The Impact of Human Capital Development on Economic Growth in Germany (1991-2018)

Author: Hellen Momoh
School: Georgetown University, United States of America

Abstract
This paper examined the impact of human capital development on economic growth in Germany from 1991 to 2018, using time series data from the World Bank Indicator and the National Bureau of Statistics. In Germany, the service industry accounts for up to 85% of total employment, with a heavy focus on education, research, the cultural and creative sectors as well as health services. Despite being shrunk since reunification, the public sector continues to account for the vast majority of employment. The health services industry, which employs over 180 000 people in Berlin, is the most significant economic sector. As the most common type of organization in the private sector, small and medium-sized firms account for 80% of total employment in Berlin. Berlin's social structure is characterized by a significant migrant population, which is reflected in its economy. The goal of this research was to investigate the link between human capital indices (education and health) and economic growth. The ordinary least square regression analysis is used in this study to examine the impact of human capital development on German economic growth from 1991 to 2018. The empirical findings show that human capital development has a significant impact on economic growth, as measured by GDP. According to theory, the human capital development indicators of secondary school enrollment, primary school enrollment, gross capital formation, total labor, gross domestic product and life expectancy have a positive and statistically significant run long impact on Germany's economic growth, implying that these indicators are critical in achieving growth in the German economy in the long run. Life expectancy and gross capital formation, on the other hand, have a positive and statistically significant impact on Germany's economic growth in the short run. According to the study, the German government should ensure that adequate resources are allocated for human capital development in order to boost economic growth in Germany.
Keywords: Human Capital, Economic growth, Gross Domestic Product (GDP) and Life expectancy
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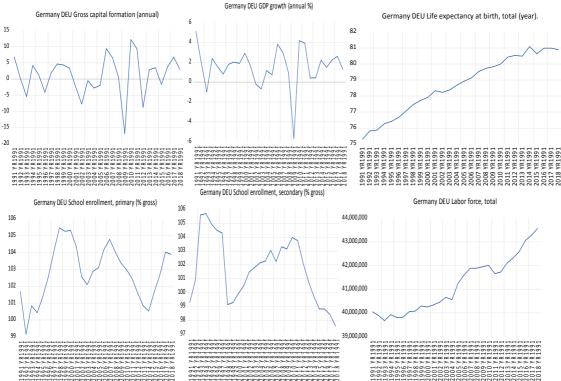**Publication date:** November 30th 2021

Introduction

An increase in productivity is the primary source of per capital output in any country, whether developing or developed, with a market economy or one that is centrally planned. However, per capita output growth is an important component of economic well-being (Abramowitz, 1981). In recent years, the impact of human capital development and economic growth has emphasized the growth theory (Romer, 1986; Lucas, 1988). One intriguing idea in their work was that, in the long run, output per unit of input could increase even when all inputs were fully accounted for.

As the global economy shifts toward more knowledge-based sectors, the development of skills and human capital becomes a critical issue for policymakers and practitioners involved in economic development at the national and regional levels (OECD 1996). Human development refers to the process of acquiring and increasing the number of people who have the necessary skills, education, and experience for a country's economic and political development.

As a result of the country's reunification, the German labor market has experienced significant upheaval. Because of the rise of the East European nations, its competitive position altered, and its labor market institutions reacted by implementing creative modifications that significantly boosted its flexibility and adaptability. Resulting from the strain of a harsh recession, the "Hartz Reforms" reduced the amount and length of unemployment benefits while increasing the incentives to find work (Jacobi and Kluve, 2007). In recent years, the regulation of temporary and contract labor has been relaxed, which has contributed to the development of a two-part labor market: a regular or core labor market, which has historically provided workers with significant job security as well as high wages, as well as a secondary labor market, which employs temporary and part-time workers. In addition, there has been a significant decentralization of labor-management talks, with more decisions being reached at the business level than before (Eichhorst and Tobsch, 2014). The structure of German labor-management relations is unique in that it places a strong emphasis on work councils, which represent workers in medium and large enterprises on a wide range of local issues, as well as on a system of codetermination, which includes worker representatives on the boards of directors of large corporations.

