Factors affecting economic growth in sub-Saharan Africa

A panel data analysis of the factors that affect economic growth and the development of sub-Saharan African countries.

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Economic growth rate differs largely between different countries. There are many opinions on which factors really affect the rate of growth in different economies and this causes debates. The factors that affect economic growth include political systems, social settings, economic freedom, human capital and institutional organization. These factors affect not only productivity, but also efficiency.

This thesis’ purpose is to investigate and explain the factors that affect economic growth in sub-Saharan Africa. Through use of a fixed effects regression model, a panel data investigation will be conducted, and an analysis will be presented in this thesis. By using secondary data for sub-Saharan African countries from reliable sources, the factors that affect economic growth on an annual basis from year 2006 to 2017 are examined. Growth in gross domestic product per individual (GDP per capita growth) is the dependent variable and represents economic growth. The independent variables which are believed to affect this growth are also given, and these include: population growth, foreign direct investment, level of corruption, democracy, life expectancy at birth, expected years of schooling and economic freedom.

The findings estimate that some of the chosen variables, for example population growth and life expectancy at birth significantly affect economic growth and development in these countries. The rest of the independent variables have an impact on economic growth but are not statistically significant according to this study.

Keywords: Economic growth, population, foreign direct investment, corruption, democracy, life expectancy, education and economic freedom.
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1. Introduction
The background of the study will be represented in this section, the problem statement, the study objective, the methodology, the scope of the study and the thesis structure.

1.1 Background
The question on which factors are important for the achievement of economic growth causes debates amongst members of society. This makes it interesting and important to study because of the factors to discuss, and it may help in figuring out what indeed affects economic growth. The issue arises mainly on which factor is/are most effective, whether it is through human capital, proper healthcare, employment standards, international trade, investment in the international markets, and whether these occur due to the population, communication or freedom in society, etc.

In previous studies on growth theories it is argued that economic growth depends on the given amount of labor, technological change and the rate of savings in the economy, the theory of human capital (education and training) are shown to contribute to a large extent to economic growth (Carlin and Soskice, 2006). The factors are however of low effect in some countries, compared to others. This makes it hard for economists worldwide, to conclude that they are indeed the reasons for economic growth, hence economists develop more theories to explain this subject. Why is it hard for countries to grow evenly when there is seemingly potential for economic growth? Studies show that growth based in regions, ways of life and the level of trust may help to find a way to development. Weil argues that often government policies, economic freedom and democracy are the major focus when discussing economic growth in a given country. Some countries may be democratic but that does not guarantee economic growth, and there are many countries that show growth even when they are dictatorships; growth may result because of wealth rather than democracy (Weil, 2009).

1.2 Study objective
The aim of this thesis is to investigate the factors that affect economic growth in sub-Saharan Africa. An investigation of theories on why countries have different levels of development will be conducted and the theories on how to obtain economic growth and sustainable
development will be explained. The different contributions and setbacks to economic growth, running regressions and analyzing the percentage GDP per capita growth due to population growth rate, FDI, corruption, democracy, life expectancy, education and economic freedom, will be the focus of this investigation. The goal is to find out whether these factors highly contribute to economic growth.

1.3 Problem statement

# Which factors affect economic growth in sub-Saharan Africa?

1.4 Scope of the study

Finding out the factors that affect economic growth in sub-Saharan African countries is the main purpose of this thesis, and by looking at seven different independent variables growth is investigated and studied by use of Panel (longitudinal) data for each individual country from the year 2006 to 2017, using a fixed effects on a linear regression model. The dependent variable GDP per capita growth was used as a function of the independent variables, population growth, foreign direct investment (inflows), corruption index, democracy index, life expectancy at birth, expected year of schooling and economic freedom.

All countries in the sub-Sahara Africa were selected, but only countries with available data were used, and use of reliable sources from independent organizations was important in this investigation for a reliable result. According to The World Bank, 48 sub-Saharan African were available initially, but only 27 had complete data in order to achieve a balanced data set. The data was collected in form of statistical secondary data from acknowledged independent organizations, that is, The World Bank, UNDP, The Economist Intelligence Unit, and transparency International, and others. Books, articles, statistical sources and electronic journals were used, and these provided content in terms of previous studies and theories for the writing of this essay.

1.5 Thesis structure
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Below the *introduction* (the first section) of this thesis are 6 different sections. The second section, *theoretical discussion*, gives a detailed explanation on the concepts that are selected to be used in this thesis using different economic theories. The third section consists of *previous studies* and provides information on what other academics have researched on the subject. The fourth section, *Data*, presents numerical information, the linear regression model and how these were used; the variables selected to explain the effects on economic growth are presented and analyzed with a fixed effects regression model. In the fifth section, *results*, the results of the regression model and data are presented. The sixth section, *discussion and analysis*, discusses and analyzes how the results relate to theories and previous studies. And the seventh section the *conclusion*, gives what the results imply and the suggestion to the limitation of economic growth in the sub-Sahara Africa.
2. Theoretical discussion

2.1 Economic growth theories

*The Solow-Romer model*

The Solow model developed by Solow (1956), relies on the capital-output ratio which is endogenous. In this model, the output per capita is related to the stock per capita by use of the production function. Capital and labor operate at the same time in the production of the aggregate output. And if there’s an equal increase in output due to the inputs used, i.e. constant returns to scale, the production function may be used to correlate output per capita with input per capita. Capital and labor are the factors considered in this long-term economic growth model, and these factors are assumed to have positive but decreasing marginal productivity, hence a given level of GDP; capital and labor operate with a positive but a decreasing marginal productivity. According to the Solow model a balance between aggregate savings and aggregate investment is assumed, and the savings are determined exogenously. ‘The savings rate has a level effect only in the Solow model.’ (Ray, 1998).

The Solow model has a linear homogeneous function \( Y = f(K, L) \) with constant returns to scale due to the factors capital and labor used in production. The production function can also be used in per capita terms through derivation to GDP per capita, which is the same as capital per labor unit. This model gives the aggregate change in the capital stock and the factors, savings per capita, depreciation rate and population growth are assumed to affect the long-term change in capital stock. The amount of savings per individual may affect the change in the long-term capital stock following the equilibrium condition. If individuals save as much as they invest, the capital stock will also increase (Carlin and Soskice, 2006).

