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Abstract

This paper proposes a new quality of growth index (QGI) for developing countries. The index encompasses both the intrinsic nature and social dimensions of growth, and is computed for over 90 countries for the period 1990-2011. The approach is premised on the fact that not all growth is created equal in terms of social outcomes, and that it does matter how one reaches from one level of income to another for various theoretical and empirical reasons. The paper finds that the quality of growth has been improving in the vast majority of developing countries over the past two decades, although the rate of convergence is relatively slow. At the same time, there are considerable cross-country variations across income levels and regions. Finally, emprirical investigations point to the fact that main factors of the quality of growth are political stability, public pro-poor spending, macroeconomic stability, financial development, institutional quality and external factors such as FDI.

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I. INTRODUCTION

Recent history has shown that high growth on its own does not necessarily lead to good social outcomes. It matters if growth is inclusive or not. Thus, inclusiveness is an essential ingredient of any successful growth strategy. The concept has yet to be rigorously documented, as it is used to convey several aspects of growth. Numerous papers have proposed different definitions. For instance, the Commission on Growth and Development 2008 notes that inclusiveness of growth is associated with equity, equality of opportunity, and protection in market and employment transitions. In a similar vein, Ianchovichina and Gable (2012) define inclusive growth as rapid, broad-based across sectors and sustained growth that is inclusive of a large part of a country's labor force. According to this definition, to be inclusive a growth path needs to be strong, pro-poor and redistributive, and further geared toward improving productive employment. Recently, Anand *et al.* (2013) refer to both the pace and distribution of economic growth to define inclusive growth, on the ground that for growth to be sustainable and effective in reducing poverty, it needs to be inclusive.

This paper argues that all these aspects of inclusive growth have a common denominator, dubbed the "quality of growth". A necessary condition to achieve all these different approaches of inclusive growth is "good quality growth". Good quality growth is seen as high, durable, and socially-friendly growth. There is a consensus that high growth over the long run is necessary to achieve lasting improvements in social outcomes, but it is increasingly evident that high growth alone may not be sufficient in many cases. For instance, over the past few decades, many developing countries experienced strong growth episodes in the context of relative macroeconomic stability, sound policies, and strengthening institutions. However, relatively few posted significant declines in poverty, inequality and unemployment (see Dollar and Kraay, 2002; Dollar et al., 2013). It is therefore relevant for policy makers and academic professionals to assess whether the underlying "quality" of growth has been good.

This paper builds on Martinez and Mlachila (2013) who explored the quality of the recent high-growth episode in sub-Saharan Africa. They delved into the concept of good quality growth, defining it as one that is strong, stable, sustainable, increases productivity and leads to socially desirable outcomes, like improved standards of living, especially in the reduction of poverty.

The main objective of this paper is to introduce an index of the quality of growth. The proposed quality of growth index (QGI) encompasses both the *intrinsic nature* of growth and its *social dimensions*. Following Martinez and Mlachila (2013), a good quality of growth—more than just its (high) level—is important to enhance living standards and welfare, and to create opportunities for better employment. Thus how growth is generated is critical for its sustainability and for accelerating employment creation and poverty reduction. Our index attempts to capture the multidimensional features of growth.

The concept of the QGI goes beyond the well-known Human Development Index (HDI) developed by the United Nations by concentrating not just on the *levels of incomes*, but the very *nature of growth*. We argue that it does matter *how* one reaches from level *L1* to *L2* of

income for various theoretical and empirical reasons that are elaborated on below. Arguably, since it is income level-based, the HDI is the result of millennia of growth. On the other hand our index facilitates the assessment of the quality of various episodes of growth both within a country and across regions. There is ample evidence that not all growth is created equal: growth that is strong, stable, sustainable, increases total factor productivity, is broad-based sectorally, and export-oriented is likely to be more efficient in fostering socially desirable outcomes.[2] Our QGI is also different from the recently developed Social Progress Index (Stern et al., 2014), as the latter focuses more on aspects that are close to the social dimension of the QGI, without accounting for the growth fundamental aspect, which is the core of the QGI.[3] That said, it is worth mentioning that there is a dynamic and complementary relationship among social indicators such as education and health, and growth. Empirical evidence confirms this two-way relationship between investment in education and health, and growth (Bils and Peter, 2000).

The paper's key contribution is the rigorous development of the QGI, covering a wide panel of developing and emerging countries over 1990–2011. This allows us to explore how it has evolved over time and whether there are important regional variations in the quality of growth. It thus enables us to determine whether there has been some convergence in the quality of growth over time, or whether there exists a growth "quality trap". The paper also explores whether the quality of growth is related to other development indicators identified in the literature.

The paper's main findings are four-fold. First, the quality of growth has been improving in the majority of countries over the past two decades. Second, the rate of convergence is relatively slow. Third, there are considerable cross-country variations across income levels and regions. Finally, empirical investigations show that political stability, public pro-poor spending, macroeconomic stability, financial development, institutional quality and external factors such as FDI, are associated with higher QGI.

The paper is organized as follows. The next section describes in detail the steps involved in the creation of the index and introduces the dataset. Section III presents the computed index itself, shows some stylized facts and the country ranking, tests the presence of convergence in the QGI dynamics and explores the potential drivers of the QGI. Section IV checks the robustness of the index by examining various computation approaches. Section V presents concluding remarks.

II. METHODOLOGY AND DATA

In order to evaluate the evolution of the quality of economic growth across countries and over time, we build a Quality of Growth Index (QGI). This section first sets forth the

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[2] See Martinez and Mlachila (2013) for a detailed review of the literature on all these aspects.

[3] The social progress index encompasses three main dimensions: (i) the basic human needs, (ii) the foundations of wellbeing, and (iii) opportunity.

methodology used to derive the QGI along with its rationale, then discusses the sensitivity of the index to alternative assumptions, and introduces the dataset.

The QGI is a composite index, resulting from the aggregation of two building blocks: the intrinsic nature of the growth sub-index ("growth fundamentals") and the social dimension sub-index representing the desired social outputs from growth, as illustrated by Figure 1.

A. Growth Fundamentals

The sub-index for the intrinsic nature of growth encompasses four dimensions aiming at capturing the extent to which a given growth episode can be considered as of high quality, with regard to its (i) strength, (ii) stability, (iii) diversification of sources, and (iv) its outward-orientation.

The strength of growth is measured by the annual change in real GDP per capita. We resort to GDP per capita instead of GDP, as the former is more in line with the concept of pro-poor growth which underlies the concept of quality of growth.[4] The strength of growth is an important aspect of the quality of growth since high growth is a necessary ingredient to put a dent to poverty (Dollar and Kraay, 2002; Dollar et al., 2013). Accordingly, higher growth rate is expected to lead to substantial dent in poverty, and hence to a better QGI.

Stability is measured by the inverse of the coefficient of variation (CV) of the level of growth as measured above. The CV is the ratio of standard deviation over the average. A five-year rolling window is used to derive time-varying CV. The CV offsets the apparent dispersion related to the level and allows a straight comparison of countries irrespective of the growth levels. It therefore allows smoothing out the influence of outliers such as small open economies that tend to be structurally more volatile or large countries with low growth that tend to be structurally less volatile. The higher the CV, the lower is the inverse of CV, and the less stable is the growth episode. However, growth instability is well-known to worsen poverty and equity, through a "hysteresis mechanism". Indeed, swings in growth trajectories are particularly harmful to the poor, since the erosion of their human capital in "bad times" is not made up when the economy pulls out of the shock (Behrman et al., 1999; Ames et al., 2001; Guillaumont and Kpodar, 2006). Accordingly, a stable growth episode is expected to feed positively into the QGI.

The diversification of sources of growth captures the extent to which growth is considered as generated by diversified sources. It is proxied by a diversification index computed as one minus a Herfindahl-Hirschman index (HHI) using exports data. The higher the index of diversification of export products, the more diversified are the sources of growth. The rationale of using the diversification of exports lies in the findings that that export diversification is associated with stronger growth and lower output volatility (Papageorgiou and Spatafora, 2012), which are both conducive to higher QGI, as argued above.[5]

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[4] Key trends and countries' ranks are broadly robust to the direct use of GDP levels instead of GDP per capita.

[5] A more intuitive indicator is the HHI of GDP value added by sector. However, widespread missing data

(continued…)

The degree of outward orientation of a growth momentum is proxied by the share of net external demand—in percentage of GDP,[6] as opposed to the share of domestic demand. The rationale for this dimension builds on the fact that an outward orientation of growth is more likely to raise productivity growth through several mechanisms, including learning-by-doing processes, importation of more advanced technology, transfer of knowledge, the discipline of the world market, competition, and foreign direct investment (Diao et al., 2006). Note, however, that such an outward orientation of growth may increase the country's vulnerability to external environment fluctuations and as such results in a more volatile and ultimately lower quality growth.[7]

Figure 1. Conceptual Representation of the Quality of Growth Index

- Note: α and β represent the weights ascribed to growth fundamentals and social dimension in the QGI. γ_1, γ_2, γ_3 and γ_4 stand for the respective weights of the strength, stability, sectoral composition, and demand composition of growth in the growth fundamentals sub-component, while δ_1 and δ_2 are the weights assigned to health and education in the social dimension sub-component.

B. Social Dimensions of Growth

As mentioned above, a strong, stable, diversified, and outward oriented growth may prove insufficient in alleviating poverty substantially and improve living standards. This pro-poor

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prevent us from using such data. More decisively, output diversification is highly correlated with exports diversification (Papageorgiou and Spatafora, 2012).

[6] Net external demand equals to the difference between exports and imports, both as percent of GDP.