According to the International Bank for Reconstruction and Development and the World Health Organization, many developed countries have used their human capital to make significant progress in terms of productivity and technological advancement. Despite the popularity of human capital utilization in developed countries, many

developing countries have yet to recognize the fact that human capital can be used as a major driving force to facilitate an improved economy. Many developing countries, including those in Sub-Saharan Africa and West Africa, have yet to reach their full potential in terms of spending on human capital as a component of economic growth. The lack of government spending on human capital in these Sub-Saharan African countries has contributed to a slew of issues ranging from poor educational delivery, which results in under-educated graduates, to inadequate healthcare infrastructure (Ragan & & Lipsey, 2005). According to Galbraith, industrial growth is a function of investment in human capital development rather than physical capital, and a country's human capital becomes more productive if it has efficient human capital. As a result, physical capital and human capital play complementary roles. As discussed further below, there is a causal system linking education and health via numerous pathways.

World Development Indicators is the source of this information.

Germany's GDP growth (annual %), gross capital formation (annual % growth), total labor force, total life expectancy at birth (year), school enrollment at primary (% gross) and school enrollment at secondary (% gross) are all shown in the graphs above from 1991 to 2018.

The paper also makes a methodological contribution by looking at the impact of human capital on economic growth not only using a single equation but also taking into account the variables' simultaneous effects. The primary goal of this paper is to empirically measure and analyze the impact of human capital on economic growth in Germany from 1991 to 2018. The rest of the paper is organized as follows. Section 2 examines the empirical literature on human capital and growth. Section 3 discusses the data, and Section 4 discusses the econometric framework and methodology. Section 5 analyzes estimation results, and Section 6 concludes the paper.

Review of Conceptual Literature

Capital is described as "those factors of production used to produce goods or services that are not themselves significantly consumed in the production process" in economic terms, while the human element is in charge of all economic activities such as production, consumption, and transactions that are required to get products to customers (Boldizzoni, 2008). This means that human capital is a critical component of the manufacturing process that adds value. Schultz (1961) acknowledges that human capital is one of the key factors determining economic growth. He defined human capital as the stock of productive knowledge and skills held by workers. Human capital is defined as 'something akin to property,' i.e., knowledge and skills embedded in an individual (Beach, 2009).

Economic Growth

Tadaro (2007) defined economic growth as the process of increasing the productive capacity of the economy over time in order to raise the level of national output and income. Kuznets (1966), on the other hand, sees economic growth as a long-term process characterized by a significant and sustained increase in real national income, total

population, and real per capita income. According to Kindlerberge (1965), economic growth means more output resulting from increased efficiency. However, according to Friedman (1972), economic growth is defined as an expansion of the system in one or more dimensions without a change in its structure. Thus, economic growth is associated with a quantitative sustained increase in a country's per capita output or income, accompanied by an increase in labor force, consumption, capital, and trade volume Jhingan (2013).

From the preceding definitions, it is critical to understand that economic growth is essentially a long-run process involving a period of time, an increase in real per capita income level and volume of production linked with a large increase in the productive ability of the economy, urbanization, equitable distribution of income and wealth among the population, and a reduction in poverty and unemployment.

Human Capital Development

Human capital development, according to Aluko (2015), means improving people's skills, knowledge, productivity, and inventiveness through a process of human capital formation broadly defined. As a result, human capital development is a people-centered strategy rather than a goods-centered or production-centered strategy of development. According to Torruam and Abur (2014), human capital development can be defined as the process of developing people's skills, knowledge, productivity, and inventiveness through the process of human capital formation. It is a people-centered development strategy that is recognized as an agent of national development in all countries around the world.

Human capital formation is the process of acquiring and increasing the number of people who have the necessary skills, health, education, and experience for economic development. [4] Formal paraphrase Human capital development refers to the process of acquiring and increasing the number of people who have the necessary skills, education, and experience for a country's economic and political development. Thus, human capital development is linked to investment in man and his development as a creative and productive resource (Jhingan 2013).