In summary, in the Solow model there is no change in GDP per capita because there will be no change in the capital-labor ratio. This is because the factors used as inputs increase at the same rate, hence the unobservable change. The Solow model makes the capital output ratio endogenous due to the relative use of capital and labor. This means that if the capital stock were to increase at a higher rate than the labour, the productivity of labour would be impacted.
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positively which would also lead to an increase in the GDP per capita; GDP per capita increases when the capital labour ratio increases.

Just like the Solow model, the Romer model assumes capital accumulation (growth), however the Romer model adds knowledge and therefore output is boosted due to the skills that the individuals on the labor market have. According to Carroll C. (2019), in the Romer model, the firm’s total output due to technical progress is achieved from endogenous accumulation of knowledge and the capital is accumulated with no depreciation and population growth. The model assumes that ‘the aggregate stock of knowledge in the economy is proportional to the accumulative sum of past aggregate investment which, not coincidentally, is identical to the size of the aggregate capital stock. The model assumes that the effect of the stock of knowledge determines productivity’, meaning there is an increase in economic growth in a given economy.

*Technical progress*

What happens to the Solow model when change in technology takes place? Because the Solow model by itself could not give a visible change in GDP, adding a change in technology, assumes two things: i) A change in technology, will cause an increase in the efficiency of the labor force and in return this will increase productivity. ii) The labor force will cause changes in production because of population growth (Ray, 1998). An introduction of continuous technological change in the Solow model, will cause the steady state with no change in GDP per capita to become positive, hence a growth in GDP per capita. This is because the labor due to technical progress is assumed to be efficient, compared to the labor from before.

In summary, when technical progress occurs productivity by the labor force will increase, which will affect GDP on the aggregate level leading also to an increase there. And if the population remains the same, GDP per capita will increase (Ray, 1998 and Carlin et al, 2006). The new production function will be linearly homogenous as mentioned earlier. But when efficient labor is, GDP/efficient labor it can become a function of the capital labor ratio.
Human Capital Model

Human capital, ‘labor that is skilled in production, labor that can operate sophisticated machinery, labor that can create new ideas and new methods in economic activity’ defined by Ray, is one of the types of the new growth theories (Ray, 1998). Human capital means that skilled labor can be obtained through education or training of the population, together with physical capital. For example, many developed countries are not only endowed with a great amount of physical capital combined with homogenous labor, they are also equipped with human capital. They invest largely in education and training their labor force compared to developing countries. Low-income countries often ‘have a higher marginal rate of return to physical capital because of its shortage relative to unskilled labor, but the very same countries also have a shortage of human capital, and this drags down the rate of return to physical capital.’ summarizes Ray. Human capital is an important concept of economic growth, because an educated/trained labor force is more efficient and contributes to increase in productivity.

The theory assumes that population growth does not change, depreciation is ignored, and technical progress is defined by the theory, productivity of labor. Labor productivity is given by the investment in education or training, equilibrium model. The linearly homogeneous aggregate production function is given by, \( y = k^a \cdot h^{(1-a)} \), where the change population is assumed to be zero, meaning the change in total GDP equals the change in GDP per capita. Because the model is very similar to the Solow model, a balanced growth may be observed. In the steady state both human capital (h) and physical capital (k) will increase in proportion to each other. An increase in physical capital may occur due to for example investment in new machines, whereas human capital may be stimulated due investment in education. There will therefore be a similar growth rate not only in the factors that allow for production, but also growth on the aggregate level (Ray, 1998). As mentioned earlier, the ability of labor in the human capital growth model is determined by investment in education and training of the labor force. These can be treated as investments because a given level of human capital needs a given level of saving (that finances for physical- and human capital).
2.2 Internalization Theory

The OLI Framework

The OLI framework (Eclectic) developed by John H. Dunning (1979) is a framework that explains multinational enterprises (MNEs) and helps with categorization and empirical research on FDI (Reinert K. et al. 2009). Feenstra R. and Taylor A. (2012) define FDI as ‘The movement of capital between countries and has effects analogous to immigration.’ They explain that an inflow of FDI into a given country will decrease the rental on capital, increase wages, and decrease the rental on land in the short run. However, the variations in wage and rentals do not have to take place when there is free movement of capital and land between industries. Production by the industry would rather adapt to the Rybczynski theorem, for the remaining capital to be totally hired with no change in wage or rentals.

Reinert K. et al. (2009) explain that OLI in full stands for: Ownership: ‘A key idea is that firms are collections of assets, and that candidate MNEs possess higher-than-average levels of assets having the character of internal public goods.’ These assets are used in production at various locations while maintaining their effectiveness, i.e. product development, managerial structures, patents and marketing skills. The more competitive advantage an investing firms has, the greater they will be involved on international production.

Locations: This is another alternative for MNEs to allocate their companies abroad through either horizontal or vertical FDI (ibid, 2009). Defined by Feenstra R. and Taylor A. (2012), horizontal FDI is when a large part of FDI takes place between two developed countries, i.e. ‘when a firm from one industrial country owns a company in another industrial country.’ For example, in car industries, etc. Vertical FDI on the other hand is when a developed country owns a firm in a developed country. One of the advantages of vertical FDI is low wages. This may lead to technological spill overs as industrial countries invest in such enterprises and cheap labour in developing countries (ibid, 2012).

Internalization: Usually seen as the most significant, is defined by Investopedia (2020), ‘Internalization occurs when a transaction is handled by an entity itself rather than routing it out to someone else.’ Reinert K. et al. (2009) explains that some tasks like
investment, business transactions etc, are carried out within the firm and others within a short distance, in the economics of FDI. He concludes that the OLI framework is a helpful way of organizing thinking about the most important features of the world economy. The framework ensures FDI and hence economic growth not only in developed but also in developing countries.