[7] This concern is somewhat addressed by accounting for the volatility of growth in the index.

aspect of the quality of growth is factored in its social dimension sub-index, through indicators capturing two of the most basic dimensions of human capital building. These include (i) a long and healthy life, and (ii) an access to a decent education/knowledge[8], which are both commonly acknowledged in the literature as key drivers of the changes in poverty levels (Schultz, 1999).[9]

The health component captures the extent to which a country's population can enjoy a long and healthy life through the aggregation of two sub-components, namely: (i) the reverse of infant mortality rate; and (ii) life expectancy at birth. Both these health measures are considered as key poverty symptoms, consistently with Amartya Sen's biological approach of measuring poverty (Sen, 2003).

Education is captured by the primary school completion rate. The main motivation for using only this indicator is data availability. Several variables could also be good proxies for a country's educational level, including inter alia, the average years of schooling and the net primary school enrollment rate. However, the lack of observations on these variables over a long period for many countries, either in the well-known Barro and Lee (2000) database or the WDI dataset, prevents us from employing such variables. It is worth noting that missing observations also do exist in the primary school completion rate variable, but we retain this variable, as a "lesser evil". Nevertheless, to avoid reducing considerably the sample size owing to missing values from the primary school completion rate, we made some assumptions allowing us to generate and fill up these missing values, consistently with the approach set forth in Appendix 2.

C. Construction of the Index

The construction of the QGI follows a two-step approach: first the variables are standardized into indices of same scale, and then are aggregated into a single index using different weights.

Standardization of the components

The different variables presented above and representing the different components of the QGI are not expressed in the same unit, which makes their aggregation into a single index comparable to a "mixing apples and oranges" problem. Two main approaches allow us to deal with this issue, namely, the centered-reduced normalization or Z-score approach, and the Min-Max approach. The former consists of transforming a given variable X characterized by

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[8] Several other opportunity variables (such as employment, inequality or poverty itself) and socially-friendly policy measures (including public spending allocated to health and education) are relevant candidates for capturing the pro-poor dimension of growth but are not considered in the construction of the QGI because of data limitation.

[9] Health and education are key components of the very well-known Human Development Index (Klugman et al., 2011).

its mean μ and standard deviation σ, into an index or Z score expressed as follows: $Z = \frac{(X - \mu)}{\sigma}$. If X is normally distributed, then Z follows a centered-reduced normal distribution, with a zero mean and a unity standard deviation. With this standardization, all variables are expressed in the same unit, namely the standard deviation, and can therefore be meaningfully aggregated into a single index. But one matter of concern related to this approach is the sensitivity of the transformed Z variable to the presence of outliers. For example, small open economies (predominant in our sample) have much more volatile growth, implying higher values for σ compared to the rest of countries. This leads to a highly dispersed distribution of Z-score (unbounded by definition) and renders the standardization strategy less appropriate to rank countries.

The Min-Max approach also consists of transforming the variable X into an index Z', according to the following formula: $Z' = \frac{(X - X_{min})}{(X_{max} - X_{min})}$, where X_{min} and X_{max} stand for the minimum (min) and the maximum (max) of X, respectively. Unlike the aforementioned Z variable, Z' is bounded, ranging from 0 to 1, and is consequently less likely to have a highly dispersed distribution, rendering it more fit for the country ranking perspective of this paper. But a key issue in building Z' relates to the choice of the minimum (X_{min}) and maximum (X_{max}) of X. What should be taken as the maximum value of life expectancy at life for example? Should it be what ideally desired (positive argument) is or rather the highest value actually observed in the considered panel of countries (objective argument)? Given the potential controversy surrounding the subjective or positive-based choice of "ideal" max and min for X, we base our standardization on the max and min actually observed in the sample.[10]

Weighting Approach

We assign equal weights (50 percent each) to the intrinsic nature of growth (α) and to the social dimension of growth sub-indices (β), respectively. Equal weight ($\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 25$ percent) is also given to the four sub-components of the intrinsic nature sub-index, so is for the two sub-components of the social dimension of growth, namely health and education ($\delta_1 = \delta_2 = 50$ percent). Equal weight (50 percent) is also assigned to the two sub-components of the health sub-index.[11] The main rationale for this weighting option, which is used in other well-known indices such as the Human Development Index (HDI) or the Economic Vulnerability Index (EVI), lies in its simplicity and transparency. But as well stressed by

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[10] Note, however, that this choice has consequences on the construction of the QGI, since the QGI for a given country will be heavily influenced by how far this country stands relatively to the sample's max or min. The results therefore depend strongly on the retained sample. But this is somewhat mitigated by the fact that we include all developing countries for which data are available.

[11] Given that the equal weights are somehow arbitrary, we conduct a sensitivity test by using alternative weights in the robustness section.

Guillaumont (2009), this equal weighting does carry a dose of arbitrariness, since the weights are determined by the number of components, and hence depends heavily on the components retained themselves.

Some alternative aggregation options (such as principal component analysis or regression-based approach) exist in the literature but present several inconveniences for our purpose. The principal component analysis is difficult to apply when it comes to aggregating more than three variables, which is the case for the "growth fundamentals" index. Similarly, the validity of the regression-based approach depends heavily on the quality of the regressions, including notably issues related to the endogeneity of the regressors. That said, for the sake of robustness, we make use of alternative weights for the intrinsic nature of growth and the social dimension of growth sub-indices.

Aggregation Approach

The QGI is calculated as the arithmetic mean—with equal weighting, but with alternative weighting subsequently, for robustness purpose, as mentioned before—of the intrinsic nature of growth and the social dimension of growth sub-indices. The same averaging approach is applied for these sub-indices themselves.[12] Simplicity and transparency are once again the main rationale for the choice of this aggregation strategy. But this strategy implicitly assumes the absence of interactions between the different components of the QGI, *i.e.*, there is a substitutability relationship between the various components of the QGI. However, some complementarities may exist between the different components of the QGI, which would make the geometric averaging strategy more appropriate.[13] Indeed, a country's level of human capital— education and health—may influence the productivity of its economy, and hence its growth pace, and vice-versa. Such complementarities may also be at work between the sub-components of each of the two major sub-indices of the QGI. For the sake of ensuring that the construction of the QGI and its associated country ranking is not skewed by the chosen averaging approach, we resort, in addition to the arithmetic averaging, to a geometric approach.

To sum up, the calculation of the QGI can be formally written as:

$$QGI = \alpha\left(Fundamenta\ ls\right) + \beta\left(Social\right) \qquad (1)$$

with "growth fundamentals" dimension defined as
$Fundamenta\ ls = \gamma_1 Level + \gamma_2 Stability + \gamma_3 Diversific\ ation + \gamma_4 Orientatio\ n$ and
the "social dimension" defined as $Social = \delta_1 School + \delta_2 Health$.

Under the geometric averaging strategy carried out for robustness purpose, the QGI is

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[12] This aggregating approach is also used for the construction of the EVI (Guillaumont, 2009).

[13] This assumption underpins the construction of the popular HDI.

defined as $QGI = (Fundamentals)^{\alpha_1}(Social)^{\alpha_2}$ where

$Fundamentals = (Level)^{\gamma_1}(Stability)^{\gamma_2}(Diversification)^{\gamma_3}(Orientation)^{\gamma_4}$ and

$Social = (School)^{\delta_1}(Health)^{\delta_2}$.

D. Data

For this paper, we use a panel data covering 93 developing countries between 1990 and 2011. The sample includes 57 middle-income countries and 36 low-income countries. To smoothen out the effects of short-term fluctuations on macroeconomic variables, each variable has been averaged over five-year (1990–94, 1995–99, 2000–04, and 2005–11). The variables used in this study are drawn upon from various databanks, including the IMF *World Economic Outlook* database, the World Bank's *World Development Indicators* (WDI) database, COMTRADE, the International Country Risk Guide database, Barro and Lee (2010) and Xala-i-Martin (2006). Detailed sources and definitions of variables are provided in Appendix 1. Appendix 2 elaborates on the specific case of dealing with missing observations in the primary school completion rate.

III. RESULTS

In this section, we highlight our key findings. First, we present out some stylized facts of the QGI. Second, we rank the QGI and categorize countries based on their performances. We also assess the convergence hypothesis in the QGI. Third, we put the QGI into perspective with the existing development and living standard indicators, and explore the potential drivers of the QGI.

A. Some stylized facts

This section builds on the benchmark computed QGI to rank the full sample countries over 1990-2011. The ranking results are reported in Table 1 below. Over the most recent sub-period, namely 2005–2011, Bulgaria emerges as the top performer, with a QGI of 0.843, followed by China (0.842) and Argentina (0.830), while Chad (0.334), Central African Republic (0.402) and Niger (0.415) are the poorest performers, respectively.