Rastogi (2002) defines human capital as "knowledge, competency, attitude, and behavior that is embedded in an individual." Human capital has been classified as important in and of itself, but it is also important in the accumulation process. This viewpoint emphasizes the knowledge and skills gained through educational activities (De la Fuente & Ciccone, 2002). The third perspective is closely associated with the perspective of human capital based on production (Dae-Borg, 2009).

The term "investment people make in themselves to increase productivity" is described by Rosen (1999). Furthermore, human capital has been defined as "an amalgamation of factors such as education, experience, training, intelligence, energy, work habits, trustworthiness, and initiative that affect the value of a worker's marginal product" (Frank and Bemanke, 2007). The global economy's shift toward more knowledge-based sectors (such as research and development, pharmaceuticals, and ICT-based sectors) has encouraged policymakers to pay closer attention to skill and human capital development (OECD, 1996).

The basic human capital theory, a refinement of the marginal-productivity theory, has since become a dominant way of understanding how wages are determined. Gary S. Becker, an American student of Theodore Schultz, helped shape the theory significantly. According to the human capital theory, education and training are investments in skills and competencies (Becker, 1964). It holds that earnings in the labor market are determined by an individual's knowledge and skill set. It is also argued that, based on rational expectations of returns on investment, individuals make decisions about the education and training they receive as a means of increasing their productivity, implying that investments in human capital are determined by the costs of acquiring the skills and the expected returns.

Empirical Analysis

Several studies have shown that various forms of human capital accumulation yield high returns, including basic education, research, training, learning by doing, and capacity building. Education broadens people's perspectives on themselves and the world. It improves the quality of their lives and has a wide-ranging social benefit for both individuals and society. Education increases people's productivity and creativity while also encouraging entrepreneurship and technological advancements, as evidenced in Malaysia, Bolivia, and China (World Bank, 1999).

The World Development Report (1997) investigates the role of knowledge in development. The report emphasizes some well-known lessons, such as the importance of knowledge gained through trade and foreign investment. It also emphasizes some that have been overlooked in the past, such as how imperfect information leads to failure in all markets and the importance of institutions in facilitating the flow of information. Furthermore, the report examines the role of knowledge in development, looking at differences in knowledge across and within countries, the impact of knowledge gaps and information failures on development, and how governments in developing countries and international institutions can foster development by addressing these issues.

Hadir and Lahrech (2015) used annual data from 1973 to 2011 to examine the relationship between human capital development and economic growth in Morocco.

The ordinary least square regression method was used, with total government expenditure on health and education as a proxy for human capital, and enrolment data from tertiary, secondary, and primary schools as a proxy for human capital. The study found a link between total government education spending, total government health spending, primary school enrollment and secondary school enrollment. As a result, they recommended that the government's efforts to increase primary school enrollment through free compulsory Universal Basic Education be sustained, and that the government invest more and more in health. Thus, improvements in health can boost output not only through labor productivity, but also through capital accumulation.

Romer and Weil (1992) investigated the role of human capital in Germany's economic development empirically. The paper made use of a number of analytical tools, such as unit root tests, cointegration tests, and error correction mechanisms (ECM). Empirical evidence suggests that there is a long-run relationship in Germany between labor force, physical capital investment as measured by real gross domestic capital formation, human capital formation as measured by enrollment in educational institutions, and economic growth. The findings indicate that in Germany, there is a feedback mechanism between human capital formation and economic growth.

In a series of OECD data from 1971 to 1998, Bassanini and Scarpetta (2001) discovered that increasing schooling duration by one-year results in a 6% increase in GDP per capita. Benhabib and Spiegel (1994) demonstrated that the introduction of human capital as a factor of production by function type Coob -Douglas has a negligible effect on GDP per capita growth, but when the influence of human capital on total factor productivity is considered, the effects are visible in two ways: a) Human capital influences the internal rate of innovation, as Romer (1990) demonstrated; b) human capital influences the rate of technological diffusion, as Nelson and Phelps demonstrated (1966). They demonstrate that a 1% increase in capital stock leads to a 0.13 percent increase in growth rate, and that the process of catching up with other countries' technological development is strongly influenced by human capital stock nationwide, as demonstrated by Funke and Strulik (2000).

