A Statistical Approach to Identifying Poor Performers

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Executive Summary

Recent decades have seen a proliferation of 'league tables' which rank countries according to their performance on an increasingly wide range of indicators. This paper asks whether, using widely available, objectively quantifiable data, it is possible to identify *using purely statistical criteria* a set of developing countries that can be classified as poor performers.

We restrict attention to two objectively quantifiable performance indicators, economic growth and infant mortality (reductions in which represent improvements in human development), over two periods 1980-1990 and 1990-2000. We use four different statistical criteria to identify poor performance, which differ in the extent to which they take things like starting conditions and external events into account when assessing countries' performance.

Our main finding is that sets of countries that can be classified as poor performers based on purely statistical analysis are sensitive to the performance measure, time period, and classification criteria used. Notably, few countries consistently appear as poor performers: those which perform poorly on one indicator, or in one period, typically do not perform poorly on/in the other. These results are valuable in demonstrating that poor performance is by no means pervasive. It would be wrong to suggest that there exists a large group of countries that consistently, over time, perform poorly on economic growth and/or human development.

Our analysis does not identify a large set of countries that can reliably be classified as poor performers according to objective performance measures. Consequently, it should not be surprising that it is also difficult to identify variables that help predict poor performance – below average performance appears to be due to country-specific factors that vary over time. However, we find some significant associations between poor performance and economic structure, governance, aid flows and inequality or conflict.

We stress that our findings remain preliminary at this stage. Lack of data may be part of the reason for why our analysis identifies so few countries as poor performers. Several countries which lack data, or for which the data may be unreliable, could be poor performers and warrant further investigation. Furthermore, our results are not strong enough at this stage to draw any inferences on the determinants of poor performance; this is another issue which requires further investigation.

1. Introduction

This paper, and the analysis presented here, is intended as a complement to the more general conceptual framework on poorly performing countries (PPCs) being developed as part of the ODI study. Countries *are* classified and 'rated' according to performance on an increasingly wide range of criteria. The quantitative nature of most economic and socio-economic variables has given rise to a long tradition of ranking countries, by income level, growth rates, etc. In economic terms, a simple indicator of poor (economic) performance is having a value (some distance) below the average value of the selected indicator for the population (sample) of countries. There are various ways in which such 'deviations from the average' can be measured (discussed in section 3 below). Most importantly, one may wish to control for certain characteristics that are known to affect performance, especially characteristics that are (largely) beyond the influence of policy. For example, landlocked countries will tend to grow slower than non-landlocked countries with otherwise similar characteristics. It is important to distinguish between 'natural' characteristics that affect growth and other variables that affect growth but are amenable to policy influence. For example, high inequality is associated with lower growth (*ceteris paribus*). In this sense, inequality is an indicator of poor (policy) performance rather than a determinant. These issues are discussed in section 2 below.

An important distinction should be drawn between measures (to be used as ranking criteria) that are 'objectively quantifiable' from those that are 'subjectively quantifiable' (even if in practice the distinction is somewhat blurred). Most economic variables are objectively quantified (even if they may be inaccurate): of a group of countries it is evident which have higher incomes, lower growth, higher investment etc. Most natural characteristics are objective (distance, being landlocked), and most socio-economic measures are objectively quantified (infant mortality, school enrolment). Furthermore, the measurement units are cardinal – 20 is twice the value of 10, etc. With such measures, to the extent that the data are reasonably accurate (and available), one can make comparisons across and between countries. Specifically, one can make 'objective' judgements on relative performance according to the measures using statistical analysis. Our analysis concentrates on variables and measures that are of this objectively quantifiable form.

Recent decades have seen a proliferation of 'league tables' to rank countries according to measures that are only subjectively quantifiable. Examples include the many indices of governance, corruption, freedom or human rights. Two features of such data deserve mention. First, the data are ordinal and provide only a ranking – 4 is above 2 (or below, depending on the order of the index), but is not twice the value of 2. For example, a country with a corruption score of 6 (where 1 = least corruption and 10 = most corruption) can be claimed to have higher corruption as a country with a score of 3, but cannot be claimed to be twice as corrupt. Second, and related, the measure in its construction embodies subjective judgements. For example, indices such as the CPIA or Freedom House are based on collating subjective responses (rankings) to a set of questions. Measures of this form pose problems for statistical analysis. Consequently, such measures are not used in our core analysis.

The statistical analysis presented in this paper has an intentionally narrow objective to address a specific question. Using (objectively quantifiable) data available for as many developing countries as possible, is it possible to identify a set of countries that would be classified as poor performers using a number of criteria, and is it then possible to identify country characteristics that determine poor performance? At this stage we restrict attention to two broad performance measures, economic growth and infant mortality (a measure of health status that is highly correlated with poverty, used here as a measure of human development performance). In simple

terms, we want to see if we can identify a group of countries that could be widely agreed to have performed poorly on either or both of these measures.

Having completed the basic analysis and identified (if we do) poor performers, we then conduct a number of further exercises. First, we assess if the poor performers share certain natural or structural characteristics, i.e. can we identify factors not readily amenable to policy influence that determine poor performance. Second, we can assess if the countries we identify as poor performers are ranked low on ordinal measures (we use governance indicators here). Furthermore, we attempt to assess the direction of causality between poor performance and governance. It is often asserted that poor governance causes poor performance, but the reverse may be the case. Finally (in a future extension) we can relate our list of poor performers to classifications that have been produced by others (e.g. LICUS, MCA).

The statistical analysis cannot identify all poor performers. Cross-country statistical analysis can only cover the countries for which data are available. However, it would be useful to know if, from the set of countries for which data are available, our statistical approach does (or does not) identify as poor performers countries that others, using whatever criteria, have classified as such. It may be the case that the absence of data is itself a sign of poor performance, in which case the approach will 'miss' many poor performers. We do report the countries for which data are not available, but some other judgement is required to decide if these are indeed poor performers (i.e. the data alone provides insufficient information). We may well conclude that the statistical approach is not appropriate for identifying the group of countries that all could agree are poor performers. This in itself would be an important conclusion, with the critical implication that judgement (or information beyond that contained in available objectively quantified data) is required. It would be a matter of concern if poorly performing countries are none other than those that donors or commentators, using their own criteria, classify as such. For these reasons, our approach is purposefully transparent and verifiable.

Section 2 presents a brief review of the literature on *economic* performance, with the principal aim of distinguishing between performance measures, indicators (or correlates) of performance, and (structural or natural) determinants. The crucial distinction is that the latter are not amenable to policy influence (at least in the relatively short term). If countries are poor performers because of structural characteristics, this has implications for the interventions and policies required to improve performance. The section includes discussion of the role of aid in influencing performance. Section 3 presents the statistical criteria and methods used in the analysis. Section 4 discusses the results, in particular whether poor performers are identified, and Section 5 presents a summary and preliminary conclusions.

2. Background and Context: Literature on Economic Performance

Empirical studies of economic performance fall within the tradition of cross-country growth regressions. The traditional approach attempts to identify the factors that determine growth: countries with high values for these variables perform well, countries with low values perform poorly. This begs the question of why some countries have low values of the relevant variables. A number of recent studies have turned to trying to identify factors that retard growth, usually when attempting to explain why sub-Saharan Africa (SSA) has experienced such poor economic performance. This work is motivated by the observation that, even accounting for the low values of the variables that contribute to growth, SSA under-performs (Collier and Gunning, 1999). The

search is on, so to speak, to find the reasons for SSA's poor growth performance. Some of these reasons will be that SSA countries have adverse structural characteristics, others that they had inappropriate policies. The aim of this section is to distinguish between the two.

We do not attempt to review what is now a very large literature. Rather, we pick out some of the more recent results to identify a list of factors that are generally agreed to be associated with poor growth performance (concentrating on the SSA studies). In particular, we aim to identify structural features not amenable to short-term policy influence. In discussing these results, we look at two specific types of study – those on the impact of aid on growth, and those on the relationship between trade and growth. A useful starting point is Artadi and Sala-i-Martin (2003) who identify seven factors associated with low growth in SSA. These are listed below but discussed in the context of the broader literature.

- *Expensive investment goods*. Investment is generally regarded as a driver of growth. In fact, the traditional economic argument for aid to poor countries was to finance needed investment (given low levels of domestic savings). A feature of poor performing countries is that the productivity of investment is low, and another way of describing this is that investment goods are relatively expensive (or costly). This can be due to a number of factors. Collier and Gunning (1999) emphasise the importance of risk, especially in countries dependent on agriculture. High risk will discourage investment, and reduce the rates of return. Manufacturing can also face high risks, especially if institutional structures are weak (e.g. lack of enforcement of property rights). Policy distortions can increase the price of investment goods, for example high transport costs or tariffs on imports. Restricted access to credit also increases the cost of investment. These growth-retarding factors include some that are structural (determinants of high risk), and some that are amenable to policy influence (policy distortions that are correlates of poor performance).