Table 1. Full Sample QGI-based Ranking

	1990-94			1995-1999			2000-04			2005-11	
Rank	country	QGI	Rank	country	QGI	Rank	country	QGI	Rank	country	QGI
1	Malaysia	0.811	1	Malaysia	0.809	1	China	0.849	1	Bulgaria	0.843
2	China	0.772	2	Poland	0.790	2	Latvia	0.798	2	China	0.842
3	Thailand	0.754	3	Vietnam	0.784	3	Vietnam	0.792	3	Argentina	0.830
4	Argentina	0.750	4	China	0.784	4	Bulgaria	0.786	4	Vietnam	0.807
5	Chile	0.748	5	Chile	0.764	5	Lithuania	0.784	5	Indonesia	0.800
6	Uruguay	0.746	6	Thailand	0.754	6	Poland	0.782	6	Malaysia	0.798
7	Poland	0.742	7	Sri Lanka	0.753	7	Chile	0.777	7	Uruguay	0.794
8	Sri Lanka	0.733	8	Uruguay	0.749	8	Sri Lanka	0.767	8	Colombia	0.788
9	Indonesia	0.725	9	Argentina	0.742	9	Brazil	0.767	9	Poland	0.786
10	Vietnam	0.721	10	Lithuania	0.740	10	Malaysia	0.755	10	Panama	0.782
11	Panama	0.719	11	Mexico	0.736	11	Mexico	0.755	11	Brazil	0.780
12	Mexico	0.712	12	Indonesia	0.732	12	Argentina	0.752	12	Sri Lanka	0.779
13	Costa Rica	0.707	13	Panama	0.727	13	Cuba	0.751	13	Peru	0.778
14	Bulgaria	0.703	14	Brazil	0.726	14	Albania	0.750	14	Kazakhstan	0.776
15	Belarus	0.692	15	Albania	0.726	15	Tunisia	0.748	15	Chile	0.776
16	Jordan	0.689	16	Bulgaria	0.724	16	Thailand	0.748	16	Thailand	0.775
17	Colombia	0.685	17	Cuba	0.721	17	Panama	0.746	17	Lithuania	0.773
18	Brazil	0.685	18	Peru	0.719	18	Uzbekistan	0.743	18	Mexico	0.768
19	Turkey	0.684	19	Costa Rica	0.716	19	Romania	0.740	19	Belarus	0.767
20	Ecuador	0.678	20	Tunisia	0.711	20	Georgia	0.739	20	Romania	0.766
21	Philippines	0.676	21	Romania	0.706	21	Peru	0.738	21	Tunisia	0.766
22	Cuba	0.674	22	Egypt, Arab Rep.	0.706	22	Costa Rica	0.737	22	Turkey	0.760
23	Syrian Arab Republic	0.673	23	Colombia	0.705	23	Armenia	0.737	23	Cuba	0.759
24	Romania	0.673	24	Jordan	0.699	24	Russian Federation	0.736	24	Jordan	0.759
25	Russian Federation	0.672	25	Bolivia	0.698	25	Belarus	0.735	25	Syrian Arab Republic	0.758
26	Kazakhstan	0.668	26	Turkey	0.697	26	Uruguay	0.733	26	Albania	0.755
27	Venezuela	0.667	27	Ecuador	0.696	27	Egypt, Arab Rep.	0.730	27	Russian Federation	0.753
28	Peru	0.661	28	Latvia	0.696	28	Indonesia	0.728	28	Costa Rica	0.751
29	Kyrgyz Republic	0.661	29	Armenia	0.696	29	Turkey	0.727	29	Latvia	0.750
30	Tunisia	0.656	30	Russian Federation	0.694	30	Jordan	0.725	30	Egypt, Arab Rep.	0.750
31	Moldova	0.655	31	Georgia	0.688	31	Colombia	0.724	31	Uzbekistan	0.748
32	Botswana	0.651	32	Syrian Arab Republic	0.687	32	Ecuador	0.723	32	Armenia	0.747
33	Lithuania	0.649	33	Kyrgyz Republic	0.685	33	Kazakhstan	0.717	33	Georgia	0.746
34	Egypt, Arab Rep.	0.630	34	Kazakhstan	0.682	34	Moldova	0.713	34	Ecuador	0.745
35	Armenia	0.630	35	Moldova	0.679	35	Kyrgyz Republic	0.710	35	Mongolia	0.738
36	Albania	0.628	36	Belarus	0.676	36	Philippines	0.700	36	Lao PDR	0.727
37	Paraguay	0.625	37	Philippines	0.671	37	Syrian Arab Republic	0.697	37	Moldova	0.721
38	South Africa	0.622	38	Paraguay	0.661	38	Bolivia	0.684	38	Paraguay	0.714
39	Kenya	0.619	39	Venezuela	0.660	39	Azerbaijan	0.682	39	India	0.714
40	Honduras	0.618	40	South Africa	0.654	40	El Salvador	0.681	40	Philippines	0.709
41	El Salvador	0.615	41	El Salvador	0.654	41	Paraguay	0.679	41	Bolivia	0.708
42	Algeria	0.612	42	Algeria	0.649	42	Mongolia	0.674	42	Honduras	0.705
43	Latvia	0.609	43	Iran, Islamic Rep.	0.641	43	Tajikistan	0.670	43	Kyrgyz Republic	0.703
44	Georgia	0.604	44	Botswana	0.639	44	Algeria	0.665	44	El Salvador	0.702
45	India	0.596	45	Uzbekistan	0.639	45	South Africa	0.663	45	Morocco	0.700
46	Iran, Islamic Rep.	0.594	46	Honduras	0.637	46	Iran, Islamic Rep.	0.655	46	Algeria	0.699
47	Namibia	0.588	47	Azerbaijan	0.635	47	Venezuela	0.655	47	Iran, Islamic Rep.	0.693
48	Mongolia	0.587	48	India	0.630	48	Namibia	0.651	48	South Africa	0.692
49	Bolivia	0.586	49	Namibia	0.623	49	India	0.649	49	Tanzania	0.690
50	Azerbaijan	0.577	50	Mongolia	0.615	50	Honduras	0.646	50	Bangladesh	0.678
51	Uzbekistan	0.572	51	Kenya	0.603	51	Lao PDR	0.644	51	Guatemala	0.673
52	Swaziland	0.569	52	Nicaragua	0.599	52	Nicaragua	0.637	52	Nicaragua	0.668
53	Ghana	0.566	53	Guatemala	0.592	53	Morocco	0.630	53	Venezuela	0.666
54	Guatemala	0.563	54	Ghana	0.588	54	Guatemala	0.621	54	Azerbaijan	0.666
55	Morocco	0.552	55	Lao PDR	0.587	55	Bangladesh	0.612	55	Tajikistan	0.653
56	Tajikistan	0.521	56	Bangladesh	0.584	56	Kenya	0.609	56	Namibia	0.648
57	Bangladesh	0.515	57	Tajikistan	0.580	57	Nepal	0.602	57	Kenya	0.646
58	Nicaragua	0.513	58	Morocco	0.571	58	Ghana	0.602	58	Ghana	0.642
59	Gabon	0.511	59	Nepal	0.557	59	Botswana	0.596	59	Nepal	0.641
60	Pakistan	0.507	60	Swaziland	0.548	60	Gambia, The	0.574	60	Botswana	0.637
61	Congo, Rep.	0.498	61	Gabon	0.541	61	Tanzania	0.562	61	Zambia	0.632
62	Nepal	0.491	62	Pakistan	0.519	62	Togo	0.553	62	Pakistan	0.602
63	Tanzania	0.482	63	Senegal	0.502	63	Cameroon	0.551	63	Madagascar	0.592
64	Senegal	0.480	64	Tanzania	0.499	64	Pakistan	0.544	64	Gabon	0.583
65	Lao PDR	0.478	65	Togo	0.499	65	Gabon	0.536	65	Ethiopia	0.574
66	Cameroon	0.451	66	Cameroon	0.497	66	Swaziland	0.536	66	Swaziland	0.574
67	Sudan	0.447	67	Sudan	0.492	67	Senegal	0.521	67	Rwanda	0.568
68	Madagascar	0.439	68	Côte d'Ivoire	0.471	68	Uganda	0.515	68	Togo	0.564
69	Côte d'Ivoire	0.435	69	Equatorial Guinea	0.467	69	Zambia	0.504	69	Gambia, The	0.564
70	Lesotho	0.433	70	Madagascar	0.462	70	Madagascar	0.504	70	Senegal	0.558
71	Togo	0.430	71	Zambia	0.461	71	Congo, Rep.	0.492	71	Uganda	0.557
72	Yemen, Rep.	0.429	72	Congo, Rep.	0.460	72	Benin	0.474	72	Benin	0.554
73	Gambia, The	0.428	73	Gambia, The	0.452	73	Yemen, Rep.	0.471	73	Cameroon	0.529
74	Zambia	0.406	74	Malawi	0.451	74	Côte d'Ivoire	0.467	74	Congo, Rep.	0.525
75	Mauritania	0.404	75	Mauritania	0.449	75	Nigeria	0.462	75	Nigeria	0.517
76	Djibouti	0.400	76	Yemen, Rep.	0.443	76	Malawi	0.461	76	Mozambique	0.513
77	Uganda	0.394	77	Uganda	0.441	77	Sudan	0.455	77	Malawi	0.511
78	Congo, Dem. Rep.	0.392	78	Lesotho	0.429	78	Mauritania	0.453	78	Mauritania	0.510
79	Equatorial Guinea	0.386	79	Djibouti	0.410	79	Djibouti	0.449	79	Guinea	0.506
80	Nigeria	0.373	80	Benin	0.407	80	Guinea	0.447	80	Djibouti	0.502
81	Burundi	0.373	81	Nigeria	0.376	81	Equatorial Guinea	0.443	81	Côte d'Ivoire	0.498
82	Benin	0.362	82	Mozambique	0.371	82	Ethiopia	0.440	82	Sierra Leone	0.498
83	Mozambique	0.346	83	Guinea	0.371	83	Lesotho	0.424	83	Congo, Dem. Rep.	0.488
84	Malawi	0.340	84	Ethiopia	0.363	84	Sierra Leone	0.407	84	Yemen, Rep.	0.482
85	Central African Rep.	0.338	85	Burkina Faso	0.355	85	Burkina Faso	0.404	85	Lesotho	0.480
86	Sierra Leone	0.328	86	Central African Rep.	0.346	86	Rwanda	0.399	86	Sudan	0.476
87	Ethiopia	0.327	87	Congo, Dem. Rep.	0.343	87	Niger	0.376	87	Equatorial Guinea	0.452
88	Burkina Faso	0.324	88	Niger	0.330	88	Mali	0.371	88	Mali	0.442
89	Rwanda	0.320	89	Rwanda	0.327	89	Congo, Dem. Rep.	0.371	89	Burundi	0.425
90	Guinea	0.308	90	Sierra Leone	0.320	90	Mozambique	0.367	90	Burkina Faso	0.417
91	Mali	0.287	91	Mali	0.311	91	Burundi	0.356	91	Niger	0.414
92	Chad	0.286	92	Chad	0.298	92	Chad	0.340	92	Central African Rep.	0.402
93	Niger	0.258	93	Burundi	0.294	93	Central African Rep.	0.331	93	Chad	0.334

The QGI varies markedly across periods, countries, and income levels. The QGI has also improved over time (Figure 2a). The average value of the QGI stands at 0.604 (Figure 2). The minimum QGI is 0.258 for Niger over 1990–94 and the maximum of 0.849 for China over 2000–04. The QGI increases from 0.556 in 1990–94 to 0.656 in 2005–2011. Moreover, a density plot shows that the distribution of the QGI is shifting to the right over time (Figure 3a). At the same time, distributions have become narrower, denoting a certain level of convergence among countries over time.