Ekesiobi, Dimnwobi, Ifebi, and Ibekilo (2016) investigated the relationship between public sector education investment and manufacturing output in Nigeria. The Augmented Dickey Fuller (ADF) unit root test and the Ordinary Least Square (OLS) technique were used in the study to examine the relationship between public educational spending, primary school enrolment rate, per capita income, exchange rate, foreign direct investment, and manufacturing output growth. According to the study, public education spending has a positive but insignificant effect on Nigerian manufacturing output growth. They recommended, among other things, that the government direct education spending in ways that promote the growth of the manufacturing industry.

Dauda (2010) investigated the role of human capital in Nigeria's economic development using the human capital model of endogenous growth developed by Mankiw, Romer, and Weil (1992). The paper made use of a number of analytical tools, such as unit root tests, co-integration tests, and error correction mechanisms (ECM). Empirical evidence suggests that there is a long-run relationship in Nigeria between labor force, physical capital investment as measured by real gross domestic capital formation, human capital formation as measured by enrollment in educational institutions, and economic growth. According to the findings, there is a feedback mechanism between human capital formation and economic growth. As a result of the findings, the policy implication is that the government should prioritize human capital development. Efforts should be increased to increase investment in human capital in order to achieve the growth that will lead to economic development. Above all, education should be prioritized in Nigeria's development efforts. This would drive the economy's productivity higher.

Johnson (2011) assesses human capital development and economic growth in Nigeria using a conceptual analytical framework that employs the theoretical and ordinary least square (OLS) to analyze the relationship using GDP as a proxy for economic growth; total government expenditure on education and health as a proxy for total government expenditure; and enrolment patterns in tertiary, secondary, and primary schools as a proxy for human capital development. According to the findings, there is a strong positive relationship between human capital development and economic growth. Following the findings, it was suggested that stakeholders develop a more pragmatic method of developing human capabilities, as it is regarded as an important factor.

In addition, a proper institutional framework should be put in place to examine the manpower needs of various sectors and implement policies that will lead to overall economic growth.

Bundell and others (1999) believe that the rate of output growth is determined by the rate of accumulation of human capital and innovation, the source of which is the stock of human capital. Education level influences labor productivity.

They cited the following passages to support their ideas: a) the work of Griliches (1997), which demonstrated that in the United States over a 50-year period, a change in the level of education of the labor force resulted in a 33% increase in productivity; b) Jenkins (1995), which demonstrated that during 1971-1992, a 1% share breeding of highly skilled workers resulted in an increase of 0.42 to 0.63 percent of annual output; C) OECD record from the 1960s that experienced rapid growth as a result of increasing the number of highly educated; Englander and

Gurney (1999) demonstrated that growth in OECD countries of school enrolment from 70% in 1960 to 95% in 1985 led to an increase in labor productivity of 0.6% per year (Bundell and others, 1999, p.16-17).

Adenuga (2006) used Nigerian data from 1970 to 2003 to investigate the relationship between economic growth and human capital development. They used co-integration analysis with the Error Correction Mechanism and discovered that investment in human capital via the availability of infrastructure requirements in the education sector accelerates economic growth. According to the findings of this study, there will be no significant economic growth in any economy if human capital development does not take place.

Lawal N.A. and Wahab T.I. (2011) investigated the link between education and economic growth. The study emphasized that investing in quality and education quality would increase human capital, resulting in growth and long-term economic development. The study's model was estimated using the Ordinary Least Squares technique. The findings revealed that there is a direct relationship between education investment and economic growth in Nigeria. The growth model also indicated that including more than one economic sector and taking into account technology would result in spillover across sectors. Oluwatobi and Ogunrinola (2011) investigated the relationship between the government's human capital development efforts and Nigeria's economic growth.

