7) With Optimal Weights for the Six Original Categories, 1/8 Weights for the Two New Categories (The Original CDI Migration Category Index)	
Rank	Country	Score	Country	Score	Country	Score
1	Netherlands	6.56	Netherlands	7.02	Netherlands	6.94
2	Denmark	5.39	Denmark	6.16	Spain	5.45
3	Sweden	5.33	Switzerland	6.09	Denmark	5.06
4	Spain	5.14	Spain	6.03	Switzerland	5.03
5	Germany	4.52	Portugal	5.90	Portugal	4.82
6	Norway	4.45	Sweden	5.62	Sweden	4.60
7	Switzerland	4.32	Austria	5.21	Germany	4.43
8	Portugal	4.25	Belgium	5.06	Norway	4.28
9	France	4.14	Germany	4.88	Austria	4.22
10	Italy	4.06	Finland	4.87	United Kingdom	4.12
11	United Kingdom	3.93	United Kingdom	4.56	Belgium	3.98
12	Austria	3.87	Norway	4.54	France	3.94
13	Japan	3.83	Italy	4.53	Canada	3.87
14	Finland	3.75	Ireland	4.27	Ireland	3.69
15	Belgium	3.71	France	4.25	Australia	3.55
16	Australia	3.62	New Zealand	4.21	Italy	3.52
17	Canada	3.60	Japan	4.16	New Zealand	3.45
18	Ireland	3.33	Canada	3.91	Finland	3.41
19	New Zealand	3.17	Greece	3.80	Japan	3.39
20	Greece	2.71	Australia	3.68	Greece	2.39
21	United States	1.62	United States	2.08	United States	2.34

Table 14
Absolute Commitment to Development Index (ACDI)
Absolute Values for Category Data with Six or Eight Categories

	(8) With Equal Weights Using the Six Original CDI Categories		(9) With Optimal Weights Using the Six Original CDI Categories		(10) With Equal Weights Using Eight Categories	
Rank	Country	Score	Country	Score	Country	Score
1	Germany	6.15	United States	7.08	Japan	5.71
2	Switzerland	5.38	United Kingdom	3.85	United States	5.47
3	Netherlands	5.35	Japan	3.78	Germany	4.58
4	Japan	5.16	Germany	3.77	Netherlands	3.92
5	New Zealand	4.91	Netherlands	3.17	United Kingdom	3.78
6	Spain	4.90	France	3.00	Spain	3.73
7	Austria	4.83	Spain	2.99	France	3.66
8	United Kingdom	4.81	Sweden	2.06	Italy	3.34
9	United States	4.68	Canada	1.99	Sweden	3.09
10	Denmark	4.53	New Zealand	1.95	Denmark	3.07
11	Belgium	4.39	Switzerland	1.91	Switzerland	2.98
12	Sweden	4.30	Denmark	1.82	Austria	2.87
13	Canada	4.19	Austria	1.80	Portugal	2.85
14	Italy	4.04	Italy	1.75	Belgium	2.80
15	France	4.01	Belgium	1.71	Finland	2.76
16	Portugal	3.93	Australia	1.67	Canada	2.68
17	Ireland	3.82	Ireland	1.58	New Zealand	2.58
18	Finland	3.82	Portugal	1.54	Australia	2.44
19	Australia	3.59	Finland	1.26	Greece	2.43
20	Greece	3.48	Greece	1.17	Ireland	2.36
21	Norway	3.30	Norway	0.50	Norway	2.10

Figure 1
Relations between the Growth Rate of the Degree of Economic Openness and the Long-Term per Labor Economic Growth Rate



Source: Penn World Table Mark 6 (http://pwt.econ.upenn.edu/).

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