

CHAPTER 5

FACTORS INFLUENCING GROWTH: AN INTERNATIONAL PERSPECTIVE

While economists may not trust politicians, it would seem that politicians have not trusted economists either – and perhaps with at least as good a reason.

Boltho and Holtham (1992: 12)

5.1 INTRODUCTION

The last two decades have seen increasing research on the reasons why some countries are more successful than others in raising the living standards of their citizens. Old growth theories based on infant industry and tariff protection have been replaced by new growth theories, which favour open economies and export-led growth. The research, which was responsible for these changes, was facilitated by the increasing availability of country data on income levels at constant prices, particularly the data sets compiled by Summers and Heston (1988). The data enabled the empirical analyses to indicate the factors that seem to favour rapid and sustained economic growth.

Growth literature (Barro and Lee 1994:18; Maddison 1982:97-125; Kuznets 1973:247) indicates that certain factors may be more important to growth at different stages of the growth process than others. To capture this effect researchers analyse a cross-section of data over a time span or successive time spans (ie panel data analysis) to see how the growth process develops over time. To establish which approach could be used for a single country, Truu (1999: 1) consulted with Barro as follows:

I hope that you don't mind being approached by a complete stranger. To save time, I will come straight to the point.

... I am ... presently supervising a student who's writing a PhD dissertation on the nature and causes of economic growth in South Africa, over the approximate period 1960 to the present ...

Now, the question I'd like to ask you is this: Is it feasible and meaningful to test endogenous growth theory by a time-series analysis of only one country? Alternatively put, do the sources of economic growth in your above-mentioned publications (which are cross-country studies) also lend themselves to a one-country time-series study? (Such a one-country study would naturally be analysed against the background of available cross-country studies.) I'm confident that the necessary data for such a test exist (or can be proxied) in South Africa, and that we have the necessary econometric know-how for it.

Professor Barro (1999: 1) replied:

There is nothing wrong in principle with estimating growth equations for a single country. The problem in practice is that one tends to rapidly run out of degrees of freedom. The kind of medium- to long-term growth that I analyse does not pertain much to business fluctuation but rather to periods of, say, 5 to 10 years or more. So, if one used 5-year observations over 35 years one would have 7 observations on growth. This means that one could not possibly estimate the effects of more than 6 policy/institutional variables with the one-country data. More realistically, the number of independent effects that could be isolated would be much less than six. This is why my own emphasis has been on large samples of countries, supplemented as far as possible by long time series for the countries.

It would therefore seem that replicating the Barro-type analysis for a single country would be too restrictive to be useful, and in this study, time-series econometric techniques are used.

What complicates growth analysis is that characteristics not included in the information set, say, oil reserves, gold reserves, navigable rivers or trade routes, and most importantly government policies, could also have influenced growth.

King and Levine (1994:286) express the hope that “research into economic, institutional, and legal determinants underlying innovation, human capital accumulation, and physical capital investment will improve our ability to design policies that promote sustained economic growth”.

Manuelli (1994:299) addresses the core issue by inferring that “the best candidates for variables that can account for cross-country differences in income levels and the rate of growth are government policies (broadly understood to include taxation, spending and *regulatory policies*) as well as institutions”. He is of the opinion that the data on government policies are as yet not enough or suitable to conduct proper analyses on their effect on growth. Manuelli (1994:299) concludes: “...much more work is needed before we can have available true measures of government policies. The payoff is likely to be very high”.

The purpose of this chapter is to identify growth-inducing or growth-detracting factors tested in international cross-sectional studies in order to use them in a time-series context in the next chapter to determine whether these factors have had a meaningful causal link to growth in South Africa in the past four decades or more. Of importance here is whether this could indicate the causes of the poor growth performance in the last decade and provide alternatives to revitalise the growth process – that is, to suggest a set of policy measures to put South Africa in a position to achieve higher growth rates in the future.

5.2 LITERATURE REVIEW

Robert Solow (1991:393) refers to what he wrote in 1982 namely that “anyone working inside economic theory these days knows in his or her bones that growth theory is now an unpromising pond for enterprising theorists to fish in”. Fortunately, in the same article he added: “I do not mean to say confidently that this state of affairs will last ... as a good idea can transform any subject”. This did in fact happen when Romer published his now famous paper in 1986. This endogenous growth theory revived interest in economic growth and a large number of research reports in the last two decades have focused on some or several of the research fields identified above.

This revival came about largely through research done by Lucas (1988:33) and Romer (1994:16) who showed that there are good theoretical reasons for believing that countries can maintain different rates of economic growth. This is contrary to the convergence theory propounded by Tinbergen (1961:333, 338). The long-term consequences of economic policies could therefore have a profound influence on economic growth and the well-being of people if the theories of Lucas and Romer are empirically valid.

Barro and Lee (1994:11) tested a number of determinants of economic growth empirically using a sample of 95 countries which included a range of economies from developing to fully developed countries. They studied growth rates over the two decades 1965 to 1975 and 1975 to 1985, thus including a limited amount of time-series variation. They regressed the real per capita growth rate on a set of variables that they classified broadly into two groups, namely levels of state variables and control or environmental variables.

5.2.1 Levels of state variables

Barro and Lee (1994:11) defined state variables as

- the stock of physical capital; and
- the stock of human capital in the forms of educational attainment and health.

5.2.2 Control or environmental variables

This type of variable is conventionally controlled or determined by governments, but some of them can also fall within the influence of private agents. The following are examples of these variables used by Barro and Lee (1994:11):

- the ratio of government consumption to GDP (without expenditure on education and defence);
- the ratio of domestic investment to GDP;
- the fertility rate;
- the black market premium on foreign exchange;
- changes in the terms of trade;
- measures of political instability;
- the extent of political instability;

- the extent of political freedom and civil liberties;
- tariff rates.

The authors theorised that some degree of endogeneity can be accommodated in the variables by using lagged dependent values as instruments.

A number of the variables listed above and others collated by Sala-i-Martin (1997:21) are more suitable for cross-sectional analysis because they are measured irregularly (e.g. the black market premium on foreign exchange); others change slowly over time and are not easily influenced by policy changes (e.g. the fertility rate); while another group is related to the physical characteristics of the country (e.g. the percentage of GDP in mining). The following section will identify a group of variables that change sufficiently over time and are usually measured on a regular basis.