2.3 Institutional theories
Scott W. (2004) explains institutional theory as a theory that ‘considers the process by which structures, including schemas, rules, norms and routines become established as authoritative guidelines for social behavior.’ The theory gives a detailed explanation of how these components are used together, and how they affect society and the economy as a whole. Acemoglu, Johnson and Robinson (2005) explain how institutions are necessary for long run economic growth, and that ‘differences in economic institutions are the fundamental cause of differences in economic development.’ They mention however that there are no results on why there is a difference in economic institutions’ equilibrium. They emphasize that economic institutions give weight to the ‘structure of economic incentives in society.’ They mean that ‘property rights’ determine people’s desire to acquire not only physical, but also human capital and productive technology. The authors argue that other factors like culture and geography too play a role in economic growth, however economic institutions are the key for the variations in economic growth in society, because they pave way for total economic growth potential and economic outcome.

Acemoglu et al. (2005) explain in a framework that economic institutions and political institutions work together to create a functional society with two state variables: i) Political institutions determine de jure political power, which determines economic institutions and later economic performance and distribution of resources in the next period. This can be the government form that a country exhibits, e.g. democracy or dictatorship. Political institutions change gradually but are endogenously determined, that is. change from being a dictatorship or a democracy to adjust the limitations of political leaders in society.
ii) Distribution of resources determines de facto political power which determine political institutions in the future period.

Vitola and Senfelde (2015) write that economic institutions consist of the ‘rule of law and quality of regulatory framework, as well as the level of corruption, because corruption distorts the operation of markets by limiting fair competitiveness.’ They mean that corruption may occur as a result of exporting a large share of primary goods which affects competition on the international market.
3. Previous studies

There are many different views in previous studies when looking at what affects economic growth. Below are the chosen variables with an explanation from previous studies in relation to the research question.

Dao Q. (2012) carries out an empirical study (1990 to 2008) on 43 developing countries for the effects of population on economic growth using a statistical model and data. The study’s results show that population growth has a negative effect on economic growth. Because in the data they use, the rate of growth in GDP per capita is precisely due to growth in population and other variables (e.g. both the young and old dependency ratio, the mortality rate), and if population growth rate is less or more than 1.2% each year. He states however that ‘Governments in developing countries can influence population growth in order to stimulate growth’. This may be done by using highly coercive methods to reduce the fertility rate.

In the study ‘FDI flows to sub-Saharan African’, the researchers used panel data from 1995 to 2009 for 38 sub-Saharan African countries to highlight that FDI inflow is determined by the how endowed a country is with resources. They argue that countries with limited resources mainly lean on the government institutional efficiency and in countries with more resources, use ‘formal financial systems.’ The ability to attract FDI in sub-Saharan African countries is due to ‘telecommunication infrastructure, the quality of legal and governance structure and the kind of FDI in question’ (Ezeoha and Cattaneo 2012). Their results show that the desire for foreign investors to apply FDI to sub-Saharan African countries is influenced by ‘prevailing institutional characteristics of each country’ and that FDI aids economic growth.

The effect of corruption on a country’s economic growth is relatively hard to determine, as there are various corruption measures, and the way they affect a country makes it difficult to make a conclusion on its effect on economic growth (Svensson, 2005). This means that corruption may occur in a given country due for example to political instability, economic policies in the market (and asymmetric information). According to the study ‘Evidence on the
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The findings are that corruption has a negative impact on economic growth. The study provides two types of corruption, Bureaucratic (type 1) corruption which often is misleading when it comes to ‘allocation of talent and skills away from productive activities towards non-productive activities.’ And Political (type 2) corruption which ‘tends to distort the allocation of public funds and sale of public assets in a way that produces political rents or unlawful economic rents.’ (Ugur and Dasgupta, 2011). Their results show that the direct effect is less than the indirect effect (through public finance and education routes) of corruption but together add up to have a genuine negative effect on economic growth. They suggest that economies can reduce corruption by using ‘anti-corruption interventions together with various policies in order to improve the quality of institution and also give the right motivation to contribute to human capital.

In ‘Democracy versus dictatorship: The influence of political regime on GDP per capita’ by Antić (2004), the author argues that in the long run, democracy may be more reliable than dictatorship. Antić concludes, ‘There is no developmental justification, especially not for small countries.’ However, research has shown that during the last five decades highly populated dictatorships significantly experienced more development than highly populated democracies (or even lowly populated countries in terms of economic growth), economically. Therefore, democracy does not equal increased economic growth! (ibid. 2004). This means that some countries may be democratic but still have a lower GDP than countries that are dictatorships.

With the aim to control for the endogeneity to find out the effect of democracy on economic growth, Helliwell (1994)’s research shows that democracy is the catalyst between education and investment however with no positive effect on growth when investment and education under control. There is no systematic net effect of democracy on subsequent economic growth.” Barro (1996)’s results also show that there is no direct relationship ‘with growth
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increasing in democracy at low levels of democracy and decreasing in democracy at higher levels’ (Helliwell (1994) and Barro (1996)).

Also, according to Rodrik (1997) in the study ‘Democracy and economic performance’ (1970-1989), there is no core relationship between democracy and long-run growth. He however argues, ‘The bottom line is that living under an authoritarian regime is a much riskier gamble than living under a democracy’. The results from his research show that it is unclear how democracies affect economic growth, although it is significant. He argues, ‘The evidence strongly suggests, therefore, that democracy is conducive to lower volatility in economic performance.’ And concludes, ‘Democracies perform better on a number of dimensions: they produce less randomness and volatility, they are better at managing shocks, and they yield distributional outcomes that are more desirable.’ Rodrik suggests three hypotheses; i) In a democracy, ‘the range of feasible economic policies is restricted to a greater extent by the preferences of the median voter; extreme results.’ ii) ‘Institutionalized forms of political participation allow for greater voice without the need for conflict and civil strife.’ iii) ‘Democracies have greater difficulty excluding the losers in political competition from economic rewards. This reduces the incentives for social groups to partake in non-cooperative and disruptive behavior ex ante.’