Moreover, there are significant differences across regions. LA countries exhibit the highest QGI scores whereas sub-Saharan Africa lags behind with the lowest QGI (Figure 2b). The density analysis shows that sub-Saharan African countries exhibit the flattest and leftmost density in their QGI distribution, with thick distribution tails (Figure 3b). This suggests that sub-Saharan Africa is the poorest performing country group in terms of quality of growth. In addition, the flatter density along with the thick tails tend to signal the presence of greater inequalities in the QGI scores, with a few countries performing quite well, namely above the full sample average score, while the bulk of sub-Saharan African countries—roughly more than 60 percent of observations—are left behind the full sample average score (0.604).

Furthermore, the QGI also varies by income levels (Figure 2c).[14] The QGI is positively correlated with countries' income level. The upper-middle income countries record the highest QGI score, followed by the lower-middle income countries and the low-income countries, respectively. A density analysis suggests that the richer is a country group, the more in the right-hand side of the figure its density curve stands, confirming a positive association between countries' level of development and their ability to draw upon a better quality of growth from their growth momentum (Figure 3c).

We also focus on the fragility status and resource endowment.[15] It emerges that fragile countries significantly underperformed the sample average by almost 16 percentage point (Figure 2d). This suggests that fragile countries face tougher structural impediments when it comes to achieving better quality of growth. Likewise, resource-rich countries have QGI scores standing slightly lower than their non-resource rich peers, which may fuel the natural resource curse debate (Sachs and Warner, 2001). From the density analysis (Figure 3d), it clearly transpires that most fragile countries are concentrated in the left side of the distribution, with around 25 percent of observations corresponding to a performance gap of as high as 0.2 point with regard to the full sample average, and around 40 percent of observations corresponding to a QGI score higher than that of the former group, but lower than the full sample average (0.604). This confirms the previously-underscored message from figure 2.d that fragility weighs severely on countries' underperformance in terms of QGI. The distribution of QGI also shows that below the sample average, the density curve
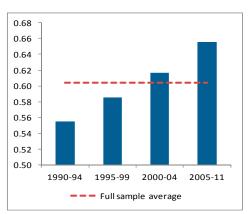
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[14] The country sub-sampling in terms of income refers to the World Bank's classification of countries.

[15] The list of fragile countries is drawn upon from IMF (2011) which is based on the World Bank's criteria of fragility while the list of resource-rich countries is extracted from IMF (2012).
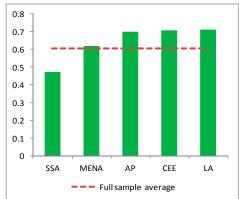
for resource-rich countries' stands above the curve for non-resource rich countries, while the reverse is observed from the full sample average onwards. This therefore suggests that endowment in natural resources worked more as a curse rather than as a blessing for countries when it comes to achieving a better quality of growth.
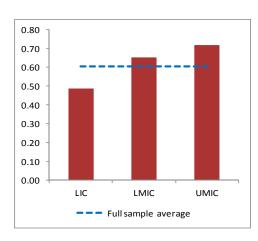
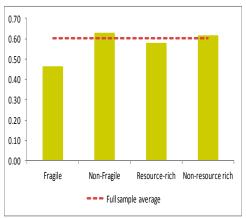**Figure 2. QGI: Average Values**

2.a : QGI by period

2.b : QGI by region
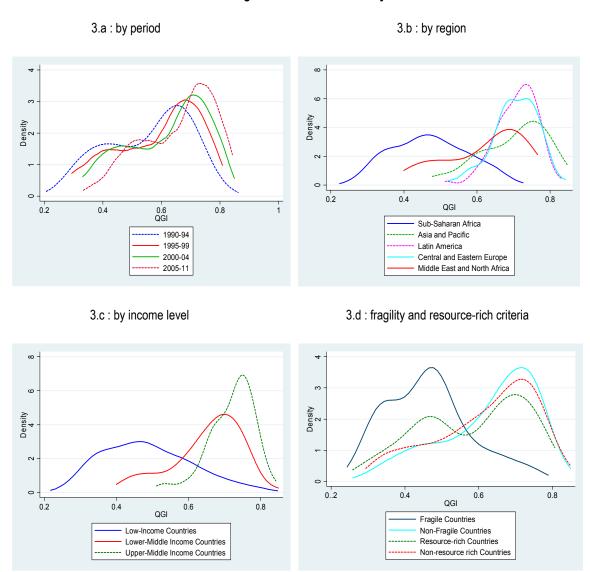
2.c : QGI by level of income

2.d : QGI by fragility and resource-rich criteria

Note: AP= Asia and Pacific; CEE= Central and Eastern Europe; LA= Latin America; MENA=Middle East and North Africa; SSA= Sub-Saharan Africa; LIC=Low-income countries; LMIC=Lower-Middle income countries; UMIC=Upper-Middle income countries.

Second, building on this above-evidenced presence of convergence in the QGI process, we propose a categorization of countries, based on their QGI dynamics between the initial period (1990–94) and the final period (2005–2011), as reflected in Figure 4.

The sample average QGI score is underlined by the red horizontal and vertical lines reprensenting the QGI values of the initial period and the final period, respectively. The dashed line represents the 45 degree line; the higher above this line, the greater the improvement in the level of the QGI. The intersection of these three lines yields 6 non-overlapping regions. It is worth mentioning that virtually all the countries have improved their quality of growth over the past two decades. Region 2 includes countries whose QGI scores in the starting period as well as in the final period stand below the sample average, but did improve between the two periods. This group is made up of low-income and/or fragile countries, mostly from sub-Saharan Africa and incidentally from MENA, are labelled as the "hopefuls", in that they have reasonably good prospects of converging progressively toward the sample average country . Region 3 includes countries that were able to improve their QGI from below to above the sample average between the starting and the final period, and as such are dubbed as the "contenders", with a reference to the idea that they are contending to be among the high performers. This group includes mainly countries from Asia Pacific (for example Bangladesh, Laos and Nepal), from sub-Saharan Africa (for example Ghana,Tanzania and Zambia), from Middle East and North Africa (for example Algeria, Iran and Morocco), from Central and Eastern Europe (for example Azerbaijan, Tajikistan and Uzbekistan) and a few from Latin America (Guatemala and Nicaragua).

Region 4 encompasses countries that not only recorded a QGI score superior to the sample average, in the initial as well as in the final period, but also experienced an improvement in their QGI between the two periods. This country group is labelled as the "club of best performers", and includes chiefly upper-middle and lower-middle income countries. A noticeable finding is that a handful of sub-Saharan African countries belongs to this club of best performers, including notably Kenya, Namibia and South Africa. Finally, region 5 is chararcterized by countries that performed well above the sample average in terms of QGI in both the initial and the final periods, but have the particularity of having experienced a mild drop in their QGI between the two periods. This group comprises only two countries, namely Botswana and Malaysia, and is categorized as the "club of superior performers".

Table 2. Test of Convergence Hypothesis

Dependent variable	1 Δ QGI	2 Δ QGI
Lagged QGI (one period)	-0.066***	
	(0.0156)	
Initial QGI (1990-94)		-0.068***
		(0.016)
Observations	279	279
R-squared	0.072	0.074

Robust standard errors in brackets. *, **, and *** indicate the significance level of 10 percent, 5 percent, and 1 percent. Intercept included.
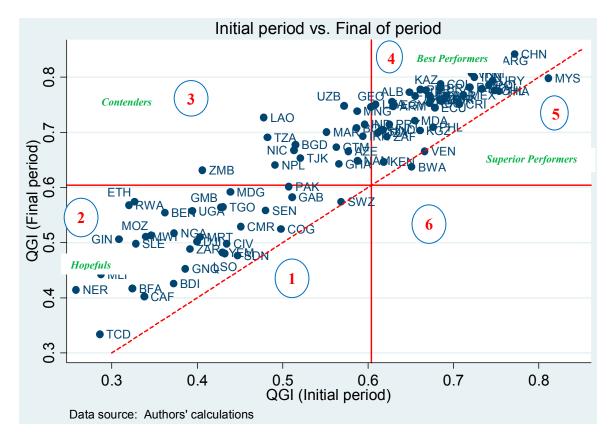
Figure 4. Quality of Growth over Time