Quah (1996a:1048-1050; 1996b:1370-1373) developed alternative research methods to standard cross-country regression frameworks. He contended that using cross-sectional averages over long periods of time may mislead, and proposed analysing the evolution of the entire distribution, which reveals different kinds of convergence, which he terms convergence clubs. This could shed some light on the observations that the rich become richer, the poor poorer and that in some cases the middle class vanishes. Quah (1996b:1355) contends that standard models "generate empirics that are ill-suited for comparisons with dynamics of a rich cross-section of data." Other researchers, such as Bernhard and Durlauf (1996:172), pointed out that "cross-section tests place weaker restrictions on the growth dynamics between countries compared with similar time-series tests". Arestis and Demetriades (1996:3, 4, 14) suggested that time-series regression for individual countries may be more appropriate to assess the effects of various variables on growth and productivity. As indicated earlier, cross-country regressions typically involve averaging out variables over relatively long periods of time. This procedure complicates the interpretation of variations in results of cross-country studies. It is also difficult to address the question of causality in cross-section frameworks. The time-series approach allows the investigator not only to analyse the possibility of bidirectional causality but also to account for differences in the

institutional framework and policy regimes. The variables in such a framework may have a crucial effect on growth.

A range of variables is now discussed in greater depth. The list is compiled from the literature. Most of the variables are used in the empirical analysis in this study as defined in this section; others are supplemented or adjusted, mainly where the same data is not available for South Africa.

5.2.3 Government expenditure as a percentage of GDP

The relationship between government expenditure and economic growth is somewhat precarious. Thomas Hobbes (1950:65: first published 1651) described life "during the time men live without a common Power to keep them all in awe" (government) as "solitary, poor, nasty, brutish, and short". This alludes to the role of government in the protection of individuals and their property and the operation of a court system to resolve disputes. These functions include secure property rights, enforcement of contracts and a stable monetary regime, which provide the foundation for the smooth operation of a market economy. Government enhances growth through efficient provision of this infrastructure. In addition, it provides "public goods" that markets find troublesome to provide because their nature makes it difficult (or costly) to establish a close link between payment for and receipt of such goods. Romer (1990b:S74) describes these as nonrival and nonexcludable goods. Roads and national defence fall into this category. Government provision of such goods may also promote economic growth.

There are, however, also adverse effects of government interventions on economic growth, which fall mainly into three categories.

Firstly, the higher taxes and/or additional borrowing required to finance government expenditures have a negative effect on the economy. Borrowing, like taxes, will crowd out private investment and will also lead to higher future taxes. The productivity of government expenditure is usually lower than that of the private sector and even if it was not, the disincentive effects of taxation and borrowing would have a negative impact on economic growth.

Secondly, as government grows relative to the market sector, diminishing returns will result. In the provision of collective goods such as infrastructure and education, the government could improve performance and promote growth, even though the private sector has demonstrated its ability to effectively provide these things. However, when the government becomes involved in the provision of private goods like food, housing, medical service and childcare they cannot provide such goods more efficiently than the market sector. When government do, the result usually is negative returns, and ultimately lower economic growth.

Thirdly, adjustment to change is much slower in the public sector. Competition in the private sector rewards alertness, but also imposes swift and sure punishment on those who make bad decisions. Adjustment to change is much slower in the public sector because the incentives and punishment are less certain, which, since it relates to economic growth, is a major shortcoming.

Private sector entrepreneurs discover new and improved technologies, better methods of production and opportunities which were previously overlooked. They are able to combine resources into goods and services that are more highly valued, which is a central element of wealth creation and growth.

A small government per se is not an asset. When a small government fails to focus on and efficiently provide core functions such as protection of persons and property, a legal system that helps with the enforcement of contracts, and a stable monetary regime, economic growth is more likely to suffer. Unless these core functions are in place and properly enforced, the empirical relationship between the size of government and economic growth is likely to be a loose one.

Gwartney, Lawson and Holcombe (1998:4) studied government expenditures as a share of GDP and showed that in 1960, the government expenditures of a group of OECD countries averaged 27 per cent of GDP, and by 1996, the share had grown to 48 per cent of GDP. They looked at a scatter graph with size of government at the beginning of the period on one axis, and the growth of real GDP during the decade measured on the other. They reported that the relationship is clearly negative and the regression line suggests that a 10 percentage point increase in government expenditure as a share of GDP leads to

an approximately one cent reduction in economic growth (Gwartney, *et al.* 1998:8).

5.2.4 Government spending (less defence and education)

Barro and Lee (1994:19) intended this variable to provide an indication of the effect of government spending that does not improve productivity, and refer to it as *government consumption*. They estimated the coefficient of the ratio of government consumption to GDP as -0.17 (standard error [s.e.] = 0.026), which is significantly negative. The mean of G/Y was 0.1 (standard deviation =0.06) in 1965-1975 and 0.11 (standard deviation [s.d.] = 0.06) in 1975-1985. Thus one standard deviation increase in G/Y is associated with a fall in the growth rate of one percentage point per year. The authors state that the estimated effect on growth is so strong because the G/Y variable may to some extent be a proxy for political corruption, as well as for the direct effects of non-productive public expenditure and taxation.

Sala-i-Martin (1997:17, no. 27) tested the statistical significance of a range of variables on growth running four million regressions. He also used public consumption of government less spending on education and defence (no. 27 of his list of variables) as the dependent variable and called it "public consumption share". He identified the variable from work done by Barro (1997:26). The variable was ranked 27th on Sala-i-Martin's table of main results and fell just outside the 10 per cent level of significance, but showed a beta coefficient of -0.022, indicating a negative effect on growth.

In a subsequent study, Barro (1997:13, 26) used a panel of 100 countries with the dependent variable being the growth in per capita GDP for three periods 1965-1975, 1975-1985 and 1985-1990. One of the independent variables was again the ratio of government consumption (also measured without spending on education and defence) to GDP. The regression coefficient for this variable was -0.136 (s.e. = 0.026). He concluded that a greater volume of nonproductive government spending – and the associated taxation to finance it – reduces the growth rate for a given starting value of GDP. He concluded that, in this sense, large governments are bad for growth.

Government expenditure as a percentage of GDP in South Africa did not exceed 16 per cent in the period up to 1972, after which it increased sharply to 21 per cent in 1973, and in the subsequent 24 years, dropped only twice to below 20 per cent. In five of the post-1973 years, it exceeded 25 per cent. A strong negative correlation of -0.6 was measured between growth and government consumption as a percentage of GDP for the period 1960 to 2002.