According to Cervellati and Sunde (2009), in their empirical investigation (1940 to 2000), they conducted a research on how life expectancy affects economic growth while specifically focusing on the role of demographic transition. They use econometrics specification to present a simplified theory of economic and demographic transition where the decision to acquire education by an entity and fertility are dependent on life expectancy. They argue, ‘.... improvement in health or life expectancy primarily influence total production by affecting technology, human capital and the size of population.’ Their results show that an increase in life expectancy leads to an increase in population growth, have a low effect on human capital and lastly lower GDP per capita; (economic growth) in ‘pre-transitional countries.’
A healthy and educated labor force may positively influence growth in the economy. A well-educated population may perform better on the job market, increase production and earn a better income. It is however hard to prove education’s impact on economic growth especially when it comes to increased earnings (Björklund and Lindahl, 2005). In their research ‘Utbildning och ekonomisk utveckling - vad visar den empiriska forskningen om orsakssambanden?’, they present a strong correlation between GDP per capita growth and education. They however start from a purely qualitative perspective, that trained labor leads to growth, and therefore positive external effects; information transfer from one individual to another and as a societal requirement, reap the benefits offered by/through education (ibid. 2005).

Romer M. (1989) in the empirical study ‘Human capital and growth: Theory and evidence’ also carries out a research on education and economic growth (1960 to 1985) and his results show that the level of human capital (education) in a given country is correlated with growth rate in GDP per capita and the amount of production linked to investment in physical capital. In other words, human capital on its own does not affect economic growth, but together with other factors like life expectancy and the rate of investment, economic growth may be seen.

Šeputienė (2007) conducted an empirical assessment using data from 1996-2007 to evaluate the impact of institutions on economic growth by using indicators: political freedom, business freedom, corruption, GDP per capita, etc. Her results show that institutions are important for ‘international trade and geography’. She writes that high institutional quality positively influences investment and creation of new technology thus increasing the GDP per capita. The results of the study show ‘a strong and statistically significant relationship between the level of economic freedom and GDP per capita.’ She further concludes, ‘The relationship between the level of different economic freedom aspects and economic growth depends on the country sample’ and the dependent variable used to measure economic growth, whether it is the rate of growth in GDP, or in per capita GDP.
4. Data

In this section, description of the regression model and variables are given and are used to find out which factors affect economic growth in sub-Saharan Africa. I will explain the variables, data used and give an analysis of the regression model.

When it comes to Education in this thesis I have started from a quantitative level, expected years of schooling which may give an extended insight on growth from a different perspective. The rest of the independent variables are viewed as in the earlier studies. This essay will contribute to development through its presentation of the new data studied.

4.1 Sub-Saharan African countries

The table below shows the sub-Saharan African countries that had available data, presented in alphabetical order. The other 21 countries were not included in the research because they were missing data for some of the variables used in the empirical analysis.

<table>
<thead>
<tr>
<th>Country</th>
<th>Benin</th>
<th>Chad</th>
<th>Gabon</th>
<th>Malawi</th>
<th>Niger</th>
<th>Sierra Leone</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon</td>
<td>Congo, Rep.</td>
<td>Kenya</td>
<td>Mauritius</td>
<td>Rwanda</td>
<td>Tanzania</td>
<td>Zimbabwe</td>
<td></td>
</tr>
<tr>
<td>Central African Republic</td>
<td>Cote d'Ivoire</td>
<td>Madagascar</td>
<td>Namibia</td>
<td>Senegal</td>
<td>Togo</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2 Chosen variables, data and expected outcome

In the table below data, sources and the hypothesized outcome of the chosen variables are listed. The dependent variable is GDP per capita growth and the rest of the variables are the independent variables.
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Table 2: Overview of the chosen variables data and expected outcome

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
<th>Expected outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆GDP/capita</td>
<td>GDP per capita growth, 2006 - 2017</td>
<td>World bank</td>
<td>Dependent variable</td>
</tr>
<tr>
<td>Popg</td>
<td>Growth in population, 2006 - 2017</td>
<td>World bank</td>
<td>-</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct investment 2006-2017</td>
<td>World Bank</td>
<td>+</td>
</tr>
<tr>
<td>Corr</td>
<td>Corruption Index 2008 – 2018</td>
<td>Transparency interna</td>
<td>-</td>
</tr>
<tr>
<td>Dem</td>
<td>Democracy index 2006-2017</td>
<td>Economic intelligence unit</td>
<td>+/-</td>
</tr>
<tr>
<td>Lifeexp</td>
<td>Life expectancy at birth, 2006 - 2017</td>
<td>World bank</td>
<td>-</td>
</tr>
<tr>
<td>Educ</td>
<td>Expected years of schooling, 2006 - 2017</td>
<td>UNDP</td>
<td>+</td>
</tr>
<tr>
<td>EF</td>
<td>Economic freedom, 2006-2017</td>
<td>Fraser Institute</td>
<td>+</td>
</tr>
</tbody>
</table>

**Description of variables**

In this section the data for countries in the sub-Saharan Africa are specified according to the corresponding variables used in the regression model with fixed effects. Economic growth is represented by the dependent variable GDP per capita growth and it is the annual percentage change from year 2006 to 2017 (12 years) and independent variables: population growth, FDI, corruption, democracy and economic freedom are also represented on an annual percentage change over the same time period. Whereas life expectancy at birth and expected years of schooling are represent in number of years on an annual basis.

**Dependent variable:**

*GDP per capita growth (ΔGDP/capita)*

The GDP per capita corresponds to the standard of living per individual, and it is measured in dollars. The ‘Annual percentage growth rate of GDP at market prices based on constant local currency’ (The world bank, 2020). The change in GDP per capita shows development; an increase or decrease in an economy’s growth.
Independent variables:

*Population Growth (Popg)*

The population growth variable shows the percentage rate of growth in the number of people over the last 12 years. Population growth is defined as the increase in growth in population from one year to another (The world bank, 2020). The variable population growth was chosen because the number of people in a given area play a role, and depending on how much it changes, may have a relevant effect on a country’s economic growth.

Ray in the book *Development economics*, uses demographic transition to analyze the different chains of population growth. He writes that poor countries tend to have high birth rates and high death rates. Death rates may decrease however due to poor communication; people may keep bearing offspring which further increases the population. In most low-income countries, often a large part of the population is in the childbearing age and this encourages more births, even though death rates are low. This puts most developing countries in the first- (high birth rates and high death rates) due to poor hygiene)) and the second (high birth rates, low death rates) phases of the demographic transition due to improved sanitation. When death rates fall but birth rates remain high, population grows faster because of the young population. He emphasizes that, ‘limited information’ and lack of ‘old-age security’, may cause people to have more children for future security in these countries (Ray, 1998).