Data source: Authors' calculations

C. Putting the QGI into Perspective with Existing Development Indicators

To have an idea about where our proposed QGI stands compared to existing development indicators, we display in Figure 5 correlations between the QGI and a selection of living standards variables. It appears that the QGI is positively correlated with the well-established United Nations (UN) HDI and real GDP per capita (albeit non-linearly), and negatively with the poverty rate and income inequality. These findings imply that the QGI could be another legitimate part of the toolkit available for gauging countries' progress toward inclusvie growth.
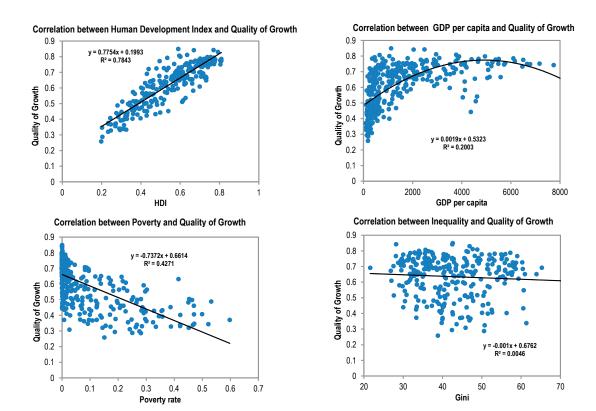
Figure 5. Correlation between the QGI and Existing Development Indicators

Correlation between Human Development Index and Quality of Growth

$y = 0.7754x + 0.1993$
$R^2 = 0.7843$

Correlation between GDP per capita and Quality of Growth

$y = 0.0019x + 0.5323$
$R^2 = 0.2003$

Correlation between Poverty and Quality of Growth

$y = -0.7372x + 0.6614$
$R^2 = 0.4271$

Correlation between Inequality and Quality of Growth

$y = -0.001x + 0.6762$
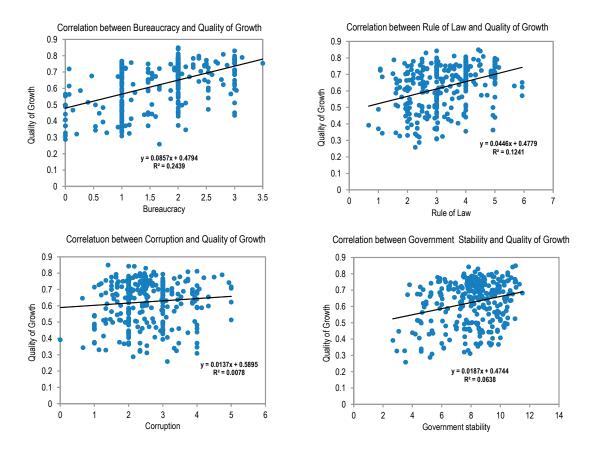$R^2 = 0.0046$

D. Drivers of the QGI: an Appraisal

Pairwise correlation

We investigate the key factors driving the QGI scores. We first adopt a pairwise correlation appraoch. We focus on living standards, politico-institutional indicators and external financing conditions. Figure (6.a) points to a strong correlation between the QGI and politico-institutional factors. On the one hand, institutional quality, as measured by the quality of bureacracy, the rule of law or the control of corruption, is positively associated with the QGI, but the correlation is less marked with the latter. On the other hand, more political stability, as proxied by government stability go hand-in-hand with a higher QGI. A sound and stable macroeonomic environement as well as a better access to credits for financing good projects may be conducive to higher QGI scores. Indeed, Figure 6.b shows that the volatility of inflation and credit to the private sector are negatively and positively correlated with the QGI, repsectively. Figure 6.c points out a relevance of social spending in achieving a good quality of growth. The QGI is positively linked with public spending in education and health sectors. The correlations with external conditions, portrayed in Figure 6.d reveal somewhat a weak association between the QGI and both FDI and remittances. The

correlation between the QGI and foreign aid[16] is markedly negative, likely owing to the fact that foreign aid is mostly allocated to low-income countries.[17]

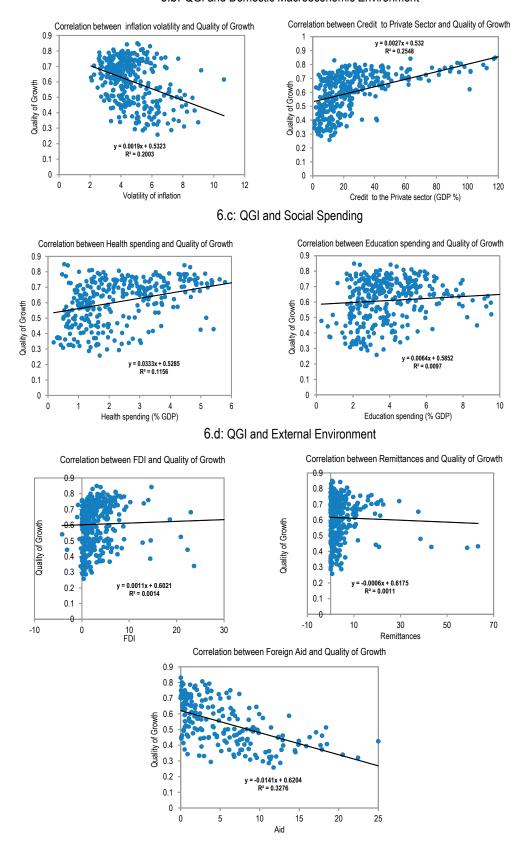**Figure 6. Quality of Growth Index: Key Correlations**

6.a: QGI and Politico-Institutional Factors

Correlation between Bureaucracy and Quality of Growth

$y = 0.0857x + 0.4794$
$R^2 = 0.2439$

Correlation between Rule of Law and Quality of Growth

$y = 0.0446x + 0.4779$
$R^2 = 0.1241$

Correlatuon between Corruption and Quality of Growth

$y = 0.0137x + 0.5895$
$R^2 = 0.0078$

Correlation between Government Stability and Quality of Growth

$y = 0.0187x + 0.4744$
$R^2 = 0.0638$

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[16] An approximation of the funds effectively transferred to developing countries, is computed by subtracting from total aid technical cooperation because it comprises education or training fees of nationals from recipient countries at home or abroad and payments to consultants or advisors for recipient countries. Furthermore, emergency flows (humanitarian aid, food aid) are subtracted as they are naturally countercyclical.

[17] Less charitably, this may rather reflect the ineffectiveness of foreign aid in improving the quality of growth in the recipient countries.

6.b: QGI and Domestic Macroeconomic Environment

Correlation between inflation volatility and Quality of Growth

y = 0.0019x + 0.5323
R² = 0.2003

Correlation between Credit to Private Sector and Quality of Growth

y = 0.0027x + 0.532
R² = 0.2548

6.c: QGI and Social Spending

Correlation between Health spending and Quality of Growth

y = 0.0333x + 0.5285
R² = 0.1156

Correlation between Education spending and Quality of Growth

y = 0.0064x + 0.5852
R² = 0.0097

6.d: QGI and External Environment

Correlation between FDI and Quality of Growth

y = 0.0011x + 0.6021
R² = 0.0014

Correlation between Remittances and Quality of Growth

y = -0.0006x + 0.6175
R² = 0.0011

Correlation between Foreign Aid and Quality of Growth

y = -0.0141x + 0.6204
R² = 0.3276

Econometric analysis

Altogether, the results above are simple unconditional correlations and should not be viewed as causal links between the QGI and the variables considered. In what follows, we attempt a preliminary appraisal of the factors driving potentially the QGI by carrying out some conditional estimates of the influence of these factors on the QGI. We perform OLS-based estimates using lagged (one period) values of the explanatory variables to account for likely delays in the influence of these variables on the QGI, and mitigate endogeneity issues. Table 3 reports the estimation results.[18]

The baseline results focus on domestic macroeconomic factors, and are depicted in column 1 of Table 3. First, it emerges that devoting more public resources to social sectors allows improving the quality of growth. Second, stable government is found to be conducive to a better quality of growth. This suggests that less frequent changes of governments, which imply a lower uncertainty faced by government members as to whether they will be left out, may increase their focus toward implementing effectively the country's development agenda and hence achieve a good quality of growth rather than getting involved in rent-seeking activities. Third, the coefficient of the volatility of inflation is negative and significant, implying that macroeconomic stability is a necessary ingredient for attaining pro-poor growth outcomes. Another striking result is the positive impact of financial development on QGI. This suggests that greater financial development, especially if accompanied by higher access to credit, may help unleash the private sector's potential for creating wealth and decent jobs for the population, and hence achieving a good quality growth ultimately. Last, but not the least, column 1 sheds light on the importance of structural factors such as institutional quality in steering up countries' QGI scores. The quality of institutions is measured by the average of quality of bureaucracy, the rule of law and the control of corruption. However, as already evidenced in Figure 5.b above, the quality of bureaucracy seems to matter the most for improving the QGI, since the effect of rule of law on the QGI is positive but not significant whereas the coefficient of control of corruption does not have the expected positive sign but also is not significant (columns 5 to 7). Columns 2 to 4 of Table 3 allow assessing the role of external conditions for the QGI. FDI is found to be positively related to the QGI. This suggests that FDI, by contributing to close the domestic saving gaps, play a pivotal role in achieving a good quality of growth in developing countries. The coefficient of remittances is also positive but not significant. For foreign aid the result is somewhat puzzling (column 4), as its effect is significantly negative. As indicated earlier, this is not necessarily a statement about aid ineffectiveness, but may rather point to a mere empirical regularity that aid is mainly allocated to poorer countries.[19]

Finally, it is worth noting that our empirical investigation is based on a partial correlation analysis after controlling for the simultaneity bias. Further research is warranted to uncover the causal links—when longer time coverage of the QGI will be available, before pretending to draw robust causal links between the QGI and these potential factors.