Gwartney, *et al.* (1998:3) found that the five fastest-growing economies in the world from 1980 to 1995 had total government expenditures as a percentage of GDP averaging 20.1 per cent, which is less than half the average of OECD countries. The levels in South Africa are therefore considerably below those of developed countries, but currently somewhat more than the ideal 20 per cent rate of the fast growers.

5.2.5 The investment to GDP ratio

Economists used to work with the incremental capital output ratio (ICOR), which was the ratio of "required" investment to desired growth and deemed it to be somewhere between two and five. According to Lewis (1959:225-226), "the central problem in the theory of economic growth is to understand the process by which a community is converted from being a 5 per cent to a 12 per cent saver – with all the changes in attitude, in institutions and techniques which accompany this conversion." This ratio of 12 per cent of GDP was arrived at by setting a target per capita growth rate of 2 per cent per annum, assuming an annual 2 per cent population growth rate and a capital-output ratio of 3 – thus $2 \times 2 \times 3 = 12$. A country that wanted to develop had therefore to increase its investment rate from a 2 to 4 per cent ratio of GDP to 12-15 per cent of GDP (Myint 1980:78). Easterly (1997:6) called this approach to development "a race between machines and motherhood". This Harrod-Domar type model of economic development has been discredited because, according to Easterly (1997:35), it "makes no sense theoretically and fails empirically".

Barro and Lee (1994:18) investigated the influence of the ratio of real gross domestic investment to real GDP on economic growth and found a significantly positive coefficient of 0.12 (s.e. = 0.020). The size of the coefficient means that a rise in the investment ratio of 10 percentage points will lead to an increase of

the economic growth rate of 1.2 per cent per year (less than half the Harrod-Domar prediction). They also used lagged values of the I/Y ratio to lessen the tendency to overestimate the convergence effect because of measurement error in GDP and also to see whether lagged values will reduce the original coefficient (Barro and Lee 1994:20). If it does, they surmise it would be an indication of reverse causation from growth to investment opportunities and hence an overestimation of the growth effect of the investment ratio. According to them, the use of the lagged variables would obviate this problem. They found that the use of the lagged variable reduced their coefficient of I/Y from 1.2 (s.e. = 0.020) to 0.077 (s.e. = 0.027), indicating an overstatement of the effect of the investment ratio on economic growth because of reverse causation. They subsequently used the lagged variable to reduce the overestimation.

Kaldor (1961:259) deduced that "capital accumulation is a feature of economic growth, not a fundamental cause: ... neither the proportion of income saved nor the rate of growth of productivity per man (nor, of course, the rate of increase in population) are independent variables with respect to the rate of increase in production".

Pack and Page (1994:219), however, investigated the growth effects of foreign direct investment and found that it permits local production to take place along the world's best-practice production function by substituting foreign physical and human capital for the absent local factors. They base their argument on the fact that foreign investors prefer to locate production in less developed countries with rapid export growth which is a sign of good macroeconomic management. These policies usually minimise the risk from inflation, exchange rate volatility, and changes in the regulatory regime. They regard Singapore as an example of a country that achieved success using this strategy.

Grossman and Helpman (1991:205-206, 330-338; 341-347) find that foreign direct investment generates significant externalities. These externalities come into effect as and when domestic firms who are in competition with these foreign firms become aware of new technologies and practices; workers move from the foreign firm to other local firms, or establish their own businesses, thus disseminating knowledge that was originally proprietary. Such real externality is indirectly attributable to export growth from the high technology country, which

provides the signal upon which multinational firms base their initial investment decision.

Levine and Renelt (1992:959) found the share of capital investment in GDP as the only truly robust variable with growth, according to the criterion they designed for robustness, namely that the variable should keep its sign and remain statistically significant irrespective of which other variables are included in the regressions.

Sala-i-Martin (1997:1) regarded the extreme bounds method of identifying "robust" empirical relations by Levine and Renelt (1992:942) as too narrow. Sala-i-Martin (1997:2-3) suggested an approach that analyses the entire distribution in sets of eight variables, which include a set of four fixed variables, the variable (z) to be tested and a vector of up to three variables from a pool of chosen variables. His aim was to widen the scope of robust variables and thus empirical growth analysis. In this method, Sala-i-Martin (1997:20) added a substantial number of variables that are strongly related to growth. Two of these variables are investment variables, namely equipment investment and non-equipment investment. These variables are presented in the following two sections, to investigate investment as a source of growth in more detail.

5.2.6 Machinery and equipment investment

The contribution of machinery equipment investment to economic growth goes as far back as the Industrial Revolution and the two machines associated with it, namely the steam engine and the cotton-spinning jenny. The historical contribution of machinery to economic growth since then has been documented in detail in more recent study by Landes (1969:40) who proclaimed that "the machine is at the heart of the new economic civilization"; and Mokyr (1990:vi) who saw the role of technology embodied in machinery in Western economies as "the lever to its riches".

However, growth accountants like Denison (1967:192) ascribed a diminished share of growth to have originated from nonresidential structures and equipment accumulation in the USA, and North-West Europe between 1950-55 and 1955-62. From Denison's study, no decisive trend is noticeable for the

individual countries that could lead to the conclusion that growth in nonresidential structures and equipment contributed to productivity growth. In the case of Belgium, Denmark and France, increased investment in nonresidential structures and equipment contributed to growth in productivity, but in Germany, the Netherlands, the UK and Italy, more equipment yielded lower productivity growth. Norway in fact recorded higher productivity growth with lower equipment investment.

Jorgensen (1988; 1990) disaggregated capital to equipment investment level and found a remarkable complementarity between this part of capital accumulation and total factor productivity – his growth measure (De Long and Summers 1991:480). The latter authors (1991:484) also showed that the high cost of equipment investment in India, for example, diminished its beneficial effects on growth. They recommended that equipment should be applied to the most productive uses by being market conforming, and not market replacing, to realise the desirable extremely high social rates of return. They contended that this distinction explains the superior performance of the activist governments in East Asia over the industrial policies of South America (except Brazil) and Africa, since the former nations correctly supported industrialisation, while the less successful nations supported industrialists instead (De Long and Summers 1991:486). Nations that invested heavily in equipment relative to other nations at the same stage of economic development enjoyed rapid growth over the period 1960 to 1985 (De Long and Summers 1991:485).

They tested the hypothesis that the quantity of equipment is a proxy for some other well-known determinant of growth omitted from their list of independent variables. They tested for the effects of

- the share of manufacturing in value added
- the importance of public investment
- the real exchange rate in 1980
- the continent.