Population growth is hypothesized negatively in this thesis. The higher the rate of population growth, the less economic growth a country will experience.

*Foreign direct investment, (FDI).*

FDI, ‘investing directly in production in another country, either by buying a company there or establishing new operations of an existing business’ (The economist, 2020). FDI is mostly done by companies and it is done alongside with trade for example a production chain may be put in a country for easier distribution to the nearby economies. Most countries allow FDI because of the desire to establish employment opportunities, extend research and innovation to its citizens, hence improving the economy (ibid, 2020).
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The variable FDI measures the percentage of the economy’s GDP due to foreign direct investment. FDI’s reliability is explained by the theories involved in this thesis, which together approves that investment in not only machinery but also in R&D, lead to an increase in GDP per capita growth.

The variable was hypothesized to have a positive impact on the receiver’s (sub-Sahara Africa) economic growth and development.

*Corruption Perceptions index, (Corr).*
Corruption is not only bad for the people’s wellbeing but also for the economy. Countries that experience high levels of corruption not only accumulate low GDP, but the percentage of that GDP that goes into investment is relatively low which causes low increase in economic growth. These low-income countries barely invest in human capital, very few developed countries are interested in investing in them, causing development to be limited. Countries that exhibit corruption are more likely to perform bribery instead of paying taxes, which harms the countries’ economy. When a country is less corrupt, the economy develops smoothly because different institutions such as, political-, financial institutions, etc. operate almost as desired (Transparency International, 2018). The scale of the corruption index is zero to one hundred (0= high corruption and 100 = low corruption).

Corruption is expected to impose a negative effect on economic growth

*Democracy index, (Dem).*
The economist intelligence unit defines democracy as ‘a set of practices and principles that institutionalize, and thereby, ultimately, protect freedom.’ (EIU 2020). Low-income- or developing countries exhibit various ruling systems, and this affects the level of economic growth accordingly. The variable shows the level of democracy in a given country and therefore its various effect on economic growth (GDP per capita growth).
Democracy was hypothesized to have a positive or negative impact on economic growth.

*Life expectancy, (Lifeexp).*

The variable life expectancy at birth represents the number of years people in each sub-Saharan African country are likely to live due to the available healthcare. It shows the amount of years a child survives in case the current ‘patterns of mortality’ in the period they are born were to remain as they are under its living (The world bank, 2020). These patterns of mortality indicate how healthy a population is and therefore enable productivity which in turn promotes economic growth. When the government provides good healthcare, the population is likely to be more active in terms of providing both goods and services. However, this can lead to a high increase in population which in the short run affects economic growth negatively.

Life expectancy is expected to have a negative effect on economic growth.

*Expected years of schooling, (educ).*

Education is represented by the expected years of schooling and this shows the number of years the people in a given country must attend school in order to attain human capital. A population equipped with human capital may have more knowledge on how to handle the economy in terms of production of both goods and services. Because education is a great way of increasing development and equality, in turn a maintainable economic growth can be achieved (The world bank, 2020). From the *United Nations development program* under education, an indicator, expected years of schooling was chosen to indicate the estimated number of years the population is expected to spend in school annually (UNDP, 2020). Age was ignored for this indicator.

Education is expected have a positive effect on economic growth.
Economic growth in sub-Saharan African countries.

**Economic Freedom, (EF).**

The economic freedom index is released yearly and reports the level of economic freedom of all the countries in the world. The index presents data on five sectors: ‘size of the government, legal system and property rights, sound money, freedom to trade internationally, and regulation.’ (Fraser institute, 2020). Economic freedom shows economic openness and trade, and the level of freedom individuals have in the economy plays a significant role in a country’s development. Do people have an opportunity to perform production of goods and services? The measure of economic freedom in the economies under research may help with finding out whether jobs are freely available to the citizens. Economic freedom can also be of advantage in explaining whether the economy has access to FDI, if the people pay taxes as required to enable local investment. This variable mainly focuses on the business activities of the participants in the economy.

Economic freedom is expected to have a positive effect on economic growth.

### 4.3 Descriptive statistics

The table below shows the descriptive statistics of the chosen variables.

<table>
<thead>
<tr>
<th></th>
<th>ΔGDP/capita</th>
<th>Popgr</th>
<th>FDI</th>
<th>Corr</th>
<th>Dem</th>
<th>Lifeexp</th>
<th>Educ</th>
<th>EF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max</strong></td>
<td>18.066</td>
<td>3.907</td>
<td>50.636</td>
<td>65</td>
<td>8.280</td>
<td>74.515</td>
<td>15.200</td>
<td>8.110</td>
</tr>
<tr>
<td><strong>Min</strong></td>
<td>-36.557</td>
<td>0.069</td>
<td>-4.852</td>
<td>16</td>
<td>1.490</td>
<td>43.853</td>
<td>3.800</td>
<td>2.990</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>2.079</td>
<td>2.516</td>
<td>4.375</td>
<td>31.929</td>
<td>4.654</td>
<td>58.468</td>
<td>10.128</td>
<td>6.174</td>
</tr>
<tr>
<td><strong>Std.Dev</strong></td>
<td>4.378</td>
<td>0.807</td>
<td>5.434</td>
<td>10.875</td>
<td>1.828</td>
<td>5.931</td>
<td>2.182</td>
<td>0.834</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>N= 324</td>
<td>N= 324</td>
<td>N= 324</td>
<td>N= 324</td>
<td>N= 324</td>
<td>N= 324</td>
<td>N= 324</td>
<td>N= 324</td>
</tr>
</tbody>
</table>

Table 3 shows a descriptive statistical summary for the variables used in this study, that is max, min, mean, standard deviation (Std.Dev) and the number of observations. The number of sub-Saharan African countries observed is 27 for all variables, and the data are precisely
balanced. As seen in the table above, there is substantial variation in the variable FDI, corruption and life expectancy whereas other variables are relatively evenly distributed.