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[18] Appendix 9 depicts signs and significance levels of the QGI's drivers for different sub-sampling.

[19] For a detailed discussion on the debate on aid effectiveness, see Burnside and Dollar (2000), Collier and Dollar (2001), Guillaumont and Chauvet (2001) or Easterly et al. (2003).

Table 3. Determinants of Quality of Growth over 1990–2011

Dependent variable	[1] QGI	[2] QGI	[3] QGI	[4] QGI	[5] QGI	[6] QGI	[7] QGI
Social spending-to-GDP ratio (one period lag)	1.340***	1.292***	1.318***	1.363***	1.451***	1.296***	1.573***
	(0.341)	(0.339)	(0.348)	(0.464)	(0.333)	(0.338)	(0.336)
Government stability (one period lag)	0.017***	0.014***	0.014***	0.007	0.015***	0.017***	0.017***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
Log of inflation volatility (one period lag)	-0.017***	-0.016***	-0.017***	-0.020***	-0.018***	-0.016***	-0.018***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
Credit to private sect.-to-GDP ratio (one period lag)	0.106***	0.108***	0.107***	0.061	0.114***	0.092***	0.118***
	(0.027)	(0.026)	(0.028)	(0.043)	(0.026)	(0.027)	(0.026)
Aggregated institutional quality (one period lag)	0.029**	0.029**	0.029**	0.036**			
	(0.014)	(0.014)	(0.014)	(0.014)			
FDI-to-GDP ratio (one period lag)		0.628**					
		(0.260)					
Remittances-to-GDP ratio (one period lag)			0.196				
			(0.160)				
Foreign Aid-to-GDP ratio (one period lag)				-1.184***			
				(0.209)			
Rule of law (one period lag)					0.013		
					(0.008)		
Quality of bureaucracy (one period lag)						0.038***	
						(0.012)	
Control of corruption (one period lag)							-0.005
							(0.011)
Observations	163	163	156	101	163	163	163
R-squared	0.423	0.438	0.427	0.638	0.417	0.447	0.408

Robust standard errors in brackets. *, **, and *** indicate the significance level of 10%, 5%, and 1%. Intercept included, but not reported.

IV. Robustness of the QGI to alternative specifications

We assess the sensitivity of the QGI in several aspects.

First, as flagged in the methodology section, the benchmark QGI (QGI1) used so far stems from an equal weighting aggregation approach. In the following, we consider alternative weighting scenarios. Four alternative QGI (QGI2, QGI3, QGI4 and QGI5) are considered. QGI2 refers to the index derived from the following weighting combination, namely, $\alpha = \frac{2}{3}, \beta = \frac{1}{3}$., and by symmetry for QGI3 $\alpha = \frac{1}{3}, \beta = \frac{2}{3}$. QGI4 corresponds to the specification which assigns respectively α=¾ and β=¼ as weights for the intrinsic nature and the social dimension of growth, and conversely for QGI5. Remark that the great emphasis put on the intrinsic nature sub-component (α=¾) compared the social dimension sub-component in QGI5 allows us to highlight to some extent distinct nature of the QGI with respect to the UN HDI, which focuses primarily on human development while the QGI rather focuses overridingly on growth fundamentals. The key findings are as follows. First, key trends with all indices are not quantitatively and qualitatively different from the benchmark ones (QGI1). This is confirmed by the correlation matrix of the five QGIs (Appendix 5), which underscores that these indices are highly and significantly correlated, with a correlation coefficient ranging from 0.91 to 0.99.

Second, to capture possible interactions between the different components of the QGI, we consider a geometric averaging approach, instead of the arithmetic one previously used. This strategy does not alter substantially the ranking, as provided in Appendix 3. This is also pinned down in Appendix 6 which reports a Spearman's rank order correlation test. The p-value for a lack of correlation between the arithmetic mean-based and geometric mean-based country ranking is zero, and the test statistic for the correlation between the two sets of ranking is quite large, standing at 0.995, suggesting that both these ways of deriving the QGI lead to consistent results, from a ranking standpoint.

Third, we rebased the Min-Max normalization of the different components of the QGI on region-specific minimum and maximum values. As underscored in the methodology section, given that the min and max used to standardize the different variables are endogenous to the retained sample, the performance gap may vary tremendously. Appendix 7 displays the results of the Spearman's rank correlation test between this ranking based on a region-specific standardization and the benchmark one. It appears that the two sets of ranking lead significantly to comparable results. Furthermore, the correlation matrix of these two sets of QGI leads to the same conclusion, as it clearly points out that these two series are highly and significantly correlated (Appendix 8).

Another potential avenue for further tweaking the robustness checks of our results could be to assess their sensitivity to using flow (as opposed to stock) variables for building the social sub-component of the QGI. Indeed, one might question the consistency of our composite QGI, in that most of the sub-indices under the growth *fundamentals* sub-component are based on flow variables (growth, volatility, etc.) while those under the social dimension building block are stock-based (education and health levels). However, we refrained from employing flow variables for constructing the social dimension sub-component, as this could have

biased the results (scores and ranking), given that the dynamics of these variables over time exhibits a marked convergence, as illustrated in Figure 7 below. Put simply, if the starting point of the social indicator is very low (or very high), the resulting flow-based (the change in the level) social sub-component might "overwhelm" the growth fundamental sub-component and drive the overall QGI. This would likely lead to misleading conclusions about the quality of growth across countries and time.
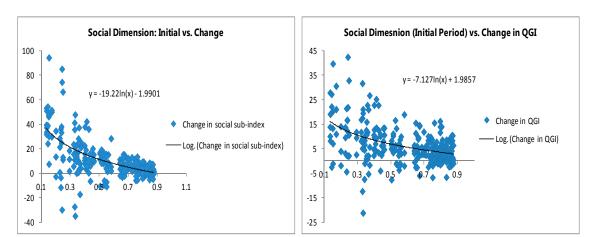
Figure 7: Social Dimension and QGI over Time: Convergence

V. CONCLUSION

Improving living standards and reducing poverty are the ultimate goal of any growth strategy in developing countries. A nascent literature shows that countries with strong, stable, and broad-based growth are more likely to improve living standards and reduce poverty rates. This paper contributes to the literature and proposes a *Quality of Growth Index (QGI)* that captures both the intrinsic nature and the social dimension of growth, with the view that a "good quality of growth" is more than just the level of growth and should improve individuals' welfare. Hence, "good growth" should feature sound fundamentals and notable achievements in social outcomes.

Based on the availability of data, the QGI is designed as a composite index of sub-indexes capturing the "growth nature" aspect and the "desirable social outcomes" aspect. For the "growth fundamentals" sub-index, four dimensions are considered of good quality: the strength of growth, the stability of growth, the diversification of the sources of growth, and the outward orientation of growth. For the "social outcomes" sub-index, the most basic indicators of human capital are used: health proxied by life expectancy at birth and infant survival rate at birth and education proxied by primary school completion rate. These variables are supposed to reflect countries' progress toward better social indicators.

The paper has brought out the following stylized facts of the QGI. First, we find that the QGI scores well when compared with other welfare measures such as the UN HDI, poverty rates, income inequality and income per capita measures. Second, while the QGI has broadly

improved over time, it has varied markedly across regions, income levels with LIC and sub-Saharan African countries lagging behind. In the same vein, structural factors such as fragility and resource endowment tend to be associated with lower QGI. Third, we explore the possibility of the existence of a "poor growth quality trap". We do find that there is a convergence in the quality of growth over time, though at a slow pace.

Building on the QGI, we also investigate the main drivers of the quality of growth. Empirical estimates indicate that institutions and policies tend to be associated with good quality growth. We find that the QGI is higher in a stable political environment. The quality of institutions, especially the quality of bureaucracy that ensures the capacity of government to deliver good public services, is also positively associated with higher QGI. Sound macroeconomic policies that help produce stable and broad-based growth contribute to better QGI. These include the share of spending allocated to social sectors, price stability, financial development and inclusion, and FDI.

The QGI is a positive step in understanding how high growth could lead to better social outcomes. It provides a comprehensive measure of the very nature of growth despite the paucity of data. It is also a dynamic concept and allows cross-country comparisons. Potential future research, as data become available, could enhance and broaden the scope of the QGI by including labor market and inequality measures. These would undoubtedly improve the inclusiveness dimension of the QGI.

For now, the QGI developed in this paper could serve as a benchmarking tool to guide policies for an inclusive growth.