The only case in which the inclusion of an additional variable has a material impact on the coefficient of equipment investment is that in which continent dummies are added to the regression using the high productivity sample (De Long and Summers 1991:461). One might feel inclined to think that since better

performance in terms of economic growth comes from South-East Asia and worse from South America, that the higher growth of South-East Asia has something to do with Asian and/or Latin American culture or religion. They disprove this hypothesis by indicating that the high performance Asian economies (HPAEs) - Hong Kong, Korea and Japan - have low equipment prices and large equipment quantities with high economic growth, while neighbouring Sri Lanka and the Philippines have high equipment prices, low quantities and low growth. It would appear as if low import tariffs on equipment might be a growth stimulant. De Long and Summers (1991:467,473) found a strong negative association between high equipment prices and growth. They regarded the association of growth with high quantities and low prices of equipment as strong evidence that equipment investment drives growth. They made a strong case for a growth strategy based on equipment investment with the *proviso* that it must be market conforming, not market replacing, to realise the extremely high social rates of return on equipment investment. They stressed the fact that policies must be designed to increase the quantity of equipment investment by encouraging purchasers rather than raising return on capital.

De Long and Summers (1991:449) made a distinction between equipment and non-equipment investment. They found that there was little explanatory evidence in the transportation component of durables and focused on the equipment part, which included electrical and non-electrical machinery. On the basis of this, Sala-i-Martin (1997:20) separated investment into these two parts and found that both made positive contributions to growth, but that the coefficient for the equipment part at 0.218 was significantly larger than non-equipment investment at 0.056. It therefore seems important to investigate the equipment part of investment separately for South Africa.

5.2.7 Investment in transport and communication

The Easterly and Rebelo's (1993:36-48) data set included a variable that refers to the average public investment in transport and communication for each of the three decades they investigate (1993:43-45). They expressed most of their investment series as percentages of GDP.

Investment in public capital projects was identified by Sala-i-Martin (1997:15) from work done by Barro and Lee (1993:19). He warned that public investment is less efficient than private investment to the extent that a growing fraction of public investment is bad. Frankel (1997:3) identified investment in infrastructural projects like telecommunications and electric power as possible growth stimuli.

Easterly and Levine (1997:1211) reported that low-quality infrastructure can hinder growth by depressing the marginal product of private investment. They refer to an exhaustive study by Aschauer (1989:191-198), in which he found that infrastructure (highways, streets, water systems and sewers) had large positive effects on US productivity growth. Similar findings were reported by Easterly and Rebelo (1993:13) who used consolidated public sector investment in transport and communications expressed as percentages of GDP in a cross-country study. They concluded that this type of investment is uncorrelated with private investment and increase growth by lifting the social return of private investment but not by raising private investment. Canning (1998:27) used cross-country data on telephone stocks and telephone mainlines per capita and found a strong link between the latter variable and growth. The World Bank (1994:14) concludes that a "strong association exists between the availability of certain infrastructure – telecommunications (in particular), power, paved roads, and access to safe water and per capita GDP". The World Development Report (World Bank 1994:17, table 1.2) shows that the average rates of financial return on World Bank supported projects from 1983 to 1992, varied between the 6 per cent of water projects and 29 per cent in the case of highways.

5.2.8 The ratio of value added in agriculture to total GDP

Sachs and Warner (1995:5) reported the linkages approach formalised by Matsuyama (1992:318-319) who examines the role of agriculture in economic development in a model in which manufacturing expands through a process of learning-by-doing technological change. There are two sectors in this model, namely agriculture and manufacturing. Forces that push the economy away from manufacturing towards agriculture lower the growth rate, by reducing the learning-by-doing effect, which, according to Matsuyama (1992:328), is proportional to the sector but external to the firm. The adverse effects of

agriculture growth are of the result of the agriculture sector employing production factors that would otherwise be used in manufacturing. The latter sector has superior learning-by-doing properties resulting in higher, or in this case, lower overall growth.

5.2.9 Crime

Brown (1998:18) contended that crime in South Africa has more causes than the pure economic theory of crime suggests, namely the influence of law enforcement. Brown showed that the most significant determinants of crime in South Africa appear to be the socioeconomic variables of population density, low income, unemployment and the extent of industrialisation, but law enforcement variables are not insignificant and the probability of prosecution is far more significant than the expected punishment. Brown stated that the positive correlation between the level of educational attainment and the crime rate cannot be explained without challenging the assumption that the skills acquired are more suited to legitimate activities.

5.2.10 The ratio of value added in mining to total GDP

Sala-i-Martin (1997:17) tested the robustness of the variable, which he identified from work done by Hall and Jones (1996:9), who used the variable to eliminate the effect on growth of oil-rich countries. The variable was ranked 11th on Sala-i-Martin's table of main results and signified that the variable will be an insignificant contributor to growth in only one per cent of the cases. Most researchers accept the contribution to growth of mining and resource abundance, but also stress the numbing effect it has on the rest of the economy, because it focuses attention almost entirely on the resource and diverts the resolve (talents, entrepreneurship) of inhabitants to acquire the human capital and know-how to pursue the more lasting sources of economic growth such as productivity and technology.

5.2.11 The ratio of value added in manufacturing to total GDP

Sachs and Warner (1995:43) put forward the ratio of value added in manufacturing to total value added (MSGDP) as a source of growth. They made

a case for the effect of the reduction in growth in the manufacturing sector as a result of a windfall either through an increase in the price of a natural resource of a country or the discovery of a new natural resource, which then retards growth in the manufacturing sector as a result of the onset of the Dutch disease.

The Dutch disease model assumes a three-sector economy, consisting of a tradable natural resource sector, a tradable (nonresource) manufacturing sector and a nontraded sector, which includes inter alia railways, pipelines or communications facilities. A substantial resource endowment leads to an increased demand for nontradable goods and as a result there will be a smaller pool of labour and capital for the manufacturing sector. The greater the natural resource endowment, the higher the demand for nontradable goods is, and consequently, the smaller the pool of labour and capital available for the manufacturing sector will be. Therefore, when natural resources are abundant, tradables production is concentrated in natural resources rather than manufacturing, and capital and labour that might otherwise be employed in manufacturing are pulled into the nontraded goods sector. As a corollary, when an economy experiences a resource boom (either a terms-of-trade improvement or a resource discovery), the manufacturing sector tends to shrink and the nontraded goods sector tends to expand.