4.4 Empirical Specification

**Fixed Effects Regression Model**

In this thesis panel data was used to estimate the factors that affect economic growth in sub-Saharan African countries. Time-series data was used together with cross-sectional data to achieve a panel (longitudinal) data which gave a more analytical data set. Panel data has an advantage in a way that it increases the size of the sample being observed and it also gives a deeper view into an analytical question that is not obtainable with cross-sectional or even time-series data by itself. The fixed effects model was used in this thesis because it allows for each cross-sectional unit to have a different intercept. The model avoids bias due to omitted variables that don’t change over time, e.g. race, gender etc. (unobserved heterogeneity); The model does experience less bias due to time invariant omitted variable (Studenmund, 2013).

**Linear Regression Model**

\[
\text{GDP/capita growth}_{it} = \beta_0 + \beta_1 \text{Popg}_{it} + \beta_2 \text{FDI}_{it} + \beta_3 \text{Corr}_{it} + \beta_4 \text{Dem}_{it} + \beta_5 \text{Lifeexp}_{it} + \beta_6 \text{Edu}_{it} + \beta_7 \text{EF}_{it} + \alpha_i + \epsilon_{it}
\]

The model above has a total of 8 variables, that is, the dependent variable and 7 independent variables. Where GDP/capita growth stands for economic growth for country \(i\), at a time period \(t\). \(\beta_0\) is the intercept, \(\epsilon\) is the error term and \(\alpha_i\) is the fixed effect on a country.

4.5 Multicollinearity

Multicollinearity was tested for, for a better analysis of this study. Studenmund (2013) writes that one can detect multicollinearity by testing the simple correlation coefficients (test for
Economic growth in sub-Saharan African countries.

strength and direction of linearity (positive or negative)) between the independent variables. This simple correlation coefficient is between +1 and -1, and the closer it is to +1, the higher the correlation. The problem of multicollinearity arises when the simple correlation coefficient is higher than the ‘arbitrary number’ 0.80 according, and ‘the simple correlation coefficient is high if it causes unacceptably large variances in the coefficient estimates in which we’re interested.’ (ibid.2013)

Table 4: Correlation table for all variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>GDPgr</th>
<th>Popgr</th>
<th>FDI</th>
<th>Corr</th>
<th>Dem</th>
<th>Lifeexp</th>
<th>Educ</th>
<th>EF</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPgr</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popgr</td>
<td>-0.006</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDI</td>
<td>0.015</td>
<td>0.138</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corr</td>
<td>0.120</td>
<td>-0.442</td>
<td>-0.054</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dem</td>
<td>0.107</td>
<td>-0.310</td>
<td>-0.026</td>
<td>0.722</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifeexp</td>
<td>0.041</td>
<td>-0.141</td>
<td>0.065</td>
<td>0.595</td>
<td>0.520</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educ</td>
<td>0.079</td>
<td>-0.437</td>
<td>0.021</td>
<td>0.561</td>
<td>0.530</td>
<td>0.550</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>EF</td>
<td>0.164</td>
<td>-0.253</td>
<td>-0.132</td>
<td>0.642</td>
<td>0.695</td>
<td>0.527</td>
<td>0.504</td>
<td>1.000</td>
</tr>
</tbody>
</table>

The table above shows the findings after testing for multicollinearity. According to the results, there is no observable multicollinearity between the variables in this study; all the simple correlation coefficients are under 0.80.
5. Results

The table below shows the results found for this thesis. It displays the estimated coefficient and the t-statistics for each variable using of panel data with a fixed effects model.

Table 5: Regression results for period 2006-2017.

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>GDP per capita growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constant</strong></td>
<td>-3.625734 (-0.54)</td>
</tr>
<tr>
<td></td>
<td>6.731157 0.591</td>
</tr>
<tr>
<td><strong>Popg</strong></td>
<td>4.370276 (3.76)</td>
</tr>
<tr>
<td></td>
<td>1.163174 0.000***</td>
</tr>
<tr>
<td><strong>FDI</strong></td>
<td>0.0494908 (0.86)</td>
</tr>
<tr>
<td></td>
<td>0.0578178 0.393</td>
</tr>
<tr>
<td><strong>Corr</strong></td>
<td>0.0980371 (1.33)</td>
</tr>
<tr>
<td></td>
<td>0.0737048 0.185</td>
</tr>
<tr>
<td><strong>Dem</strong></td>
<td>0.2256299 (0.43)</td>
</tr>
<tr>
<td></td>
<td>0.522735 0.666</td>
</tr>
<tr>
<td><strong>Lifeexp</strong></td>
<td>-0.2415300 (-2.09)</td>
</tr>
<tr>
<td></td>
<td>0.1156522 0.038**</td>
</tr>
<tr>
<td><strong>Educ</strong></td>
<td>0.439122 (0.90)</td>
</tr>
<tr>
<td></td>
<td>0.4863008 0.367</td>
</tr>
<tr>
<td><strong>EF</strong></td>
<td>-0.0022144 (0.00)</td>
</tr>
<tr>
<td></td>
<td>0.909092 0.998</td>
</tr>
</tbody>
</table>

Note: p<0.1 = *, p<0.05 = **, p<0.001 = *** and t-statistics in parenthesis.

R-squared 0.0031
Prob > F 0.0099
Observations 324

Table 4 shows the results of 324 observations, meaning it uses balanced data. It shows the estimated coefficient (magnitude) which is the size of the effect of each variable, the t-statistic in parenthesis, the standard error and the p-value that is used to show the significant levels. The overall regression run shows which variables that significantly affect economic growth, i.e. population growth and life expectancy. The other variables show an effect on economic growth; however, no significance is seen.
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The constant (intercept) was (-3.626), meaning that if all the variables were equal to 0, GDP would decrease by 3.626%.

The estimated coefficient of the variable population growth is positive; at a significance level of 1% meaning that it had a positive effect on GDP per capita growth.

Foreign direct investment has a positive coefficient (0.049), with no significance. This means that the variable FDI had a positive effect on economic growth.

Corruption has a positive estimated coefficient (0.098) and showed no significance, meaning the level of corruption measured by the corruption index had a positive impact on economic growth.

Democracy has a positive coefficient (0.226) with no significance. This means that democracy had a positive impact on economic growth.

Life expectancy has a negative coefficient (-0.242) at a significance level of 5%, meaning the variable had a negative impact on economic growth.