- *Low levels of education*. The principal way in which education contributes to growth is through enhancing the skill-base of the workforce. Low levels of education, in terms of coverage (access) and quality, implies low average levels of skill and this retards growth. There is evidence that in agriculture, better educated farmers have higher productivity, especially as they are more likely to adopt new technologies. Manufacturing productivity is increased, and foreign investment attracted, if there is a larger pool of skilled workers. At another level, the competence of the government and its ability to implement policies is greater if educated workers are available. This factor is amenable to policy influence.

- *Low quality of health*. This is related to education, in the sense that the two combined determine the quality of human capital. Furthermore, the two are inter-related. Education can increase health awareness and especially nutrition, while expectations of health increase incentives to acquire education. The incidence of HIV/AIDS, and to a lesser extent malaria and TB, is a major factor associated with poor health in certain countries. This depletes the workforce, reduces the incentive to invest in education, and can be a severe constraint on growth. While health status is amenable to policy influence, location in the tropics is a structural characteristic associated with greater incidence of disease (so that initial health status will tend to be lower).

- *Adverse geography*. Measures of geography are often found to be associated with poor growth, usually because they capture the effect of other factors that retard growth. For example, 'location in the tropics' acts as a proxy for low health quality (high incidence of disease) and/or dependence on primary (agricultural) commodities. More commonly, it is a

proxy for SSA (tropical countries in other regions perform better than those in Africa). Geographical remoteness, especially being landlocked, captures the cost of being far away from major markets – transport costs are higher, and integration in markets is more difficult. These are perhaps the most obvious structural characteristics associated with poor growth.

- *Closed economies*. The literature on the link between openness (to trade, investment and capital) and growth is controversial. Nevertheless, there is evidence that growth is higher in relatively open as compared with relatively closed economies, and that opening up the economy tends to be associated with higher growth. Much of the evidence belies clear interpretation. Typically, a closed economy is a highly distorted economy – Mbabazi *et al* (2002), for example, argue that high inequality may be a good measure of the policy distortions associated with a closed economy. Opening up the economy does not guarantee growth, but it does reduce important distortions that act as constraints on growth. The evidence does not suggest that fully open economies perform best, but does suggest that very closed economies perform badly. Openness is evidently a policy variable. However, there are features of trade structure that take a long time to be altered by policy, and can be considered structural features in the short-term (e.g. dependence on primary commodity exports). This is discussed further below.

- *Excessive public expenditure*. There is a growing, but controversial and inconclusive, literature on the relationship between public expenditure and growth. Conventional wisdom suggests that investment spending contributes to growth whereas consumption spending retards growth (because it must be financed by distortionary taxes or borrowing). Evidence for poor countries does not always support this – investment spending often fails to contribute to growth (because productivity is low), whereas consumption spending may contribute (e.g. if public sector wages finance private consumption spending). Furthermore, spending on health and education is often considered as consumption (most expenditure is recurrent, on wages, textbooks, medicines etc), and this is desirable (investment in human capital). A more balanced interpretation of the evidence is that public spending is *inefficient*, and this may be closely related to corruption and low levels of governance. It is not the level of spending that matters, but the type of spending. Whilst expenditure and taxation are policy variables, there are features of economic structure that restrict policy options, and can be considered structural features in the short-term (e.g. a relatively small formal sector implies a low tax base).

- *Military conflict*. Conflict has clearly been associated with poor performance in SSA, although there could be debate as to the nature of causality (poor performance may lead to conflict). More broadly, political instability (or the likelihood of government collapse) is consistently found to retard economic performance. In fact, instability more generally (volatility of export earning or terms of trade, volatility of agricultural output, vulnerability to shocks, instability of aid and capital inflows) is negatively associated with growth, and poor countries appear to face greater instability of various kinds than other countries. Some forms of instability will be related to geography (see above), such as agricultural output and export earnings. Many of the determinants of instability are structural in nature, and 'vulnerability' can be considered a structural characteristic.

2.1 Aid and growth regressions

There has been a recent revival in the literature on the relationship between aid and growth, and the results help to identify factors contributing to or retarding growth. If cross-country growth regressions fail to account for all determinants of and especially constraints on economic growth, the estimated coefficient on included variables may be biased. In the specific case of aid, as aid is more likely to flow to poor countries that suffer growth-retarding characteristics (that may not be included), there is a greater likelihood of incorrectly drawing the conclusion that aid is ineffective. Nevertheless, the balance of recent studies find consistent evidence that aid is effective (see Tarp, 2000; Morrissey, 2001), conditional on controlling for other influences on growth (of which policy is one, but only one and not necessarily the most important).

Results from four empirical studies are summarised in Table 1; this is not intended to be comprehensive, but it is illustrative of a number of general issues in the aid-growth empirical literature. Burnside and Dollar (2000) and Hansen and Tarp (2001) are directly comparable - they use essentially the same data for the same sample, with mostly the same explanatory variables. The major difference is the method of estimation used (and this clearly affects the results). Dalgaard *et al* (2002) use essentially the same sample, but focus on the interaction between aid and geography, arguing that aid appears to be less effective in tropical countries. Gomanee *et al* (2002) restrict analysis to a sample of sub-Saharan African countries and focus on accounting for the relationship between aid and investment. Their specification is quite different, but the results are included to show that even for the countries with the poorest growth performance, SSA, the evidence suggests a positive effect of aid.

Table 1 : Selected aid-policy-growth regression results

	BD	**HT**	**GGM**	**DHT**
Aid	-0.32	0.24*	0.43*	1.82*
Aid^2		-0.75*	-0.01*	-0.06
Policy Index	0.74*			
Aid*policy	0.18*	-0.006		
Institutional Quality	0.66*	0.81*	1.33*[a]	0.76*
Initial GDPpc	-0.90	0.001	0.001*	-0.39
Investment			0.11*[b]	
Policy indicators:				
Openness	2.25*	0.02*		1.75*
Inflation	-1.39*	-0.01*	-0.004*	-1.12*
Budget deficit	-6.49*	-0.10*	-0.15*[c]	-0.07*
Financial Depth	0.02	0.01		
Sample Period	1970-93	1974-93	1970-97	1974-93
Countries/periods	56/6	56/5`	24/7	54/5
N	270	243	135	231
R^2	0.35		0.44	

Notes and Sources: Not all significant variables in the relevant regressions are reported, see below; t-ratios are not reported but * indicates significance (at least the 5% level). Due to measurement differences parameter values are not directly comparable. GDPpc is real GDP per capita. N indicates total number of observations.

Burnside and Dollar (BD, 2000): 2SLS estimation from Table 4, regression (5) also included ethnic fractionalisation, assassinations and regional dummies. Coefficients on policy indicators from Table 3, 2SLS regression (2), which is similar to Table 4 in terms of results for other variables.

Hansen and Tarp (HT, 2001, Table 1, regression 1.1), instrumental variable method with lagged aid, also included policy squared, ethnic fractionalisation, assassinations, and regional dummies.

Gomanee *et al* (GGM, 2002, Table 5, column 3) is a robust regression method for SSA countries only, aid measured as grants (lagged): a – refers to a democracy variable, b – investment measured as a generated regressor (excludes any effect of aid), c – government consumption. Regression includes human capital.

Dalgaard *et al* (DHT, 2002, Table 2, column 3) is GMM regression also includes ethnic fractionalisation, assassinations, geographical variables and regional dummies.

A number of issues are illustrated in Table 1:

- All studies except BD find a significant positive coefficient on aid. The general interpretation of this is that capital inflows (in particular aid and foreign investment) can contribute to growth provided they finance productive investment.
- When included, investment is a significant determinant of growth.
- Policy variables tend to be significant, in particular openness, inflation and budget surplus (or government consumption spending). The nature of the relationship between policy and growth (and aid) is not revealed from these studies. Countries with a better economic performance are likely to have more favourable values of the policy indicators (especially inflation and deficits).
- When included, the Aid^2 term tends to be negative and significant, typically interpreted as diminishing returns to aid. However, it is possible that this is picking up an effect of the volatility of aid flows. More vulnerable countries experience more volatility of aid inflows and this is associated with a poor growth performance (see Lensink and Morrissey, 2000). The DHT result suggests this is correlated with location in the tropics. In other words, this variable may be picking up the effect of omitted structural characteristics.
- Institutional variables (including variables not reported in the table) are clearly important in determining growth performance. A wide variety of institutional and governance indicators are found to be associated with economic performance in different studies. However, interpretation is not always clear.