The decline of the manufacturing sector is dubbed the "disease", although there is nothing harmful about the decline in manufacturing if neoclassical, competitive conditions prevail in the economy. The Dutch disease can be a real disease, however – and a source of chronic slow growth – if there is something special about the sources of growth in manufacturing, such as the "backward and forward linkages" stressed by Hirschman (1964:100), or the learning-by-doing stressed by Matsuyama (1992:328). If manufacturing is characterised by externalities in production, then the shrinkage of the manufacturing sector leads to technology resource abundance, which can lead to a socially inefficient decline in growth.

5.2.12 Growth in the manufacturing sector as a source of growth

Kaldor (1978:101) asserted that "fast rates of economic growth are associated with the fast rate of growth of the 'secondary' sector of the economy – mainly the manufacturing sector". He (1978:103) provided evidence of this by means of regression analyses between economic growth and manufacturing growth of 12 industrialised countries for the period 1953 to 1954 and 1963 to 1964. He stated that the R^2 was 0.96 between the growth rates of GDP and that of the manufacturing sector, and emphasised that the regressions reveal more than the large contribution of the manufacturing sector to these economies (25 to 40 per cent). He asserted that "the positive constant (1.153) in the equation and the (0.614) regression coefficient which is significantly less than unity" means that "rates of growth above 3 per cent a year are found only in cases where the rate of growth in manufacturing output is in excess of the overall rate of growth of the economy".

Choi (1983:151) refers to similar findings by Cripps and Tarling (1973:22), the United Nations (1970:78) and Stoneman (1979:311).

The significance of these figures is confirmed by investigating the opposite relationship between the growth of GDP and the growth of output in a number of other branches of production. The relationship between the growth in services and the GDP renders a coefficient which is larger than unity (1.06) and a negative constant (-0.188), which, according to Choi (1983:152), suggests that it is the rate of growth of GDP that determines the rate of growth of the service sector.

A similar exercise in which time-series data from the UK over the period 1800 to 1969 was used, confirms the relationship between industrial growth and productivity growth. The results lead to the conclusion that there is strong support for the relationship between the growth of GDP and the growth of manufacturing production, and that in no other branch of production does the growth of output exhibit such a close correlation to the growth of GDP; where it does, the causal relationship seems to be that GDP influences the growth in the other sector (Choi 1983:152).

Kaldor provided three explanations for the high correlation between productivity in manufacturing activities, compared with the rest of the economy. Firstly, he asserted that the higher level of productivity of the manufacturing sector was the reason for its influence on overall growth. He then hypothesised that since the incidence of technological progress, and thus productivity, is higher in manufacturing than in the rest of the economy, it follows that with the large employment complement in this sector, it lifts the average productivity. Secondly, he observed that technological progress is higher in the manufacturing sector and the higher employment numbers in this sector bring about a higher growth of productivity for the whole economy. He rejected these explanations and concluded that the third possible explanation was the most plausible. This explanation suggests a strong association between the growth rate of manufacturing output and the rate of overall productivity growth stemming from economies of scale or increasing returns. Kaldor (1967:15) emphasised a dynamic relationship between productivity change involving both technical progress and economies of large-scale production and not a static relationship in which the level of productivity is derived from the levels of output and associated inputs (Choi 1983:152).

5.2.13 Public expenditure on education as a percentage of GDP

Barro and Lee (1994:14) were of the opinion that the best currently available data to assess the quality of schooling are pupil teacher ratios and public spending on education. Barro and Lee (1997:26) confirmed the notion in this later study by defining the variable on public spending as less defence and education and described it as a variable to measure nonproductive public spending. By implication, public spending on education should therefore have a positive effect on growth.

5.2.14 Primary school attainment

Sachs and Warner (1995:44) used the primary school enrolment rate as a growth factor (Pri70), which they defined in line with Barro and Lee (1994:14), who assembled data on educational attainment. These data were sourced from census and/or survey information on schooling of the adult population (aged 25 and above) by gender and level. The data distinguished seven levels, namely no

schooling, incomplete and complete primary, incomplete and complete secondary, and incomplete and complete higher (Barro and Lee 1994:13). The latter authors found that the data set that does not distinguish between complete and incomplete education at each level, was more plentiful, and therefore used it.

Federke (2001:7-12) defined a range of variables measuring investment in human capital at the secondary and primary schooling as well as tertiary educational levels in South Africa. The intention of this group of variables is to control for both the quantity and the quality of human capital investment.

The variables used to indicate levels of investment in primary and secondary human capital are:

- the school enrolment rate, for the “white” racial group in South Africa. This variable and others to follow were all expressed as the enrolment rate of the relevant age cohort, obtained from census data. For whites, the age cohort is the 5-19 age group, as the schooling pupil statistics covers both primary and secondary schooling. This variable is likely to result in underestimation, since a substantial part of white pupils are likely to complete schooling by the age of 18.
- the school enrolment rate, for the blacks were calculated using the 5-24 age cohort, as a significant proportion of pupils in the black schooling system are likely to complete schooling into their mid-20’s.
- the total school enrolment rate, for all racial groups is taken as the ratio of pupils enrolled in primary and secondary schooling as a proportion of the total age cohort eligible for schooling.
- the proportion of pupils sitting for mathematics in their matriculation examination in white schooling.

Federke (2001: 13) regressed growth in total factor productivity on capital stock growth, as well as the abovementioned range of alternative indicators of human capital investment. He (2001:14) found the coefficient on the growth rate of the capital stock to be consistently negative and statistically significant (even where he controlled for investment in human as well as physical capital). The proportion of matriculation students taking mathematics, and the proportion of mathematical, natural and engineering sciences (NES) degrees in total degrees

are the only two human capital variables that provide a positive and significant contribution to productivity growth in South African manufacturing industry over the 1970-97 period. Kularatne (2001:22) using cointegration techniques, similarly found that human capital does have a positive, statistically significant effect on per capita growth in South Africa.

The total school enrolment rate, and the total number of degrees issued by South African universities while significant, contributed negatively to total factor productivity growth, while the white school enrolment rate, the total number of NES degrees, and the number of apprenticeship contracts per capita were insignificant.

5.2.15 Secondary school attainment

Sachs and Warner (1995:44) also used the secondary school enrolment rate as a growth factor (Sec70) and defined it in line with the Barro and Lee (1994:14) concept described in 5.2.14 above. The Sec70 variable (secondary school enrolment ratio in 1970) had a 5.3 coefficient (the t-ratio [2.73] was significant), which made it the largest positive contributor to growth of all the above-mentioned categories defined by them.