Education has a positive estimated coefficient (0.439) with no significance. This means that the variable expected years of school had a positive impact on GDP per capita growth.

Economic freedom had a negative estimated coefficient (-0.002) and no significance, meaning the variable had a negative effect on economic growth for this study.
6. Discussion and Analysis

In this study, population growth showed a positive impact on GDP per capita growth and its effect was significant. This can be explained by the Solow model that ‘a higher rate of population growth pushes the economy onto a lower trajectory of per capita income.’ (Ray, 1998). He means that a slow growth in population, if equipped with human capital will cause GDP to increase in a given period from one steady state to another, and this is what the results of this study perhaps show. However due to diminishing marginal returns, as the population increases, the economy will slow down, in other words the return to capital will decrease; in the short run, population decrease may be of advantage to a country’s economic growth. The effect of population growth may arise due to limited resources and finances to low income large families. However, in the study by Dao Q. (2012), high population has a negative impact on economic growth. Developing countries that are densely populated in the sub-Saharan tend to have low levels of GDP per capita due to a high number of unskilled labor.

In the theoretical discussion, the Solow model was used to discuss the endogeneity of the capital-output ratio using the production function to show the relation of GDP per capita and the stock per capita. The OLI framework was also used to explain how FDI is applied in a given country. The results indicate that FDI as a means of capital accumulation has a positive effect on GDP per capita growth although it is not significant in the regression run for this study. Ezeoha et al. (2012) in their study also argue that the ability for a country to attract FDI is influenced by the wellbeing of the standing institution. Their results show that FDI has a positive impact on economic growth. Therefore, as hypothesized FDI proved true to having a positive effect on economic growth in sub-Saharan Africa.

The level of Corruption showed a positive effect on economic growth with no significance. The empirical result did not match with the hypothesis made and the results from earlier studies. As mention earlier by Svensson (2005), due to different types of corruption, it is hard to conclude its effect on economic growth. This could be why this study on sub-Saharan countries with relatively high levels of corruption showed a positive effect on economic
Economic growth in sub-Saharan African countries.

growth. The results of this study are contradictory to those of Ugur and Dasgupta (2011), that corruption has a negative effect on economic growth. They explain that the negative indirect effect of corruption on economic growth is relatively larger than the negative direct effect. A country may experience corruption through indirect channels, i.e. limited access to public goods, human capital which may affect economic growth.

An example of a sub-Saharan country that recovered from a dark time due to corruption is Rwanda. Its level of corruption has decreased by over 45 percent over the 12-year period looked in this study, having one of the highest corruption indices in the year 2017.

In the summer of year 1994, a mass murder (genocide) took place among ethnic groups Tutsi, Twa and the hutu in Rwanda. Around eight hundred thousand people were killed due to corruption (racism) in the country’s government institution led by Hutu, Interahamwe and impuzamugambi (political institutions). The genocide was motivated by anti-tutsi racism, Hutu power. Rwandan patriotic front initiated the Rwandan civil war 1990 and ended the Rwandan genocide in 1994 (Shaw. J, 2012).

The mass murder happened as a result of corruption amongst political leaders, and ethnic groups. ‘Plagued with low morale and discipline, corruption in the officer corps, poor training, lack of pay, and other systemic issues within its ranks the RGF (Rwandan government forces) increasingly looked less a match against the RPF (Rwandan patriotic front)’. This is because the RPF had a great leader, Paul Kagame, due to his strong forces and literacy. Shaw. J (2012) writes that Rwanda recovered from this horrible history by reinforcing ‘aggressive anti-corruption laws’ and is currently under the rule of President Kagame. The country on average has an annual five percentage economic growth (world bank 2020) and universal health insurance. Rwanda is estimated as one of the leading countries in fighting corruption and is ranked 48th in the world in its corruption index (transparency international, 2018). The country also had the highest average percentage of GDP per capita growth amongst all sub-Saharan African countries included in this study.

Democracy showed a positive effect on GDP per capita growth in this study. The result is not completely in line with the previous studies’ by Antić (2004), Helliwell (1994), Barro (1996)
and Rodrik (1997). Their empirical studies are unable to show an absolute connection between democracy and GDP per capita growth. They however argue that democracy is more reliable than dictatorship because it is a link between some growth parameters. In argument for dictatorships, Antić (2004) writes that highly populated developing countries experience more economic growth than highly populated democratic developing countries.

It is less risky to live in a democracy than in a dictatorship and democracy limits instability in the economy due to its benefits (significance). Democracies lower unexpected changes in the economy, in other words they are better performers when it comes to economic shifts because of inclusion (ibid. 1997). To back up the result of this study, in Table 6, some sub-Saharan African countries had mixed data of democracy in comparison to GDP per capita growth. For example, on average South Africa had a very high democracy index but its GDP per capita growth over the period 2006-2017 was relatively low. Mauritius that had the highest democracy index had a moderate change in GDP per capita growth, whereas, Rwanda that had a relatively low democracy index possessed the highest GDP per capita growth.

Life expectancy showed a negative effect on economic growth with relatively high significance. According to Carlin et al. (2006), when life expectancy increases it leads to an increase in productivity favoring the Solow model. However, a decrease in population growth rate in a given period may cause GDP per capita to increase due to the growth in capital intensive production, although in the long run this increase may be limited due to the role of diminishing marginal returns. This explains the results from this study, that life expectancy has a negative effect on economic growth, meaning that an increase in life expectancy which leads to an increase in population also has a negative impact on the economy, i.e. a heavy population can lead to an increase in unemployment which lowers GDP in the long run. Cervellati et al. (2009) writes that an increase in life expectancy increases population, lowers human capital a little which later on tend to reduce GDP per capita in countries with high fertility and mortality whereas in post-transitional countries, it lowers population, increases human capital and highly increases GDP per capita. Sub-Saharan countries tend to have high
Economic growth in sub-Saharan African countries.

fertility level and high death-rates, which proves the result of this study. Life expectancy has a negative impact on economic growth in the sub-Sahara in this study as well.