A large amount of aid is intended to reduce poverty, or at least improve the welfare and living conditions of the poor, to provide public goods (such as health and education), to protect the environment and even to support good governance. Such aid can contribute to development (the welfare of people) even if it does not add to economic growth. Concentrating on the impact of aid on growth may therefore miss important ways in which aid contributes to performance. Gomanee *et al* (2003) argue that the composition of public spending may hold the key to increasing levels of human welfare, thereby alleviating poverty. Attempts to increase the targeting of expenditure in areas that are more likely to benefit the poor could yield a high pay-off. Aid is found to influence the allocation of government spending in this way, with increased spending on social sectors that contribute to improving human welfare indictors. They find that infant mortality tends to be lower in countries receiving more aid if that aid increases spending on social sectors. Thus, the effect of aid on performance operates through many of the growth-retarding factors listed above.

- There is now a growing body of evidence that aid contributes to improved performance. This is true whether performance is measured in terms of growth or human development indicators. There is no robust evidence that aid is less effective in the poorest countries. Aid can be effective in poor performers.

2.2 Trade, openness and growth

While the evidence on the association between exports and growth is persuasive, the link between trade liberalisation (increasing openness) and growth is weak (Greenaway *et al*, 1998). Onafowora and Owoye (1998) find evidence that exports are positively related to growth in an analysis of 12 African countries over 1963-93. Trade liberalisation, if interpreted as outward orientation, can increase growth rates in SSA. However, following trade reform we often do not see any improvement in trade or economic performance, especially in countries dependent on agricultural exports. The failure to observe (sustained) export supply response does not imply that liberalisation is ineffective. Trade liberalisation may reduce but not remove the bias against exporting, and may be insufficient to relax other constraints (McKay *et al*, 1997). This is one reason why one may not observe any relationship between trade liberalisation and growth in SSA, but does not imply that countries do not benefit from opening the trade regime. Note also that trade reforms are only one element of openness, which also includes technology, capital and investment inflows. The evidence suggests that openness to trade is conducive to growth, conditional on appropriate domestic policies and institutions (Rodrik, 1999). Although an open trade policy may facilitate growth, there are (structural) features of trade structure that tend to retard growth.

Trade structure, in particular dependence on primary commodities, is an important determinant of trade performance, and therefore mediates any link between trade and growth. Resource endowments will be a major determinant of trade structure. A standard hypothesis is that countries with relatively low endowments of natural resources, thus relatively high labour endowments, will need to industrialise to promote export growth and utilise their comparative advantage. However, countries endowed with natural resources coupled with low skill levels will tend to have export dependence on unprocessed primary commodities. This can retard growth because extractive industries have weak linkages with the rest of the economy, agricultural exports are largely unprocessed and primary commodities tend to face volatile and deteriorating terms of trade. This may help, in particular, to explain SSA's poor growth performance

In one recent study, Mbabazi *et al* (2002) use cross-section and panel econometric techniques to investigate the links between growth, inequality and openness for a sample of developing countries. They find that inequality appears to have a robust negative effect on growth in the long run, and interpret this as capturing the adverse impact of policy distortions (inequality will be associated with rent-seeking and corruption). This negative effect persists when controlling for factors that promote growth (investment and openness), factors that retard growth (natural resource dependence and barriers to trade), and initial GDP. They also find consistent robust evidence that openness is positively associated with growth. However, Africa does appear to be different, i.e. SSA countries have a below average growth performance, controlling for the 'usual' explanatory variables. The especially poor SSA growth performance can be explained by low levels of openness combined with natural barriers to trade (especially high costs of transport to distant markets). Although SSA countries are disadvantaged by natural barriers and distance from markets, interventions are possible that can reduce transport and transactions costs of trade. Increasing openness tends to promote growth, even in an environment of high natural barriers. Similarly, although SSA countries may have unfavourable resource endowments, resulting in

over-dependence on unprocessed primary commodity exports, this is not a binding constraint on growth. Policies that encourage exports and diversification, and that reduce barriers to openness, can boost economic performance.

Lederman and Maloney (2003) provide a recent review of the evidence on trade structure and growth, and find that natural resource abundance has a positive effect on growth although declining world prices (for primary commodities) and export concentration retards growth. Thus, having an abundance of primary commodities to export is, in itself, beneficial. Problems arise for those countries dependent on a narrow range of primary commodities, especially if these commodities face declining terms of trade (declining world prices). Poor performing countries, especially in SSA, are likely to be export dependent on a few agricultural exports. This dependence reflects a structural feature of the economy that retards growth. Under such an environment, trade liberalisation will confer limited benefits – the capacity of the export sector to respond is constrained, whereas domestic producers will face increased competition from imports.

- There is now a growing body of evidence that restrictive and distorted trade policies lead to poor economic performance. Insofar as openness represents a policy of reducing restrictions and distortions to trade, it can contribute to improved performance. However, there are identifiable structural characteristics that undermine the effectiveness of this policy option.

Characteristics of poor economic performance

There appear to be growth-retarding features specific to SSA countries (only partly captured by policy and institutional variables), notably natural characteristics and vulnerability to shocks. This suggests that there may be a set of structural features or inherent characteristics, not amenable to policy influence in the short-term, that predispose certain countries to poor economic performance. We proceed by identifying a set of structural characteristics that are posited as determinants of poor performance.

- *Natural barriers* – this is a general term to encompass adverse geography, specifically remoteness. Two relevant measures are 'landlocked or remote island' status and distance from major markets. These are truly structural characteristics. They cannot be changed by policy, although they may imply that certain policies are especially appropriate. For example, transport costs can be reduced and this is the policy counterpart of geographic distance.
- *Lack of economic breadth* – the specific aim here is to capture the absence of diversification in the economy, and especially dependence on a small range of exports (adverse trade structure). Suitable measures include share of agriculture in GDP, employment, exports; share of manufactures in exports; export diversification or concentration (on primary commodities) indices. Although it is true that policy interventions can promote diversification of exports, for example, the process is slow and it is not a simple matter to identify effective policy interventions.
- *Lack of economic depth* - the aim here is to identify countries with a weak economic base, which will tend to be associated with limited breadth (this may be associated with low productivity of investment). Suitable measures include tax/GDP and domestic saving/GDP ratios, or financial depth. It is true that as an economy grows and develops, these constraints are relaxed (the values increase), and they can be influenced by policy. Nevertheless, initial (or starting) values do capture important structural features of an economy that tend to change only slowly over time.

- *Economic vulnerability* – to capture the susceptibility of the country to economic shocks (probably correlated with natural shocks and political instability). Suitable measures include the Commonwealth Vulnerability Index, the vulnerability impact index. Although vulnerability is a structural characteristic, it is difficult to get good measures.

These structural characteristics can be considered predetermined in statistical analysis (i.e. they are not caused by any of the policy or performance variables). This distinguishes them from a set of initial, or starting, values for policy inputs (e.g. tariff rates) or variables directly influenced by policy (e.g. expenditure/GDP ratios). For example, public expenditure on health or education and immunisation rates are policy inputs (using starting values) that should influence subsequent human capital performance (enrolment or mortality rates). However, they may not be predetermined as they can be influenced by starting values of other variables (e.g. tax/GDP, policy orientation). Thus, given the structural characteristics, the next step is to identify a set of **policy inputs** (starting values). These relate to factors identified by Artadi and Sala-i-Martin (2003), as summarised above.

- *Investment* – gross fixed capital formation (initial and period average). Macroeconomic policy indicators may capture aspects of productivity of investment – budget deficit, inflation, growth in money supply.
- *Human capital* – health and education investment indicators. Basic inputs are public spending on sectors, numbers of schools or teachers, and immunisation rates, for example.
- *Trade* – many structural features associated with trade will already have been covered, so the aim here would be to have a policy indicator – average tariff, if available, or some other measure of trade orientation.
- *Public sector* - total expenditure/GDP ratio is one option, but the real aim is to have a measure of policy distortion. Inequality (starting value) is a reasonable proxy for policy distortion. Corruption or governance indices could be used, but are rejected as being only subjectively quantifiable.

As detailed in the next section, the measures of structural characteristics are used later in the analysis (to an extent depending on data availability). Essentially, we ask two complementary questions. First, do countries typically identified as poor performers indeed have adverse values of these measures? Second, if we allow in some way for their adverse structural and/or natural characteristics, would such countries still be identified or labelled as poor performers?

3. Conceptualisation of Method

For the core analysis we will focus on two indicators of performance – infant mortality (IM) to capture health/welfare, and growth in per capita GDP (g) for economic performance – in both the 1980s and 1990s. For each variable in each period, four criteria are used to classify countries as poor performers. The first two criteria look at performance relative to an average or base value, while the other criteria condition performance on a set of control variables. For the latter, the intention is to ask if a country performed poorly given the conditions it faced initially.

- *Absolute* – a poor performer is any country that experienced a deterioration in the indicator over the period (increase in IM or negative growth).