Appendix 1. Data Sources and Definition

Variables	Definition	Sources
Quality of Growth Index (QGI)	Composite index ranging between 0 and 1, resulting from the aggregation of components capturing growth fundamentals and from components capturing the socially-friendly nature of growth. The higher the index, the greater is the quality of growth.	Authors' own calculations
Poverty rate	Proportion (percent) of the population living with less than one dollar a day	Sala-i-Martin (2006)
Human Development Index (HDI)	Geometric mean of normalized indices measuring achievements in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living.	UN HDI database, available at: http://hdrstats.undp.org/en/indicators/103106.html
Inflation	Inflation rate based on the CPI index	World Economic Outlook
GDP per capita growth rate	Annual change of per capita product	World Development Indicators (WDI)
Life expectancy at birth	Number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	
Infant mortality rate	Number of infants dying before reaching one year of age, per 1,000 live births in a given year.	
Credit to private sector	Domestic credit to private sector, namely credit offered by the banks to the private sector, as percent of GDP	
Foreign Direct Investment (FDI)	Net Inflows of Foreign Direct Investments, as percent of GDP	
Remittances	Workers' remittances and compensation of employees (Percent of GDP), calculated as the sum of workers' remittances, compensation of employees, and migrants' transfers.	
Primary school completion rate	Percentage of students completing the last year of primary school.	WDI, with authors' estimations for missing observations
Index of diversification of export products	Complement of a Herfindahl-Hirschman index (HHI) of the concentration of countries' export products	COMTRADE
Foreign Official Aid	Official development Aid actually disbursed, as percent of GDP	Guillaumont and Tapsoba (2012)
Public Health spending	Public resources allocated to heath spending, as percent of GDP	IMF dataset
Public Education spending	Public resources allocated to education spending, as percent of GDP	
Quality of bureaucracy	Index of the institutional strength and quality of the bureaucracy, ranging from 0 to 4. The higher the index, the stronger the quality of the bureaucracy.	International Country Risk Guide (ICRG, 2009)
Rule of Law	Index assessing the strength and the impartiality of the legal system, as well as the popular observance of the law. The index ranges from 0 to 6, with a higher value of the index reflecting a higher institutional quality.	
Control of corruption	Index assessing the control of corruption within the political system. It ranges from 0 to 6, with a higher value of the index reflecting a better control of corruption	
Government stability	Index ranging from 0 to 12 and measuring the ability of government to stay in office and to carry out its declared program(s).The higher the index, the more stable the government is.	

Appendix 2. Dealing with Missing Observations in the Primary School Completion Rate

Observations for primary school completion rate are missing for some countries. In order to avoid reducing considerably the sample size when using this indicator as a proxy for the social dimension of the quality of growth, we estimate these missing observations according to the following approach:

1) First, we compute for each country the primary completion rate (*Complest*) by dividing the average years of primary schooling (from Barro and Lee, 2010) with the average duration of primary school (from WDI, 2010).

2) Second, to ensure that the computed completion rates (*Complest*) are consistent with the actual rates, we proceed as follows:

   - For a given country at a given year, if the actual completion rate (*Complact*) is available, then we keep this *Complact* as the completion rate (*Compl*) to be considered for the calculation of the QGI index.

   - For a given country at a given year, if *Complact* is missing, then we consider *Complest* adjusted for the average deviation between *Complest* and *Complact* (in the neighborhood of the year for which *Complact* is missing). The neighborhood considered spans from the 5 years preceding the year for which the observation is missing to the 5 years following the year for which the observation is missing.[20]

   $$Compl_{it} = Compl\_est_{it} + \lambda_{it}$$

   where *i* et *t* stands for country *i* and period *t*, respectively, with
   $$\lambda_{it} = mean\,(Compl\_act_{ij} - Compl\_est_{it}), \quad j = \overline{t-4,\,t+4}.$$

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[20] Note that "5" also corresponds to the interval over which the data are averaged in the calculation of the QGI.

Appendix 3. Country Ranking using Geometric Mean-based QGI

	1990-94			1995-1999			2000-04			2005-11	
Rank	country	QGI	Rank	country	QGI	Rank	country	QGI	Rank	country	QGI
1	Malaysia	0.804	1	Malaysia	0.802	1	China	0.843	1	China	0.836
2	China	0.757	2	China	0.781	2	Latvia	0.790	2	Bulgaria	0.826
3	Thailand	0.748	3	Poland	0.780	3	Vietnam	0.785	3	Argentina	0.823
4	Chile	0.736	4	Vietnam	0.778	4	Bulgaria	0.776	4	Vietnam	0.798
5	Uruguay	0.730	5	Chile	0.750	5	Poland	0.769	5	Indonesia	0.794
6	Argentina	0.728	6	Thailand	0.748	6	Lithuania	0.766	6	Malaysia	0.790
7	Indonesia	0.723	7	Sri Lanka	0.744	7	Chile	0.762	7	Uruguay	0.776
8	Poland	0.720	8	Uruguay	0.731	8	Sri Lanka	0.746	8	Poland	0.772
9	Sri Lanka	0.718	9	Indonesia	0.729	9	Brazil	0.743	9	Panama	0.769
10	Vietnam	0.713	10	Argentina	0.724	10	Tunisia	0.740	10	Colombia	0.767
11	Panama	0.704	11	Mexico	0.716	11	Malaysia	0.739	11	Peru	0.765
12	Mexico	0.700	12	Lithuania	0.713	12	Uzbekistan	0.738	12	Sri Lanka	0.765
13	Costa Rica	0.690	13	Brazil	0.712	13	Mexico	0.737	13	Kazakhstan	0.764
14	Bulgaria	0.682	14	Panama	0.712	14	Thailand	0.733	14	Thailand	0.764
15	Colombia	0.677	15	Bulgaria	0.704	15	Cuba	0.730	15	Brazil	0.761
16	Turkey	0.673	16	Peru	0.704	16	Panama	0.730	16	Lithuania	0.761
17	Brazil	0.671	17	Egypt, Arab Rep.	0.700	17	Argentina	0.729	17	Chile	0.760
18	Belarus	0.664	18	Albania	0.699	18	Russian Federation	0.728	18	Belarus	0.756
19	Philippines	0.664	19	Tunisia	0.698	19	Albania	0.726	19	Tunisia	0.754
20	Ecuador	0.662	20	Costa Rica	0.698	20	Georgia	0.723	20	Romania	0.751
21	Jordan	0.654	21	Colombia	0.690	21	Armenia	0.723	21	Russian Federation	0.747
22	Romania	0.651	22	Bolivia	0.690	22	Egypt, Arab Rep.	0.721	22	Uzbekistan	0.745
23	Venezuela	0.648	23	Cuba	0.689	23	Romania	0.721	23	Mexico	0.745
24	Peru	0.645	24	Romania	0.688	24	Indonesia	0.720	24	Turkey	0.742
25	Russian Federation	0.644	25	Turkey	0.684	25	Peru	0.719	25	Albania	0.741
26	Tunisia	0.644	26	Latvia	0.679	26	Costa Rica	0.715	26	Jordan	0.739
27	Syrian Arab Republic	0.643	27	Ecuador	0.678	27	Uruguay	0.710	27	Cuba	0.738
28	Cuba	0.641	28	Jordan	0.675	28	Turkey	0.709	28	Egypt, Arab Rep.	0.738
29	Kyrgyz Republic	0.641	29	Armenia	0.671	29	Belarus	0.707	29	Latvia	0.736
30	Botswana	0.639	30	Russian Federation	0.671	30	Kazakhstan	0.704	30	Syrian Arab Republic	0.736
31	Moldova	0.635	31	Georgia	0.664	31	Colombia	0.703	31	Armenia	0.735
32	Lithuania	0.625	32	Syrian Arab Republic	0.663	32	Jordan	0.703	32	Costa Rica	0.729
33	Egypt, Arab Rep.	0.623	33	Philippines	0.659	33	Kyrgyz Republic	0.699	33	Georgia	0.726
34	Kazakhstan	0.621	34	Kazakhstan	0.656	34	Ecuador	0.697	34	Lao PDR	0.722
35	Paraguay	0.615	35	Kyrgyz Republic	0.656	35	Moldova	0.685	35	Mongolia	0.720
36	South Africa	0.613	36	Moldova	0.651	36	Philippines	0.683	36	Ecuador	0.719
37	Kenya	0.611	37	El Salvador	0.646	37	El Salvador	0.672	37	India	0.710
38	Honduras	0.606	38	Paraguay	0.646	38	Bolivia	0.668	38	Bolivia	0.700
39	El Salvador	0.603	39	South Africa	0.645	39	Azerbaijan	0.665	39	Philippines	0.699
40	Albania	0.599	40	Venezuela	0.639	40	Mongolia	0.662	40	Moldova	0.697
41	Algeria	0.594	41	Belarus	0.638	41	Tajikistan	0.661	41	Paraguay	0.694
42	Latvia	0.594	42	Algeria	0.635	42	Syrian Arab Republic	0.656	42	Morocco	0.691
43	India	0.591	43	India	0.626	43	South Africa	0.653	43	Honduras	0.687
44	Bolivia	0.582	44	Botswana	0.626	44	Paraguay	0.651	44	El Salvador	0.684
45	Armenia	0.581	45	Honduras	0.623	45	India	0.646	45	Tanzania	0.682
46	Namibia	0.577	46	Namibia	0.614	46	Lao PDR	0.641	46	South Africa	0.681
47	Mongolia	0.575	47	Azerbaijan	0.609	47	Namibia	0.641	47	Kyrgyz Republic	0.678
48	Ghana	0.564	48	Uzbekistan	0.607	48	Algeria	0.640	48	Algeria	0.666
49	Swaziland	0.560	49	Mongolia	0.607	49	Honduras	0.629	49	Bangladesh	0.662
50	Azerbaijan	0.555	50	Kenya	0.590	50	Nicaragua	0.623	50	Guatemala	0.658
51	Georgia	0.540	51	Ghana	0.586	51	Morocco	0.617	51	Nicaragua	0.651
52	Guatemala	0.537	52	Lao PDR	0.584	52	Venezuela	0.611	52	Namibia	0.641
53	Morocco	0.529	53	Nicaragua	0.581	53	Guatemala	0.608	53	Ghana	0.640
54	Iran, Islamic Rep.	0.518	54	Iran, Islamic Rep.	0.579	54	Bangladesh	0.605	54	Iran, Islamic Rep.	0.639
55	Bangladesh	0.505	55	Bangladesh	0.577	55	Iran, Islamic Rep.	0.603	55	Kenya	0.635
56	Tajikistan	0.501	56	Guatemala	0.572	56	Ghana	0.600	56	Nepal	0.631
57	Nepal	0.487	57	Tajikistan	0.556	57	Nepal	0.596	57	Tajikistan	0.630
58	Gabon	0.485	58	Nepal	0.554	58	Kenya	0.594	58	Zambia	0.618
59	Congo, Rep.	0.483	59	Morocco	0.549	59	Gambia, The	0.569	59	Botswana	0.616
60	Uzbekistan	0.479	60	Swaziland	0.542	60	Botswana	0.562	60	Pakistan	0.595
61	Nicaragua	0.475	61	Gabon	0.520	61	Tanzania	0.553	61	Venezuela	0.593
62	Pakistan	0.475	62	Pakistan	0.494	62	Togo	0.542	62	Madagascar	0.581
63	Tanzania	0.472	63	Tanzania	0.488	63	Cameroon	0.537	63	Azerbaijan	0.578
64	Lao PDR	0.462	64	Togo	0.487	64	Swaziland	0.528	64	Swaziland	0.567
65	Senegal	0.454	65	Cameroon	0.482	65	Pakistan	0.521	65	Rwanda	0.564
66	Yemen, Rep.	0.413	66	Senegal	0.477	66	Uganda	0.509	66	Ethiopia	0.563
67	Cameroon	0.409	67	Sudan	0.455	67	Gabon	0.501	67	Gambia, The	0.558
68	Côte d'Ivoire	0.405	68	Zambia	0.448	68	Senegal	0.501	68	Togo	0.557
69	Madagascar	0.404	69	Côte d'Ivoire	0.445	69	Zambia	0.494	69	Gabon	0.554
70	Togo	0.404	70	Congo, Rep.	0.443	70	Madagascar	0.472	70	Benin	0.551
71	Gambia, The	0.403	71	Malawi	0.438	71	Benin	0.466	71	Uganda	0.549
72	Sudan	0.399	72	Gambia, The	0.437	72	Malawi	0.454	72	Senegal	0.546
73	Zambia	0.385	73	Equatorial Guinea	0.436	73	Côte d'Ivoire	0.451	73	Cameroon	0.526
74	Congo, Dem. Rep.	0.383	74	Uganda	0.431	74	Congo, Rep.	0.446	74	Malawi	0.506
75	Uganda	0.381	75	Mauritania	0.422	75	Mauritania	0.439	75	Mauritania	0.503
76	Equatorial Guinea	0.378	76	Madagascar	0.411	76	Guinea	0.424	76	Guinea	0.502
77	Mauritania	0.366	77	Yemen, Rep.	0.408	77	Sudan	0.423	77	Mozambique	0.502
78	Burundi	0.364	78	Lesotho	0.396	78	Lesotho	0.415	78	Côte d'Ivoire	0.486
79	Djibouti	0.344	79	Benin	0.383	79	Yemen, Rep.	0.407	79	Sierra Leone	0.476
80	Malawi	0.320	80	Djibouti	0.339	80	Ethiopia	0.393	80	Congo, Dem. Rep.	0.473
81	Lesotho	0.316	81	Nigeria	0.317	81	Djibouti	0.391	81	Djibouti	0.469
82	Rwanda	0.298	82	Guinea	0.315	82	Nigeria	0.385	82	Lesotho	0.468
83	Central African Rep.	0.297	83	Congo, Dem. Rep.	0.312	83	Sierra Leone	0.363	83	Nigeria	0.464
84	Benin	0.295	84	Central African Rep.	0.290	84	Rwanda	0.362	84	Congo, Rep.	0.456
85	Nigeria	0.291	85	Sierra Leone	0.279	85	Equatorial Guinea	0.360	85	Mali	0.435
86	Mozambique	0.277	86	Rwanda	0.278	86	Congo, Dem. Rep.	0.347	86	Burundi	0.420
87	Sierra Leone	0.259	87	Burkina Faso	0.263	87	Mali	0.347	87	Yemen, Rep.	0.416
88	Burkina Faso	0.259	88	Mali	0.262	88	Burkina Faso	0.344	88	Equatorial Guinea	0.406
89	Guinea	0.221	89	Mozambique	0.260	89	Burundi	0.321	89	Sudan	0.406
90	Chad	0.184	90	Burundi	0.243	90	Chad	0.304	90	Burkina Faso	0.393
91	Niger	0.164	91	Ethiopia	0.229	91	Niger	0.289	91	Niger	0.390
92	Mali	0.153	92	Niger	0.195	92	Mozambique	0.286	92	Central African Rep.	0.373
93	Ethiopia	0.002	93	Chad	0.168	93	Central African Rep.	0.278	93	Chad	0.220