Federke (2001:8) gave two schooling enrolment rates to serve as the quality differential between the schooling provided for the racial groups in South Africa. He is of the opinion that simple incorporation of the aggregate school enrolment rate may not differentiate properly for the substantial quality differentials in South African schooling and could render the aggregate enrolment rate insignificant or perverse. The school enrolment rates are employed as proxies for the quantity of primary and secondary human capital investment. He also used the proportion of matriculation students studying mathematics, to indicate the quality of schooling. Fedderke, de Kadt and Luiz (2000) use the mathematics proportion in the matriculation year as a proxy for the quality of schooling. This study shows that the white schooling system provided the best available schooling in South Africa and that the mathematics quality indicator is a good indicator for the quality of schooling.

5.2.16 Higher education

Barro and Lee (1994:14) constructed a series on female and male secondary school attainment. A problematic finding of their study was the negative coefficient of female secondary education levels. They attributed it to the wide spread between male and female attainment, which, to a degree, manifests as a measure of backwardness (Barro and Lee 1994:18). No source variables are available in the South African data set to construct a time-series to be used with the time-series methods applied in chapter 6.

In terms of the tertiary human capital variables Federke (2001:11) used:

- the total number of degrees awarded by South African universities.
- the total number of degrees awarded by South African universities in the mathematical, natural and engineering sciences
- the ratio of mathematical, natural and engineering science degrees to the total degrees issued by the university system
- apprenticeship contracts issued per capita
- the total number of patents registered in South Africa, as a proxy for the quality of intellectual property rights
- an index of property rights in South Africa, as a second proxy for the quality of the property rights.

5.2.17 Openness to international trade and investment

There is a substantial and growing body of empirical literature investigating the relationship between openness and growth. A number of empirical studies on growth across countries find that the ratio of exports to GDP, or some other measure of openness, is a significant determinant of growth, and often that it is an important determinant of growth in East-Asian economies in particular.

Various definitions of openness are found in the literature. Sachs and Warner (1996:8) defined their variable as the fraction of years between 1965 and 1989 that the country was integrated with the global economy. The integration with the global economy was measured by the maintenance of relatively low tariffs and quotas and by not having an excessively high black market exchange rate premium.

Feder (1982:65) regressed growth rates for 31 semi-industrialised countries over the period 1964 to 1973 against three variables: investment as a share of income, the rate of growth of the labour force, and the rate of growth of exports. In this analysis the coefficient on the export variable was statistically highly significant. Agénor (2000:416) found that growth in the volume of exports and imports (used as the degree of openness) are positively correlated with growth.

Similarly, Edwards (1993:9-11) regressed the rate of growth of total factor productivity on two measures of openness – total trade as a percentage of GDP and total tariff revenue as a percentage of trade – along with some other variables, and found that “in every regression the proxies for trade distortions and openness are highly significant”. Summers and Heston (1991:362) measured openness as imports plus exports as a percentage of GDP.

Frankel (1997:17) set out the mechanism through which openness to trade and investment influences growth. He described the old exogenous foreign trade growth process as one that facilitated specialisation in the production of goods at which a country was good – the products in which it had a comparative advantage. This model raised the efficiency of the use of existing resources and this also raises the real level of per capita income. The growth rate was, however, unaffected.

The new growth theory with its endogeneity of technological change, in tandem with the new international trade theory which integrates the notion of imperfect competition, opens up the possibility of achieving perpetually higher growth rates, at least in theory. Openness to trade and foreign direct investment allows the transfer of technology, while world-class management practices are assimilated which, in turn, introduces innovation, cost-cutting and thus eliminates monopolies. These factors together can permanently raise the growth rate.

Coe, Helpman and Hoffmeister (1995:27) show that the transfer of technology can be accomplished through trade openness and concomitant knowledge spillovers from advanced to developing economies. The spillovers through

export flows are mostly achieved by the ability of developing countries to imitate high-technology products by reverse engineering (Coe, *et al.* 1995:8). Importing high technology components and incorporating them into local production can achieve the transfer of technology via the import route. In this way, higher value-added products can be manufactured in less developed countries. They also found that these spillovers are more successful in economies with better and more advanced education. Coe and Helpman (1995: 872, 874-876) found that the productivity levels of countries were positively affected by domestic as well as bilateral imported components embodying foreign research and development, that is, intermediate goods that embody technology.

Keller (1997:21) investigated 13 manufacturing industries in eight OECD countries for the period 1970 to 1991 using input-output matrices and found that R&D increases productivity and that foreign and local R&D is indeed transmitted within local and foreign firms. The highest productivity-increasing effect from R&D expenditures is derived from own-industry R&D and the returns vary between 7 and 17 per cent (Keller 1997:33). Benefits from foreign R&D expenditures in the same industry are lower for local industry and vary between 50 and 95 per cent of local R&D. A third R&D benefit is derived from businesses in other sectors (outside industry sectors), which contribute between 20 and 50 per cent of the benefits that can be obtained from own industry R&D.

Harrison and Revenga (1995:27-28) correlated trade policy reform and increased investment flows, and found a significant influence of more liberal trade on inward investment flows. They suggested, however, that other factors – such as the general macroeconomic environment and macro-conditionality imposed by international organisations – could have largely contributed to this result.

Foreign direct investment is an excellent vehicle for the transfer of technology because it transfers technology that is embodied in capital and machinery, as well as through new managerial practices and worker skills that are disseminated through the local economy by locals working in the foreign company. These locals subsequently move to local firms taking the acquired

skills and techniques to them. These advantages accrue over and above the inherent characteristics of the new products or processes.

Romer (1989:2) found that openness to foreign trade seems to cause increases in the growth rate of technology, which he implied would increase the overall growth rate. He stated that countries that are more open tend to have a higher rate of investment and thus capital stock, without effecting a reduction in the marginal output of capital. Higher output of capital is facilitated by an intensified participation in international trade.

It is also interesting to note the flying geese pattern of development in which latecomers can derive more benefit from other developing countries that are just ahead of them in the process than from the technology leaders themselves. Countries with large unskilled labour to capital ratio, such as Indonesia and China, can learn more from ones, such as Korea, that have recently made the transition, rather than from the leaders, such as Japan and the USA. This principle is akin to a newly appointed worker who can learn more from a colleague who was recently promoted than from the managing director.