- *Relative* – countries that are at least one standard deviation below mean performance on the indicator will be classed as poor performers (countries one standard deviation above the mean are good performers). Implicitly, mean performance is taken as the benchmark, capturing the effect of global external events. We aim to identify countries that perform significantly below the mean, hence one standard deviation.[2]
- *Conditional* – as 2) except that performance is predicted conditional on a country's starting value for the indicator, and the mean is normalised. The aim here is to take into account that the expectation of relative performance should be conditional on initial conditions in the country.
- *Residual* – as 3), except that the predicting regression is supplemented with other explanatory variables that are structural in nature (i.e. not readily amenable to policy influence). This criterion is useful for comparison with the conditional criterion. If a country is classified as a poor performer under 3) but not under 4), the implication is that the poor performance is attributable to the identified structural features of the country (i.e. poor performance may be due to factors largely beyond the control of country policy-makers).

Each measure will give us a set of countries classed as poor performers. What we are most interested in is whether there is a common set. At the extreme, are there countries classed as poor performing on both indicators in both periods for all (or at least for relative and conditional) criteria?

3.1 Method (in equation form)

The **Absolute** criterion of performance is represented by the change in the performance indicator, labelled Δy_i . The **Relative** criterion is represented by the standardised residuals from a regression of the form:

$$\Delta y_i = a + e_i, \quad (1)$$

where a is the mean change in the performance indicator y over a given period. The **Conditional** criterion is represented by the standardised residuals from a regression of the form:

$$\Delta y_i = a + by_i + e_i, \quad (2)$$

where y_i is the initial level of the performance indicator at the beginning of the decade. The **Residual** criterion is represented by the standardised residuals from a regression of the form:

$$\Delta y_i = a + by_i + cx_i + e_i, \quad (3)$$

where x_i comprises a set of additional variables thought to affect performance indicator y which are broadly speaking beyond the control of the domestic government (or any other domestic agents) – and which should (one might argue) be controlled for when assessing whether performance has been good or bad. They include geographical variables, such as whether a

[2] It transpires that most indicators in each decade are normally distributed, so cut-offs of one standard deviation below and above the mean classify approximately 15% of countries as poor performers and 15% as good performers, in any one indicator and decade (see Appendix Figures A1 and A2).

country is landlocked, its distance to world markets, and its climate, and measures of exogenous 'shocks', such as war, disease (in particular, HIV/AIDS), and changes in the terms of trade.

For GDP per capita, **poor performance** is defined as a negative value of Δy_i (absolute criterion), or a standardised residual less than minus one (relative, conditional, and residual criteria). For infant mortality, poor performance is defined as a positive value of Δy_i (absolute criterion), or a standardised residual greater than one (relative, conditional, and residual). Note that, in all cases, performance is measured over a period of time, rather than at a single point in time. In other words, a poorly performing country is not necessarily a poor country, and vice versa. In this paper we will assess country performance over two ten-year periods, 1980-1990 and 1990-2000. This choice is arbitrary, however, and it is possible that we would obtain a different set of results if we were to choose periods of different lengths and/or different starting points.

3.2 Data

The majority of data are taken from the World Development Indicators CD-ROM. Levels of GDP per capita and infant mortality rates in 1980, 1990 and 2000 are, where possible, averages of the years 1979-81, 1989-91, and 1998-2000, or are otherwise the nearest year available (within two years either side of the three-year averages). Changes in GDP per capita and infant mortality rates between the averages for 1979-81 and 1989-91, and 1998-2000 are calculated by dividing the total change by the number of years between observations. GDP per capita is measured in log units of constant local currency, and changes are multiplied by 100, so they give the average percentage change per year, in real terms (i.e. after allowing for inflation). We focus our attention on the 126 countries classified by the World Bank as low or middle income in 2002, excluding the transition countries in Europe and Central Asia.

In the additional set of explanatory variables used to estimate the residual criterion of performance, we include three geographical variables: landlocked, minimum distance from New York, Rotterdam, or Tokyo, and the proportion of a country's area within the geographical tropics (all taken from Gallup and Sachs, 1999), and two 'shock' variables: the change in the terms of trade (from WDI), and the proportion of the adult population estimated to be living with HIV/AIDS (from UNAIDS, 2001).

Measures of performance are only as accurate as the underlying data on which they are based. Unless each performance indicator is measured with complete accuracy, each performance measure will also reflect measurement error. For instance, a country may be classified as having poor economic performance simply because per capita GNP growth is under-estimated, or as having good economic performance simply because per capita GNP growth is over-estimated. We should for this reason treat our results with caution.

Data on changes in per capita GDP and infant mortality during the 1980s and 1990s are unavailable for some countries (at least when using standard publicly available datasets, such as the World Bank's World Development Indicators). These countries are listed in Appendix Tables A1 and A2. Clearly, we have no way of classifying these countries performance statistically. A further problem, however, is that the lack of data for some countries may bias our estimates of performance for others. For instance, if (as is likely) poorly performing countries are less likely to have data, some countries whose performance is in fact moderate by *true* world standards will be classified as having poor performance by *observed* world standards. (This is not the case for our **absolute**

definition of poor performance, which is unaffected by estimated levels of performance in other countries). For this reason also we should treat our results with caution.

4. Implementation

Tables 2 and 3 show the countries classified as poor performers according to each of the four performance criteria described in the previous section. The countries affected by missing data are listed in Appendix Tables A1 and A2. The underlying regressions on which the criteria are based are shown in Appendix Table A3.

- In the 1980s, eight countries were poor performers, according to all four criteria, in terms of infant mortality (Liberia, Mozambique, Niger, Papua New Guinea, Rwanda, Sierra Leone, Somalia, and Zambia). Four countries were poor performers according to all four criteria in terms of GDP per capita (Democratic Republic of Congo, Cote d'Ivoire, Nicaragua and Niger). A further three were poor performers in terms of infant mortality according to all definitions which could be calculated, given data availability (Micronesia, North Korea, and Tanzania). A further six were poor performers in terms of GDP per capita according to all definitions which could be calculated, given data availability (Guyana, Iraq, Kiribati, Liberia, Libya, and Saudi Arabia).

- Only one country was a poor performer according to all four criteria in both infant mortality and GDP per capita in the 1980s (Niger). However, Micronesia, North Korea, and Tanzania might fit into this category, but they all lack GNP per capita data for the 1980s.

- In the 1990s, three countries were poor performers according to all four criteria in terms of infant mortality (Cote d'Ivoire, Kenya, and Zambia). Seven countries were poor performers according to all four criteria in terms of GDP per capita (Angola, Burundi, Republic of Congo, Haiti, Rwanda, Sierra Leone, and Zambia). Iraq, North Korea and Swaziland were poor performers in terms of infant mortality according to all criteria which could be calculated given data availability. Comoros, the Democratic Republic of Congo and Djibouti were poor performers in terms of GDP per capita according to all criteria which could be calculated.

- Only one country was a poor performer according to all four criteria in both infant mortality and GDP per capita in the 1990s (Zambia). However, Iraq and North Korea may fit into this category, but they lack GNP per capita data for the 1990s.

Table 2: Poorly performing countries, infant mortality

Decade	1980s				1990s			
Measure	Absolute	Relative	Conditional	Residual	Absolute	Relative	Conditional	Residual
	Liberia	Burundi	Afghanistan	China	Barbados	Barbados	Afghanistan	Burkino Faso
	Micronesia	China	Burundi	**Liberia**	Botswana	Botswana	Angola	**Cote d'Ivoire**
	Mozambique	Grenada	Chad	Mauritania	**Cote d'Ivoire**	**Cote d'Ivoire**	Botswana	**Kenya**
	Niger	**Liberia**	**Liberia**	**Mozambique**	*Iraq*	*Iraq*	Burkina Faso	Mali
	North Korea	*Micronesia*	*Micronesia*	**Niger**	**Kenya**	**Kenya**	Central Af. Rep.	Rwanda
	Papua New Gn	**Mozambique**	**Mozambique**	**Papua New Gn.**	*North Korea*	*North Korea*	**Cote d'Ivoire**	**Zambia**
	Rwanda	**Niger**	**Niger**	**Rwanda**	St Vinc. & Gren.	St Vinc. & Gren.	Djibouti	
	Sierra Leone	*North Korea*	*North Korea*	**Sierra Leone**	South Africa	South Africa	*Iraq*	
	Somalia	**Papua New Gn.**	**Papua New Gn.**	**Somalia**	*Swaziland*	*Swaziland*	**Kenya**	
	Tanzania	**Rwanda**	**Rwanda**	South Korea	**Zambia**	**Zambia**	Namibia	
	Zambia	Seychelles	**Sierra Leone**	**Zambia**	Zimbabwe	Zimbabwe	Nigeria	
		Sierra Leone	**Somalia**				*North Korea*	
		Somalia	*Tanzania*				Rwanda	
		Tanzania	**Zambia**				South Africa	
		Zambia					*Swaziland*	
							Zambia	
							Zimbabwe	

Notes: Countries in bold are poor performers according to all four definitions. Countries in italics are poor performers for all definitions which can be calculated given data availability.