Appendix 4. QGI for the Full Sample over 1990–2011: Descriptive Statistics

Variables	Obs	Mean	Std.	Min	Max
1 : Benchmark result					
QGI1	372	0.604	0.140	0.258	0.849
2 : Robustness to Alternative Specifications					
QGI2	372	0.550	0.137	0.201	0.797
QGI3	372	0.591	0.116	0.299	0.836
QGI4	372	0.616	0.167	0.217	0.868
QGI5	372	0.584	0.105	0.319	0.829
QGI6	372	0.597	0.180	0.169	0.843

Note: APC= Asian and Pacific Countries; CEEC= Central and Eastern European Countries; LAC= Latin American Countries; MENA=Middle East and North Africa; SSA= Sub-Saharan Africa; LIC=Low-income countries; LMIC=Lower-Middle income countries; UMIC=Upper-Middle income countries; OIL=Oil exporting countries; NON-OIL=Non-oil exporting countries. QGI1 corresponds to the QGI obtained using $\alpha_1 = \alpha_2 = 1/2$, QGI2 when using ($\alpha_1 = 2/3$, $\alpha_2 = 1/3$), QGI3 when using ($\alpha_1 = 1/3$, $\alpha_2 = 2/3$), QGI4 when using ($\alpha_1 = 3/4$, $\alpha_2 = 1/4$) and QGI5 when using ($\alpha_1 = 1/4$, $\alpha_2 = 3/4$).

Appendix 5. Correlation Matrix of the Alternative QGIs

	QGI1	QGI2	QGI3	QGI4	QGI5
QGI1	1				
QGI2	0.9868***	1			
	(0.000)				
QGI3	0.9937***	0.9624***	1		
	(0.000)	(0.000)			
QGI4	0.9635***	0.9941***	0.9274***	1	
	(0.000)	(0.000)	(0.000)		
QGI5	0.9845***	0.9452***	0.9965***	0.9051***	1
	(0.000)	(0.000)	(0.000)	(0.000)	

Note: *** indicates the significance level of 1 percent; P-value in brackets.

Appendix 6. Spearman's Rank Order Correlation Test

(Arithmetic Mean-based *versus* Geometric Mean-based QGI)

Number of Observations	372
Spearman's rho	**0.995**
Ho: *Arithmetic Mean-based QGI* and *Geometric mean-based QGI* are independent	
Prob > |t| = 0.0000	

Appendix 7. Spearman's Rank Order Correlation Test

	QGIAPC1	QGICEEC1	QGILAC1	QGIMENA1	QGISSA1
Variables	vs.	vs.	vs.	vs.	vs.
	QGIAPC2	QGICEEC2	QGILAC2	QGIMENA2	QGISSA2
Spearman's rho	**0.988**	**0.98**	**0.98**	**0.961**	**0.999**
Number of Observations	48	64	68	40	144
	Ho*: The two sets of QGI indices are independent*				
P-value	0.000	0.000	0.000	0.000	0.000

Note: subscript 1 refers to the benchmark QGI score by region while subscript 2 refers to the region-specific one.

Appendix 8. Correlation Matrix between the Benchmark QGI and the Region-Specific QGI

	QGIAPC1	QGICEEC1	QGILAC1	QGIMENA1	QGISSA1
QGIAPC2	0.993*** (0.000)				
QGICEEC2		0.984*** (0.000)			
QGILAC2			0.982*** (0.000)		
QGIMENA2				0.964*** (0.000)	
QGISSA2					0.999*** (0.000)

Note: subscript 1 refers to the benchmark QGI score by region while subscript 2 refers to the region-specific one; P-value in brackets.

Appendix 9. Determinants of Quality of Growth on Different Subsamples

Dependent variable: QGI	[1] LIC	[2] MIC	[3] 1990-99	[4] 2000-11	[5] SSA	[6] Non-Fragile	[7] Resource-rich
Social spending-to-GDP ratio	(+)*	(+)*	(+)***	(+)*	(+)***	(+)***	(+)*
Government stability	(+)***	(+)	(+)***	(-)	(+)***	(+)***	(+)***
Log of inflation volatility	(-)**	(-)**	(-)***	(-)**	(-)**	(-)***	(-)**
Financial depth	(+)***	(+)***	(+)***	(+)***	(+)***	(+)***	(+)***
Aggregated institutional quality	(+)*	(+)	(+)***	(+)***	(+)*	(+)**	(+)**
FDI-to-GDP ratio	(+)	(+)*	(+)*	(+)*	(+)	(+)***	(+)
Remittances-to-GDP ratio	(+)**	(-)	(-)	(+)	(+)	(+)	(+)
Foreign Aid-to-GDP ratio	(-)***		(-)***	(-)***	(-)***	(-)***	(-)***
Rule of law	(+)	(+)**	(+)	(+)	(+)	(+)	(+)*
Quality of bureaucracy	(+)***	(+)	(+)***	(+)***	(+)***	(+)***	(+)***
Control of corruption	(-)	(-)*	(+)	(+)	(-)	(-)	(+)
Observations	71	158	96	133	78	159	52
R-squared	0.558	0.218	0.509	0.370	0.541	0.432	0.566

Note: (+) and (-) indicate a positive and negative effect respectively, while *, **, and *** indicate the significance level of 10%, 5%, and 1% respectively.

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