Furthermore, Coe and Helpman (1995:875) argued that the countries that gain the most from foreign R&D are those whose economies are most open to foreign trade. Lichtenberg (1992:10, 17) used the Summers-Heston data set and extended it to include the effect of private and government-funded R&D as well as fixed and human capital. For a cross-section of 53 countries, he found that labour productivity growth between 1960 and 1985 was positively influenced by the ratio of private R&D to GNP. The estimated social rate of return to private R&D investment was about seven times as large as the return to physical investment, with an elasticity of output with respect to private R&D of about 7 per cent (Lichtenberg 1992:21). The social marginal product of government-funded R&D was found to be much lower than that of private R&D. The findings of Lichtenberg (1992:26) suggest that international spillover of technical knowledge is neither complete nor instantaneous.

Export-oriented industrialisation, on the other hand, prescribes a complex set of policies intended to make exports a leading sector. The notion is to exploit opportunities presented by trading with the rest of the world on market terms,

rather than adopting a strategy that deliberately tries to limit imports. This approach further relies on the exploitation of increasing returns to scale (World Bank 1993:358-362).

Harrison (1996:8) investigated the policy determinants that underlie openness. These included a trade liberalisation index, the black market premium, trade shares, movements towards institutional prices and the bias against the agriculture index. Instead of using period averages for these openness variables, annual data were used in this study to uncover exchange rate changes over time. These occur as a result of policy interventions, which are marred when using period averages. Harrison (1996:18) used cross-country time-series panel techniques and seven openness variables. Of these variables, three are significant at the 5 per cent level and another at the 10 per cent level. Harrison (1996:20) used five-year averages or annual data. These specifications show a positive, often significant association between the various openness variables and productivity growth. By contrast, Harrison (1996:40) showed that cross-sectional data reveal only a significant relationship between openness and growth for two of the seven indicators with one having the wrong sign.

Frankel, Romer and Cyrus (1996:15) also studied the causality problem: Does openness lead to growth, or does growth lead to openness? They concluded that the effect of openness on growth turns out to be even stronger when correcting for simultaneity compared with standard estimates. Each additional percentage point in openness (expressed as imports plus exports, divided by GDP) raises income per capita between 1960 and 1986 by an estimated 0.34 per cent (Frankel, *et al.* 1996:12).

To develop successfully, Romer (1998b:2) argued, countries should be open to new ideas and capture the benefits of the latest technologies. The only logical path, he suggested, was to embrace free trade and encourage investment by large corporations. These companies will then bring the necessary knowledge of industrial organisation, international markets and product differentiation to allow developing nations to become truly global players. Romer's theory hinted at an unexpected benefit of free trade, namely access to new ideas.

Wei (2000:18) found that because foregone trade and business opportunities due to corruption and bad governance would be greater for naturally more open economies, they would choose to invest more in building good public governance and would display less corruption.

5.2.18 Exogenous increases in the savings rate

Romer (1989:2) found no substantial evidence to show that exogenous increases in the savings rate causes increases in the rate of technological change and the growth rate. There is, however, some evidence to the contrary, namely that these exogenous changes in savings and investment in fact lower the rate of return on capital as predicted by the neoclassical model. In the light of these findings and the fact that an exhaustive analysis was done on investment, and seeing that investment and saving should largely follow similar trends, no further analysis on saving seemed appropriate.

5.2.19 Average share of exports in GDP

Two variables that had explanatory power for the investment share were the average share of exports in GDP and the average level of real income (Romer 1989:24). Pack and Page (1994:229) endeavoured to answer the question of increasing growth performance by analysing the strategies of the high-performing Asian economies. They found that these countries were more successful than other comparable countries in raising investment levels and developing human capital and that these factors had contributed largely to their growth.

They then pursued the question of what the possible sources of rapid technical efficiency change in the high-performing Asian economies might be and concluded that on the basis of both cross-country evidence and a more detailed examination of Korea and Taiwan, rapid productivity change was partly a result of the superior manufactured export performance. They found that after allowing for the potential productivity-enhancing effect of exports there remained some unexplained component in the growth performance of these countries. They also found that exports, rather than openness, were one element in the trade productivity nexus that could have important implications

for the design of trade policy. This is because manufactured exports work through several mechanisms to improve technical efficiency, thereby contributing to rapid productivity change.

The productivity-driven high-performance Asian economies, while they had moderate distortions in the relative prices, did not attempt to achieve neutral incentives until quite late in their growth cycle. Instead, they engaged in an export-push strategy. The lesson from this is that other developing countries should sequence trade policy reforms by beginning with a modest reduction in import protection, combined with greater uniformity of the structure of effective protection (something South Africa has not yet achieved [Lewis 2001:v]). This should be followed by a period of favouring exports in their trade policy before final liberalisation of the domestic market.

5.2.20 Income distribution

The notion that inequality is in some way linked to economic development dates back at least to Kuznets (1955:23), who argued that inequality should rise during the early stages of economic development, stabilise, and then decline as a country becomes more wealthy (a pattern that was dubbed the “Kuznets curve”). One mechanism that was suggested as the cause of this process is the increasing degree of urbanisation that typically accompanies industrialisation, the argument being that inequality is lower in rural areas.

There is no continuous time series on income distribution in South Africa which means that the relation of income distribution to growth cannot be tested with the techniques used in this study.

5.2.21 Productivity growth and quality improvements

Adam Smith contemplated that the initial start of the process of the division of labour was the extent of the market. “When the market is very small, no person can have encouragement to dedicate himself entirely to one employment ...” (Smith 1776:1981ed.:31). A larger market stemming from higher or continuous growth therefore leads to higher productivity. Allyn Young (1928:8) observed the endogenous nature of the causal relationship by stating that “the division of

labour depends upon the extent of the market, but the extent of the market also depends upon the division of labour”.

Early empirical evidence of a positive relationship between the growth of output and labour productivity for 51 manufacturing industries in the USA over the period 1899 to 1937, was presented by Solomon Fabricant (1942:33-37). In a subsequent publication, he (1969:33, 90) observed that “labour productivity generally rises less rapidly when national output is falling and more rapidly when national output is expanding,” implying that output growth determines productivity growth. Verdoorn (1949:3) showed empirically that productivity growth in manufacturing depends on output growth in that sector, which became known as Verdoorn’s law. Kendrick (1961:207) presented rank correlation coefficients of 0.68 between relative changes in productivity and output for 33 industry groups; 0.67 for 80 manufacturing industries; and -0.10 for 12 farm groups in the USA for the period 1899 to 1953.