Table 3: Poorly performing countries, GDP per capita

Decade	1980s					1990s				
Measure	Absolute		Relative	Conditional	Residual	Absolute		Relative	Conditional	Residual
1	Algeria	Malawi	**Congo, DR**	**Congo, DR**	Argentina	Algeria	Togo	**Angola**	**Angola**	**Angola**
2	Angola	Mali	**Cote d'Ivoire**	**Cote d'Ivoire**	**Congo, DR**	**Angola**	Vanuatu	**Burundi**	**Burundi**	**Burundi**
3	Argentina	Mauritania	*Guyana*	Ethiopia	**Cote d'Ivoire**	**Burundi**	Venezuela	Cameroon	Cameroon	**Congo, Rep.**
4	Bahrain	Mexico	*Iraq*	*Guyana*	Jordan	Cameroon	**Zambia**	*Comoros*	*Comoros*	**Haiti**
5	Benin	Mozambique	*Kiribati*	*Kiribati*	Iran	Cen. Af. Rep.		*Congo, DR*	*Congo, DR*	**Rwanda**
6	Bolivia	Myanmar	*Liberia*	Madagascar	**Nicaragua**	Chad		**Congo, Rep.**	**Congo, Rep.**	**Sierra Leone**
7	Cameroon	Namibia	*Libya*	**Nicaragua**	**Niger**	*Comoros*		*Djibouti*	*Djibouti*	South Africa
8	Cen. Af. Rep.	**Nicaragua**	**Nicaragua**	**Niger**	Nigeria	*Congo, DR*		Guinea-Bis.	**Haiti**	**Zambia**
9	Comoros	**Niger**	**Niger**	Peru	Syria	**Congo, Rep.**		**Haiti**	**Rwanda**	
10	**Congo, DR**	Nigeria	Peru	*Saudi Arabia*		Cote d'Ivoire		Mongolia	Saudi Arabia	
11	Costa Rica	Panama	*Saudi Arabia*	Zambia		*Djibouti*		Niger	**Sierra Leone**	
12	**Cote d'Ivoire**	PNG				Ecuador		**Rwanda**	**Zambia**	
13	Ecuador	Paraguay				Gabon		**Sierra Leone**		
14	El Salvador	Peru				Gambia		**Zambia**		
15	Ethiopia	Philippines				Guinea-Biss.				
16	Fiji	Rwanda				**Haiti**				
17	Gabon	*Saudi Arabia*				Kenya				
18	Gambia	Sierra Leone				Madagascar				
19	Ghana	South Africa				Micronesia				
20	Guatemala	Sudan				Mongolia				
21	*Guyana*	Suriname				Niger				
22	Haiti	Syria				Nigeria				
23	Honduras	Togo				Paraguay				
24	Iran	Trin. & Tob.				**Rwanda**				
25	*Iraq*	Uruguay				Sao T & P				
26	*Kiribati*	Venezuela				Saudi Arabia				
27	*Liberia*	W. Samoa				**Sierra Leone**				
28	*Libya*	Zambia				Solomon Is.				
29	Madagascar					South Africa				

5. Characteristics of Poor Performers

In this section we assess if the countries identified as poor performers in the previous section share features/values with respect to other factors of interest in the study. Our approach is to compare the average values of various measures of characteristics for poor performers with the corresponding (by indicator and decade) group of good performers. If there is a statistically significant difference between the average values for poor and good performers, this will suggest characteristics that influence performance. We restrict our attention to comparing countries classified as poor or good performers according to either the relative and conditional criteria; an identical analysis could be applied to any of our other criteria of performance.[3] We consider four types of characteristics (actual measures used are discussed below):

- *Economic structure* – do poor performers share certain adverse economic characteristics? In other words, are there inherent characteristics of these countries that would permit us to anticipate poor performance?
- *Policy and Governance* – do poor performers tend to have low governance scores, and are they countries that have not implemented much policy reform?
- *Aid* – have poor performers been relatively low/high aid recipients? Has the type of aid or relationship with donor differed for these countries?
- *Fragmentation/inequality/conflict* – are poor performers characterised by fractious, poorly integrated or highly unequal societies, or been particularly prone to social conflict and political instability?

5.1 Economic structure

We analyse four features of the economic structure of poor performers: financial depth (as measured by the ratio of the M2 measure of money supply to GDP), tax revenues (measured as a share of GDP), openness to trade (as measured by the ratio of exports to GDP), export diversification (as measured by the inverse Herfindhal-Hirschman index[4]). We relate the value of each variable at the beginning of each decade to subsequent performance over the decade. We also relate performance to an index of vulnerability to adverse shocks calculated by Atkins *et al.* (2000), which is calculated using data for both the 1980s and 1990s.[5]

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[3] Countries classified as poor or good performers according to either of these criteria are listed, by decade and measure, in Appendix Tables A4 and A5.

[4] Defined as $1/\sum a_i^2$, where each a_i represents the share of exports (in value terms) accounted for by each different product *i*. When each export good has an equal share of total exports, the index equals the number of export goods.

[5] This is the Vulnerability Impact index, which is a weighted average of a country's trade openness (exports as a % of GDP, between 1991 and 1995), export concentration (measured by the Herfindhal-Hirschman index, and the incidence of environmental shocks and hazards (as measured by the percentage of the population affected by natural disasters between 1970 and 1996). We multiply the index by minus one so that higher values indicate lower vulnerability.

Table 4 shows the difference between the average value of each structural variable for poor and good performers. Negative values indicate that poor performers began each decade with lower values of these variables (corresponding to more 'adverse' economic structures). Asterisks denote that the difference between poor and good is statistically significant – in other words, is unlikely to have arisen purely by chance.

Table 4: Differences in economic structure between poor performers and good performers

	Outcome/decade on which performance is assessed:			
	Infant mortality, 1980s	GDP per capita, 1980s	Infant mortality, 1990s	GDP per capita, 1990s
Tax revenue (% of GDP)	-0.96	-0.17	8.37*	-2.60
Financial depth (% of GDP)	-5.79	-13.83*	0.32	-15.30
Exports (% of GDP)	-3.02	-2.68	14.03*	-5.58
Export diversification	-	-	-0.06	-4.30*
Vulnerability to shocks (Atkins et al 2001)	0.15	0.65	-0.43	0.02

Notes: * Indicates differences which are statistically different from zero at the 10% significance level. Negative values indicate that poor performers began each decade with lower values of these variables (corresponding to more 'adverse' economic structures).

The results suggest that the links between economic structure and poor performance are not very strong. In over half of the cases, poor performers had lower values of the structural variable, but in only two instances are the differences statistically significant. Poor growth performers in the 1980s began the decade with significantly lower financial depth, and poor growth performers in the 1990s began the decade with significantly less diversified exports. One somewhat surprising finding is that poor performers in infant mortality in the 1990s began the decade with significantly *higher* tax-GDP and export-GDP ratios. This may be explained by the presence of some middle income countries in that set of poor performers. The results serve to highlight the fact that there was relatively little overlap between poor performance in infant mortality and economic growth in the 1990s (or the 1980s).

5.2 Policy and governance

We measure governance in two ways. First, we use five of the governance indicators calculated by Kaufman *et al.* (2003) for the period 1996-2002.[6] These data include separate measures of:

[6] These indicators are derived from 250 different governance indicators, from 25 different sources constructed by 18 different organisations, and are for this reason, the most comprehensive (in terms of country coverage), and arguably the most accurate set of indicators of 'good governance' or 'institutional quality' currently available. The dataset is unique in that it also provides information regarding the margins for error in the estimates for each country's governance scores. Nevertheless, they do possess certain limitations. First, there are doubts regarding the cross-country comparability of 'surveys of businesspeople' based indicators of governance, while 'polls of experts' based indicators may be influenced more by

- Voice and Accountability (VA), which measures the extent to which citizens of a country are able to participate in the selection of governments;
- Government Effectiveness (GE), which measures perceptions of the ability of the government to produce and implement good policies;
- Regulatory Quality (RQ), which measures the incidence of "market-unfriendly" policies;
- Rule of Law (RL), which measures the extent to which agents have confidence in and abide by the rules of society;
- Control of Corruption (CC), which measures perception of corruption, in both the business environment and the political arena.

In each case, better governance is indicated by a higher value of each indicator. The second includes the Freedom House index of civil liberties and political rights; these data are available between 1973 and 2000. The third includes the International Country Risk Guide (ICRG) estimates of risk of expropriation, risk of expropriation of contracts, bureaucratic quality, rule of law, and control of corruption. These data are available between 1982 and 1995.