In this study, education had a positive effect on GDP per capita growth. The human capital accumulation model says that at a given level, human capital (education) when constant produces an increased amount of capital and that it is very important for economic growth (Carlin et al. 2006). Part of the determinants of a country’s welfare include education, and endogenous theories explain that it is the root of innovation (technical progress). Therefore, investment in human capital will cause growth in GDP per capita due to an educated labor force being efficient; productivity.

According to Romer (1989), without parameters like life expectancy and investment, parameters relatively low in the sub-Sahara compared to many developing countries, human capital on its own has no effect on economic growth. Even at low levels, these parameters exist in most sub-Saharan African countries and this may have influenced the result of this study causing education to have a positive effect on economic growth. Over nine sub-Saharan African countries including: Mauritius, South Africa, Cote d'Ivoire etc. had expected years of schooling above 10 years on average, and they all had positive GDP per capita growth for the 12 year period, hence causing an overall positive effect of education on economic growth for this study.

Economic freedom showed a negative effect on economic growth in this study and was not completely in line with the results from previous studies. The expected result could be linked to the study by Šeputienė (2007) that the level of economic freedom is dependent on the quality of the institution in place (in a country) in order to cause a growth in GDP per capita. In the model her results showed a stark (positive) and significant relationship between the level of economic freedom and economic growth (GDP per capita). She argues that this result is dependent on the country in question and the dependent variable used in the model. For this study the dependent variable was GDP per capita, and the result of the estimated coefficient of the economic freedom index was negative. This result could possibly be due to the low
Economic growth in sub-Saharan African countries.

average percentage of economic freedom in some low income sub-Saharan African countries e.g. Central African Republic and Chad that had a negative GDP per capita growth over the period studied, hence causing the overall negative result of the effect of economic freedom on economic growth.
7. Conclusion and Summary

The purpose of this thesis was to find out which factors affect economic growth in the sub-Saharan African countries. The model builds upon different theories of growth. The empirical results are however insignificant, and, in that regard, only marginal conclusions can be drawn. The results suggest that further investigations should consider more case studies, and perhaps more advanced econometric modelling.

Population showed a positive effect on GDP per capita, i.e. a growth in population would cause an increase in GDP per capita by 4.370% holding all the other independent variables constant. The result did not match with the hypothesized result because in all the previous studies looked at, population showed a negative effect on economic growth. It was however backed by the Solow model, that an increase in population may cause the need for society to perform economically in areas such as innovation, expansion of workplaces, etc. (demand). On the supply side, population may improve development because it is better to have more people available to work, more ideas etc. hence technical progress. With technical progress comes efficient labor and this is assumed to cause a growth in GDP per capita due to population growth and labor productivity as mentioned earlier. Therefore, for this study an increase in population in the sub-Saharan African countries studied, if there is investment in human capital, technical progress (which they are both) will cause an increase economic growth.

Life expectancy showed a negative effect on economic growth with significance for the fixed effects model run. That is, a negative change in life expectancy will cause GDP per capita to decrease by 0.2415% holding all the other variables constant. The result came out as expected. Because life expectancy causes an increase in population (which in this study has a positive effect on GDP per capita growth) it should have a positive effect on economic growth too. However, the result life expectancy is dependent on demographic transition, as sub-Saharan countries are moving towards the second phase. There is poor information transfer in this region and little to no welfare for old people which is the likely cause of a decrease in economic growth.
The empirical results give no guidance concerning the variables, i.e. FDI, corruption, democracy, life expectancy at birth, expected years of schooling and economic freedom, that are insignificant.

Which factors affect economic growth in sub-Saharan Africa? This study indicates that population growth and life expectancy have a significant effect on GDP per capita growth. However, other variables estimated were statistically insignificant. One limitation of this study is the number of sub-Saharan countries included in the study. In the future a case study approach could consider the level of development, i.e. low-income, middle-income and high-income levels to see a variation in the results. The time period investigated could also be increased to at least 15 to 20 years using unbalanced data. Another limitation was the broadness of the corruption perceptions index scale that could have caused the result of this study to be different, hence further research for a more reliable result could be applicable.
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Appendix

Graph 1: Scatter plot of corruption and GDP per capita: Mid-year 2011

The scatter plot above shows the positive association between GDP per capita growth and the corruption index on the scale of zero to one hundred (0 = high corruption and 100 meaning low corruption). On the graph, the line slopes up-wards due to the scale the corruption index which makes it seem as though corruption had a positive association with GDP per capita. However, according to the data and the definition of the corruption, the variable has a negative association with GDP in the sub-Saharan.
Economic growth in sub-Saharan African countries.

Graph 2: Scatter plot of Economic freedom and GDP per capita: Mid-year 2011

The scatter plot above shows the positive association between GDP per capita and Economic freedom- in the mid-year 2011. The positive association shows that sub-Saharan countries with a high GDP per capita growth on average tend to have more economic freedom than those with a lower GDP per capita growth, hence the line sloping up-wards.
Economic growth in sub-Saharan African countries.

Table 6: Average change for all variables for period 2006-2017.

<table>
<thead>
<tr>
<th>Country</th>
<th>ΔGDP/C</th>
<th>Popg</th>
<th>FDI</th>
<th>Corr</th>
<th>Lifeexp</th>
<th>Educ</th>
<th>EF</th>
<th>Dem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin</td>
<td>2.748</td>
<td>2.804</td>
<td>1.865</td>
<td>32.75</td>
<td>59.632</td>
<td>11.492</td>
<td>6.173</td>
<td>5.933</td>
</tr>
<tr>
<td>Botswana</td>
<td>2.853</td>
<td>1.696</td>
<td>3.367</td>
<td>59.917</td>
<td>62.062</td>
<td>12.4</td>
<td>7.123</td>
<td>7.721</td>
</tr>
<tr>
<td>Cameroon</td>
<td>1.480</td>
<td>2.716</td>
<td>1.712</td>
<td>24.583</td>
<td>55.854</td>
<td>10.733</td>
<td>5.833</td>
<td>4.168</td>
</tr>
<tr>
<td>Central African Republic</td>
<td>-0.177</td>
<td>1.078</td>
<td>1.837</td>
<td>22.417</td>
<td>48.482</td>
<td>6.808</td>
<td>5.178</td>
<td>1.688</td>
</tr>
<tr>
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