Choi (1983:159) pointed to the uncertainty regarding the line of causation, and posed the question whether it is the high rate of growth of output that causes the high rate of growth of productivity, or the other way round. He contended: “In principle either sequence is possible”. He then arbitrarily chose the direction of causation “from growth of output to growth of productivity”.

Englander and Mittelstadt (1988:47, 48) found that the lack of output growth “shows up as productivity declines rather than as input reductions” (p 47), and that “demand policy should be used to increase output growth in order to improve TFP performance” (p 48). This indicates that they were of the opinion output causes changes in productivity. This is confirmed by their recommendations that “demand policy should be used to increase output growth in order to improve TFP performance”.

Thompson and Waldo (1997:155, 157) asserted that unobserved quality improvements may account for at least half but even as much as a three-quarters of growth, and that real productivity growth in post-war USA was two to five times greater than measured TFP growth; also that 15 per cent of the observed productivity slowdown in TFP growth could be ascribed to unobserved increases in the relative importance of product innovations.

Harberger (1998: 3) investigated the residual in terms of cost reductions, which would then explain or induce productivity increases. He implored economists to investigate a large number of factors that could produce real cost reductions and thus higher productivity, and challenged that "there are at least 1001 ways to reduce real costs and that most of them are actually followed in one part or other of any modern complex economy, over any plausible period ...".

Keller (1997:31) produced evidence that a country's own R&D contributes more to local productivity and growth than that of an "average" foreign country. Secondly, he found that the foreign R&D in the same industry, in turn, is more productive than local outside industry R&D; and thirdly, that international trade in the form of foreign R&D investments is low because it tends to be monopolistic and contributes little to the total effect on productivity (Keller 1997: 34).

Easterly and Levine (2000:4) used growth accounting and panel data to establish the reasons for growth differences between countries and also the reasons for changes in economic growth over time. They used the Mankiw, Romer and Weil (1992:410-412) methodology and extended it to allow for changes in technology. The results showed that wide differences in total factor productivity (TFP) account for the largest share of cross-country differences in economic growth. These results were obtained after adjustments had been made for country-specific effects, which could have biased TFP shares upwards, such as large increases in capital stock and increases in education attainment. They found that TFP growth accounted for about 50 per cent of growth in OECD countries and an average of about 30 per cent in Latin American countries.

5.2.22 Institutional factors

Commander, Davoodi and Lee (1997:56) affirmed that policy distortions have a negative effect on growth, but that the positive effects of well-functioning institutions and high-quality government bureaucracies can offset the negative influence of large government.

Brunetti, Kisunko and Weder (1997a:1-2, 29-30) and the World Development Report (1997:34-37) proposed new measures of institutional uncertainty

designed to capture predictability of rules, the fears of entrepreneurs of policy surprises and reversals, their perception of safety and security of property, the reliability of the judiciary and their problems with bureaucratic corruption. All these factors were combined in an overall indicator of credibility of rules. Brunetti, *et al.* (1997:30) found that this new indicator was significantly related to higher rates of growth and investment in their cross-country analyses using a sample of 52 countries for which comparable data were available. They (1997:25) show that the subindicator of “predictability of judiciary enforcement” was significant at the 1 per cent level for both growth and investment regressions. The “security of property rights” indicator was closely related to growth, but at lower levels of significance in investment regressions.

5.3 SYNOPSIS OF FACTORS TO CONSIDER WHEN DESIGNING POLICIES FOR FASTER GROWTH

If the developmental state approach is correct, countries investing more heavily in and enjoying lower equipment prices should enjoy more rapid growth (De Long and Summers 1991:448). Developing countries may wish to sequence trade policy reforms in the form of lower tariff protection by beginning with a modest reduction in the protection of importables, combined with greater uniformity of the structure of effective protection. This should be followed by a period of tilting trade policy in favour of exports before final liberalisation of the domestic market (Pack and Page 1994:230).

Lewis (2001:v) found that the recent tariff reforms in South Africa have lowered average protection and removed most nontariff barriers, but that the spread of effective protection remains high, and that the structure of protection remains complex because it comprises 45 different rates. Rama and Tabellini (1995:1) advised that conditionality by foreign agencies should target product market distortions and not labour market distortions because the latter are likely to respond in the desired direction once product market distortions have been removed or diminished.

Brunetti, Kisunko and Weder (1997a:30) found that the institutional factors of security of person and credibility of rule-making are most closely associated with

growth and investment. Burnside and Dollar (1997:32) found that the policies that have a great effect on growth are those related to fiscal surplus, inflation and trade openness.

Romer (1989:34) recommended that the key determinant of the growth rate in less developed countries is the rate of expansion of investment opportunities. He advised that free trade increases investment opportunities, and most importantly, that it facilitates the purchase of a broad range of highly developed producer inputs from a wide range of foreign suppliers. Ng and Yeats (1999:1) found that improving African trade and economic governance policies to levels currently prevailing in such (nonexceptional) countries as Jordan, Panama and Sri Lanka would be consistent with a sevenfold increase in per capita GDP (about US\$3 500) and an annual increase of three or four percentage points in the growth rate.

5.4 CONCLUSION

This chapter identified the most frequently cited and internationally used growth determinants in cross-country analyses. These include the following: the ratio of value added in mining to total GDP; the ratio of value added in manufacturing to total GDP; the growth rate in the manufacturing sector as a source of growth; public expenditure on education as a percentage of GDP; primary school attainment; secondary school attainment; openness to international trade and investment; exogenous increases in the savings rate; average share of exports in GDP; income distribution; productivity growth and quality improvements; investment in various types of infrastructure; and institutional factors.

Time-series tools may be better empirical instruments to assess the effects of various variables on growth because cross-section tests place weaker restrictions on the growth dynamics than similar time-series tests. Typically, cross-country regressions involve averaging out variables over relatively long periods of time. This procedure obliterates important dynamics between interactive variables, which complicates the interpretation of variations in results of cross-country studies. It is also difficult to address the question of causality in cross-section frameworks. The time-series approach allows the investigator not

only to analyse the possibility of one directional, but also bidirectional causality and to account for differences in the institutional framework and policy regimes.

The variables identified in this chapter as having some effect on growth in cross-country analyses will be used in chapter 6, and by applying time-series tools like Granger-causality tests, variance decomposition and response functions, those variables affecting growth in South Africa in a crucial manner will be identified.