Table 5 relates performance in the 1980s to average values of the Freedom House and ICRG indices during the 1980s, and performance in the 1990s to the average values of the Freedom House and ICRG indices for the 1990s and the five indicators calculated by Kaufman *et al.* (2003) for 1998. We again show the difference between the average value of each governance indicator for poor-performers and the average value for good performers. Negative values indicate 'worse' governance for poor performers than other countries; asterisks signify that the difference is statistically significant.

Table 5: Differences in governance between poor performers and good performers

	Outcome/decade on which performance is assessed:			
	Infant mortality, 1980s	GDP per capita, 1980s	Infant mortality, 1990s	GDP per capita, 1990s
Political rights/civil liberties (Freedom House)	-1.01*	-1.57*	0.16	-1.06*
Foreign investment risk (ICRG)	0.45*	-1.06*	0.52*	-0.57*
Voice and accountability (Kaufman et al)	-	-	0.08	-0.35
Government effectiveness (Kaufman et al)	-	-	-0.06	-0.57*
Regulatory quality (Kaufman et al)	-	-	0.30	-0.68*
Rule of law (Kaufman et al)	-	-	0.22	-0.88*
Control of corruption (Kaufman et al)	-	-	0.23	-0.53*

Notes: * Indicates differences which are statistically different from zero at the 10% significance level.

subjective opinion than objective fact. Second, the margins for error in countries' scores in each governance dimension are in fact shown to be quite large. Third, they are only available for the years 1996-2002.

The results show that poor performers in economic growth had lower values of the Kaufman *et al.* (2003) indicators in the 1990s, and of the Freedom House and ICRG governance indicators in both decades. These differences are almost always statistically significant. By contrast, poor performers in infant mortality *did not* have significantly lower values of the Kaufman *et al*. (2003) indicators, and in fact had significantly higher values of the ICRG measure (indicating less risk for foreign investment). This is likely to be due to the presence of middle income countries in the list of poor performers on infant mortality, rather than indicating a direct causal influence. Moreover, although the Kaufman *et al*. (2003) governance indicators are associated with poor performance in economic growth in the 1990s, no causal inferences can be drawn, as the indicators relate to the end of the period.

5.3 Aid

Here we ask whether countries that performed poorly on either indicator received, on average, more or less aid than countries classed as good performers. Table 6 shows the difference between the average amount received by poor performers and the average amount received by all good performers. Three findings are statistically significant:

- Countries that performed poorly in GDP per capita in the 1990s received more aid (as a share of GDP) than other countries during the 1990s. This is consistent with aid being allocated according to need.
- Countries that performed poorly in infant mortality or economic growth during the 1980s went on to receive more aid (as a share of GDP) during the 1990s than countries which had performed well (during the 1980s). Note, however, that almost all of these countries did not appear as poor performers on infant mortality or growth in the 1990s (suggesting that aid in the 1980s was effective).
- Countries that performed poorly in infant mortality during the 1990s had received less aid (as a share of GDP) during the 1980s than countries which performed well during the 1990s.

Table 6: Differences in aid flows between poor performers and good performers

	Outcome/decade on which performance is assessed:			
	Infant mortality, 1980s	GDP per capita, 1980s	Infant mortality, 1990s	GDP per capita, 1990s
Aid inflows in 1980s (% of GDP)	3.65	2.57	-8.70*	6.35
Aid inflows in 1990s (% of GDP)	8.24*	11.84*	-1.18	8.48*

Notes: * Indicates differences which are statistically different from zero at the 10% significance level.

These results, by themselves, are inconclusive about causation. However, they are at least consistent with the hypotheses that aid was (over this period) a) positively associated with performance in infant mortality and GDP growth, and b) responsive to some extent to country 'need'. Further work would be required to extend this analysis by exploring whether the structure

of aid flows – in terms of project assistance, programme assistance, and emergency assistance – differs between poor performers and other countries.

5.4 Fragmentation, inequality and conflict

Here we ask whether poor performers have more fragmented or more unequal societies, or are more prone to political instability. We measure fragmentation using the index of 'ethno-linguistic fractionalisation' used by Easterly and Levine (1997), which refers to 1960.[7] Inequality is measured as the average Gini coefficient over the period 1975-1999 (calculated from Dollar and Kraay, 2002). Conflict is represented by an index of political instability calculated from data in Kaufman *et al.* (2003).[8]

Table 7: Differences in 'social integration' between poor performers and good performers

	Outcome/decade on which performance is assessed:			
	Infant mortality, 1980s	GDP per capita, 1980s	Infant mortality, 1990s	GDP per capita, 1990s
Ethno-linguistic fractionalisation (Easterly & Levine 1997)	0.09	0.03	0.16	0.01
Gini coefficient of income inequality (Dollar and Kraay 2002)	-1.68	3.59	6.37	4.48
Political instability (Kaufman et al)	0.12	0.64	-0.12	0.84*

Notes: * Indicates differences which are statistically different from zero at the 10% significance level.

Table 7 shows the difference between the average values of these indicators for poor performers and good performers, again with asterisks denoting differences which are statistically significant. (Note that positive differences here imply that poor performers are more fragmented, or more unequal, or more instable). On this evidence, we find no significant correlation between poor performance and ethno-linguistic fragmentation. However, we do find that poor performers in economic growth in the 1990s had significantly higher levels of political instability.

[7] This measures the probability that two people drawn at random from a country do not belong to the same ethno-language group. The data refer to 1960.

[8] This index measures perceptions of the likelihood that the government in power will be destabilised or overthrown by possibly unconstitutional and/or violent means. It is equal to the measure of political stability provided by Kaufman *et al.* (2003) multiplied by minus one; higher values indicate greater instability.

6. Preliminary Conclusions

The basic finding from our analysis is that identifying a set of countries that could be classed as poor performers based on purely statistical analysis is sensitive to the performance measure, time period and classification criteria used. This may not be surprising, but it is worth elaborating the findings. We emphasise that here we are only considering poor performers among the set of countries for which full data were available. Countries with missing data are considered below.

First, few countries consistently appear as poor performers. Only one country appears as a poor growth performer on all criteria which could be calculated in both periods (the Democratic Republic of Congo), and only one (Zambia) is a poor performer on infant mortality on all criteria in both periods. On this very strict classification, all criteria in both periods, only two countries are poor performers. Within each period, the numbers are higher. Regarding infant mortality, 13 countries perform poorly on at least two criteria in the 1980s, and 15 countries perform poorly on at least two criteria in the 1990s (but mostly different countries in each period). Regarding growth, 19 countries perform poorly on at least two criteria in the 1980s, and 16 in the 1990s (again, mostly different countries in each period).

Second, countries that perform poorly on one measure (growth or infant mortality) typically do not perform poorly on the other, even within the same period. In the 1980s, Liberia, Niger and Zambia are the only countries that performed poorly on at least two criteria for both growth and IM. In the 1990s, Angola, Rwanda, South Africa and Zambia are the only countries that performed poorly on at least two criteria for the two measures. This at least suggests a very low correlation between the factors determining poor growth performance and those determining high infant mortality.

Third, countries that perform poorly in one period typically do not perform poorly in the other period. In terms of growth, the Democratic Republic of Congo, Niger, Saudi Arabia and Zambia are the only countries that performed poorly on at least two criteria in both the 1980s and 1990s. In terms of infant mortality, North Korea, Rwanda and Zambia are the only countries that performed poorly on at least two criteria in both periods. This result is not due to a general improvement over time. Overall, there is little difference between the number of countries classified as poor performers in both periods for growth and infant mortality.

Fourth, the number of countries classed as poor performers does vary according to the criteria used. For GDP per capita, the absolute criterion gives the highest number, while for both GDP per capita and infant mortality the residual criterion gives the smallest number. In other words, while many countries may perform poorly in an absolute sense, fewer perform poorly conditional on where they started, their geographical characteristics, and the impact of adverse ‘shocks’, such as HIV/AIDS.

In terms of identifying a set of poor performers, the relative or conditional criteria are probably the most useful. These criteria provide similar, although not identical, classifications of countries. Of the countries for which data are available, on at least one of these criteria, there were 14 (7 on both criteria) poor growth performers in the 1980s and 15 (11 on both criteria) in the 1990s. There were 17 (11 both) poor performers on infant mortality in the 1980s and 19 (8 both) in the 1990s. As observed above, however, very few countries were poor performers in both periods or for both performance indicators.

Given that our approach did not identify a large set of countries that could be classed as poor performers on more than one criterion for either indicator or period, it is likely to be difficult to identify variables that would help predict poor performance. However, considering poor performance according to the relative or conditional criteria, we obtain some significant associations between poor performance and economic structure, governance, aid flows and inequality/conflict. For instance, countries with poor performance on growth in the 1990s tended to have lower governance values (in 1998), and began the decade with lower ratios of tax revenue to GDP, and with higher levels of political instability. The results are not strong enough at this stage to draw any inferences on the nature of the relationship between performance, structural characteristics and governance. This is an issue for further investigation.

Lack of data is part of the reason for why our analysis identifies so few countries as poor performers. For our preferred criteria, relative and conditional, lack of data resulted in the loss of 21 countries for growth in the 1980s and 13 in the 1990s. Data were far less a constraint on infant mortality, losing seven countries in the 1980s and four in the 1990s (all small countries). Many of the countries that had to be omitted from the growth analysis could be poor performers, and warrant further investigation. Examples to highlight are Afghanistan, Cuba, North Korea and Somalia.

We can draw some general implications of relevance. Our findings show that poor performance is a nebulous classification – few countries are classified as poor performers with any consistency. Typically, countries perform poorly on either growth or infant mortality in either the 1980s or 1990s. The absence of consistency across measures or time suggests that there are no general determinants of poor performance, whether structural or institutional. The fundamental conclusion is that cross-country statistical analysis is not very illuminating on the determinants of poor performance. However, it is valuable in the sense of showing that, applying reasonable criteria, poor performance is by no means pervasive. The majority of countries, given their circumstances, are not performing poorly (this does not imply that they are performing well – they may simply be hovering about, or just below, the average).

This analysis does not allow us to comment on the five Shepherd (2003) hypotheses specifically. The evidence reviewed (in section 2) shows that aid has tended to support improved performance, but instability of aid (its 'stop-go' nature) can be damaging for growth. Institutions, governance, societal integration and empirical sovereignty may well be important in improving performance, but these concepts are not easily amenable to quantification or statistical analysis. Our cross-country analysis is a first step – it identifies countries worthy of further (case study) analysis.

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Annex 1: Tables and figures

Table A1 Countries lacking infant mortality performance data

	1980s	1990s
1	Bhutan	Dominica
2	Dominica	Marshall Islands
3	Marshall Is.	Mayotte
4	Mayotte	Palau
5	Palau	
6	W. Samoa	
7	W. Bank and Gaza	

Notes: In the 1980s, a further 45 countries lack data on the additional explanatory variables used to estimate the **residual** measure of infant mortality performance. In the 1990s, a further 56 countries lack these data. For these countries we can only calculate the absolute, relative and conditional measures of performance.

Table A2 Countries lacking GDP per capita performance data

	1980s	1990s
1	Afghanistan	Afghanistan
2	Cambodia	Cuba
3	Cuba	Dominica
4	Djibouti	Iraq
5	Dominica	North Korea
6	Eritrea	Liberia
7	Guinea	Libya
8	Equ. Guinea	Marshall Is.
9	North Korea	Mayotte
10	Lao P.D.R.	Oman
11	Lebanon	Palau
12	Maldives	Somalia
13	Marshall Is.	West Bank and Gaza
14	Mayotte	
15	Micronesia	
16	Palau	
17	Sao T & P	
18	Tanzania	
19	Vietnam	
20	West Bank and Gaza	
21	Yemen	

Notes: In the 1980s, a further 5 countries (Iraq, Liberia, Libya, Myanmar and Somalia) lack data on GDP per capita in US$ needed to estimate the **conditional** measure of performance, and a further 28 countries lack data on the additional explanatory variables used to estimate the **residual** measure of GDP per capita performance. In the 1990s, there are one (Myanmar) and 44 such countries.

Table A3: Regression results

Dependent variable	Change in infant mortality, deaths per year			
Period	1980s	1980s	1990s	1990s
Intercept	-1.048	-7.695	-0.416	-1.634
	(-3.69)	(-2.29)	(-2.37)	(-0.68)
initial value	-0.008	-0.013	-0.012	-0.018
	(-2.81)	(-2.83)	(-5.40)	(-6.09)
Min. distance from US, EU and Japan	-	0.738	-	0.112
		(1.83)		(0.39)
Landlocked	-	0.522	-	-0.137
		(1.13)		(-0.44)
% of land in tropics	-	0.719	-	0.433
		(1.65)		(1.47)
Change in terms of trade	-	-0.002	-	-0.003
		(-0.63)		(-1.29)
Prevalence of HIV/AIDS	-			0.082
				(5.26)
R2	0.064	0.162	0.198	0.542
N	117	74	120	66
Dependent variable	Change in real GDP per capita (log units per year, x100)			
Period	1980s	1980s	1990s	1990s
	1	2	3	4
Intercept	0.858	9.440	-2.037	-3.763
	(0.52)	(1.67)	(-1.42)	(-0.57)
initial value (log units, US$)	-0.051	-0.454	0.470	0.686
	(-0.22)	(-1.60)	(2.25)	(2.37)
Min. distance from US, EU and Japan	-	-0.581	-	0.196
		(-0.93)		(0.27)
Landlocked	-	-0.564	-	0.919
		(-0.75)		(1.14)
% of land in tropics	-	-1.765	-	-1.519
		(-2.60)		(-2.00)
Change in terms of trade	-	-0.004	-	-0.015
		(-0.78)		(-2.10)
Prevalence of HIV/AIDS	-	-	-	-0.081
				(-2.04)
R2	0.000	0.165	0.044	0.284
N	100	72	111	66

Notes: T-statistics are shown in parentheses.

Table A4 Poor performers by decade and measure, according to the relative or conditional criteria

	Reductions in infant mortality, 1980-90	*Reductions in infant mortality, 1990-2000*	*Economic growth, 1980-90*	*Economic growth, 1990-2000*
1	Afghanistan	Afghanistan	Congo, DR	**Angola**
2	Burundi	Angola	**Cote d'Ivoire**	**Burundi**
3	Chad	Barbados	Ethiopia	Cameroon
4	China	Botswana	**Guyana**	**Comoros**
5	Grenada	Burkina Faso	**Iraq**	**Congo, DR**
6	**Liberia**	Central Afr. Rep	**Kiribati**	**Congo, Rep.**
7	**Micronesia**	**Cote d'Ivoire**	**Liberia**	**Djibouti**
8	**Mozambique**	Djibouti	**Libya**	Guinea-Bissau
9	**Niger**	**Iraq**	Madagascar	**Haiti**
10	**North Korea**	**Kenya**	**Nicaragua**	Niger
11	**Papua New Gn.**	Namibia	**Niger**	Mongolia
12	**Rwanda**	Nigeria	Peru	**Rwanda**
13	Seychelles	**North Korea**	**Saudi Arabia**	Saudi Arabia
14	**Sierra Leone**	Rwanda	Zambia	**Sierra Leone**
15	**Somalia**	South Africa		**Zambia**
16	**Tanzania**	St Vin. & Gren.		
17	**Zambia**	**Swaziland**		
18		**Zambia**		
19		Zimbabwe		

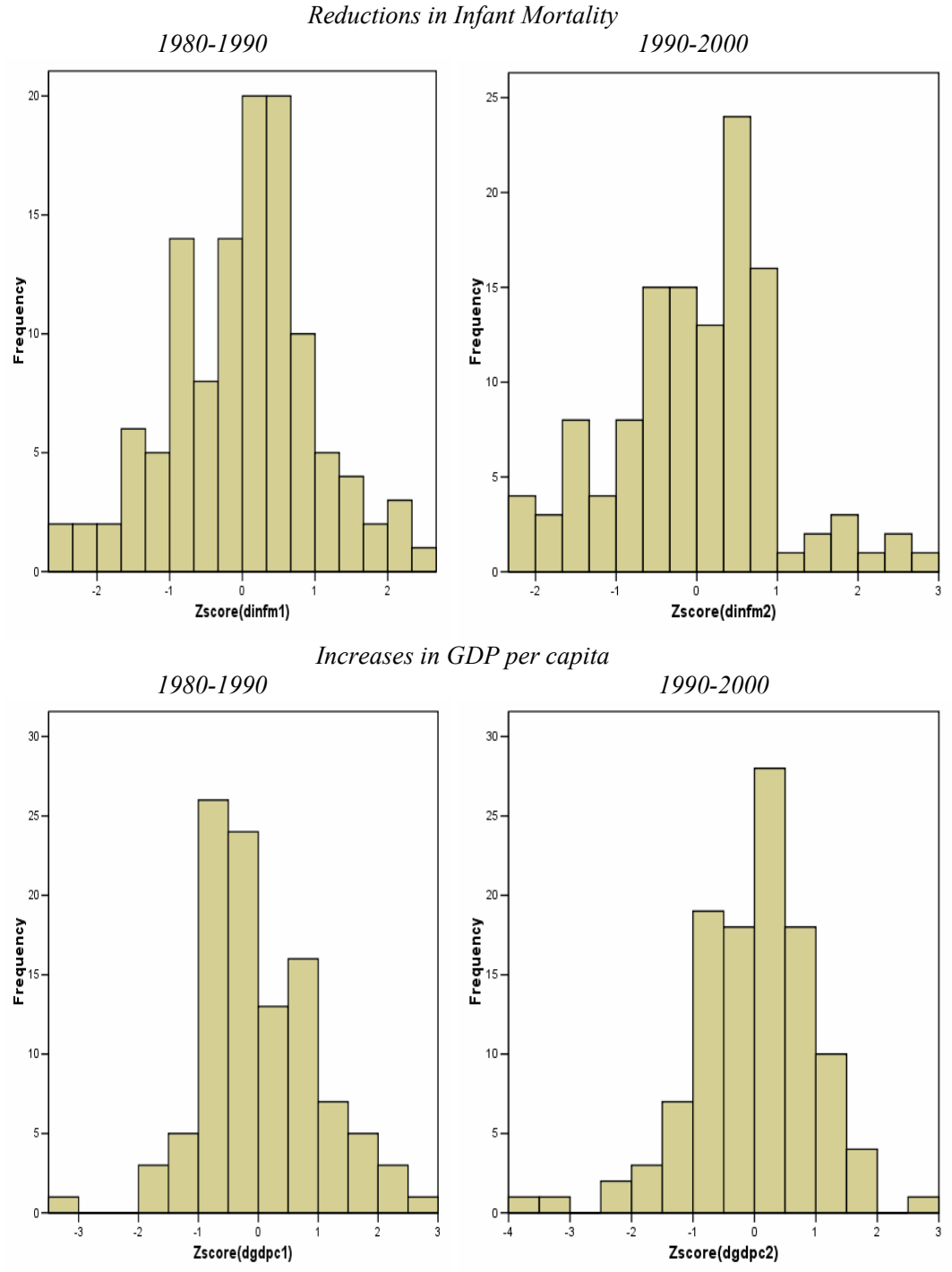
Notes: Countries highlighted in bold performed poorly according to all four criteria (absolute, relative, conditional and residual) which could be calculated given data availability. Countries are listed in alphabetical order, as opposed to any ranking of poor performance.

Table A5 Good performers by decade and measure, according to the relative or conditional criteria

	Reductions in infant mortality, 1980-90	*Reductions in infant mortality, 1990-2000*	*Economic growth, 1980-90*	*Economic growth, 1990-2000*
1	**Algeria**	**Bangladesh**	**Bhutan**	Bhutan
2	Bangladesh	**Cape Verde**	**Botswana**	Chile
3	**Bolivia**	Comoros	**Cape Verde**	**China**
4	**Cameroon**	**Egypt**	**China**	**Equ. Guinea**
5	**Comoros**	**Ethiopia**	**Grenada**	**Guyana**
6	**Egypt**	**Fiji**	**India**	India
7	**El Salvador**	**Gambia**	**Indonesia**	**Lao PDR**
8	Gabon	Guinea	Malaysia	**Lebanon**
9	**Gambia**	**Haiti**	**Mauritius**	**Malaysia**
10	**Iran**	**Iran**	**Oman**	Mauritius
11	**Iraq**	**Liberia**	Pakistan	**Maldives**
12	**Malawi**	Malawi	**South Korea**	Mozambique
13	**Maldives**	**Maldives**	**St Kitts & Nev**	**Myanmar**
14	**Mali**	Nepal	**St Lucia**	**Sri Lanka**
15	Morocco	**Niger**	**St Vin & Gren.**	South Korea
16	Nicaragua	Pakistan	**Swaziland**	St Kitts & Nev
17	**Saudi Arabia**	**Papua New Gn.**	**Thailand**	**Sudan**
18	**Senegal**	**Peru**		Uganda
19	Tunisia	Sierra Leone		**Viet Nam**
20		**Somalia**		
21		**W.Bank & Gaza**		
22		**Yemen**		

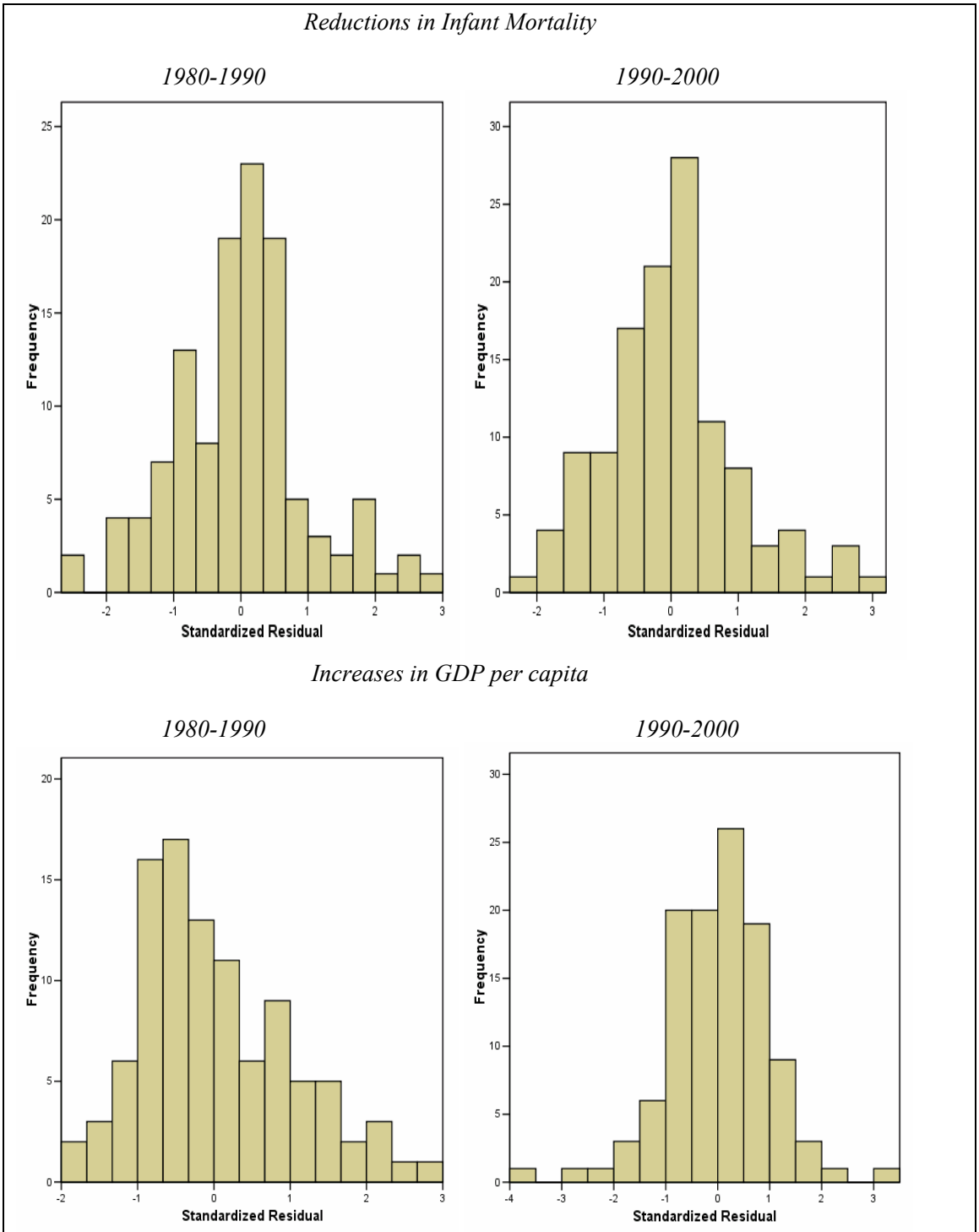
Notes: As Table A4. Countries highlighted in bold performed well according to all four criteria (absolute, relative, conditional and residual) which could be calculated given data availability. Countries are listed in alphabetical order, as opposed to any ranking ofgood performance.

Figure A1: The frequency distribution of the 'relative' measure of performance



Notes: The horizontal axis of each graph shows the mid-point of the range of values in each bar. We omit the following outliers from these distributions: two very large reductions in infant mortality (-8.8 per year in the 1980s in Cambodia, and -5.7 in the 1990s in Liberia), and one very large increase in GDP per capita (15.7% in Equatorial Guinea in the 1990s). These were also omitted from the performance calculations.

Figure A2: The frequency distribution of the 'conditional' measure of performance



Notes: The horizontal axis of each graph shows the mid-point of the range of values in each bar. We omit the following outliers from these distributions: two very large reductions in infant mortality (-8.8 per year in the 1980s in Cambodia, and -5.7 in the 1990s in Liberia), and one very large increase in GDP per capita (15.7% in Equatorial Guinea in the 1990s).