Ehimare, Ogaga-Oghene, Obarisiagbon, and Okorie (2014) investigated the Nigerian government's Human Capital Development Expenditure. The level of human capital development, which is a reflection of a country's health and education, influences the level of economic activity in that country. Using the Phillip Peron test, the unit root test was used to determine whether the variables are stationary or not. The data analysis was carried out using Data Envelopment Analysis with Input Oriented Variable Return to Scale in order to capture the efficiency of government expenditure on human capital development in Nigeria. According to the study's findings, there has been a significant decrease in the efficiency of government expenditure since 1990 up until 2011. As a result, the Nigerian education sector's poor quality and output could be evidence of this result. It is thus suggested that efforts be made to encourage and promote self-dedication, commitment, and service delivery in order to improve the quality of educational output in Nigeria in terms of human capital and capacity building.

Obi and Obi (2014) used time series data from 1981 to 2012 to examine the impact of education spending on economic growth as a means of achieving the desired socioeconomic change in Nigeria. The Johansen co-integration analysis and ordinary least squares (OLS) econometric techniques were used to examine the relationship between GDP and recurrent education expenditure. The findings show that, while there is a positive relationship between education spending and economic growth, there is no long-run relationship over the study period. They propose that the education system be improved by making better use of public resources through good governance, accountability, and transparency. Additionally, policymakers should make efforts to develop policies that will check, preserve, and protect the plight of educational capital to other countries.

Also, Mat, Mansur, and Mahmud (2015) used the Ordinary least square (OLS) technique of analysis to study the effects of human capital investment on education, health, and migration to economic development in Sabah (Malaysia) from 1980 to 2010. Findings show that higher GDP per capita is influenced by higher literacy rate, longevity of life expectancy at birth, and requisition.

Furthermore, Adeyemi and Ogunsola (2016) used ARDL Cointegration analysis to investigate the relationship between human capital indices (education and health) and economic growth in Nigeria from 1980 to 2013. The study's findings revealed a positive long-run relationship between secondary school enrollment, public education spending, life expectancy rate, gross capital formation, and economic growth, but it is statistically insignificant. The findings also revealed a negative long-run relationship between primary and tertiary school enrollment, public health spending, and economic growth.

DATA AND METHODOLOGY

This chapter describes the data used in this study as well as the sources of that data. It also specifies the models that were used to establish the relationships between the study's variables, as well as the various estimation techniques. In the study, a panel regression model of the type developed by Pedroni (2000) was used. The primary advantage of a panel data set over a cross section or time series is that it combines both cross sectional and time series elements, giving the researcher greater flexibility in analysis individual differences in behavior are modeled. The survey research design was used in this study, and the time series annual secondary data was used for the purpose of the study. The time series were chosen because the data used in this study was gathered over time and aims to investigate the effect of human capital development on economic growth in Germany.

The ordinary least squares regression (OLS) method was used to investigate the impact of human capital development on Germany economic growth. The dependent variable in the study was Gross Domestic Product, while the independent variables were human capital development as measured by life expectancy, gross capital formation, primary school enrolment, secondary school enrolment, and total labor force. Data were obtained from World Bank World Development indicators from 1991 to 2018.

The variables that were assessed were as follows:

GDP growth (% annual)- GDP annual percentage growth rate at market prices in constant local currency. The aggregates are calculated using constant 2010 US dollars. GDP is calculated as the total of the gross value contributed by all resident producers in the economy, plus any product taxes and minus any subsidies not included in the product value. It is computed without regard for depreciation of manufactured assets or depletion and deterioration of natural resources.

Gross capital formation (annual % growth)- based on constant local currency, average yearly increase in gross fixed capital creation. The aggregates are calculated in 2010 US dollars. Land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings, are all examples of gross fixed capital formation (formerly gross domestic fixed investment). Net acquisitions of assets are also considered capital creation, according to the SNA of 1993.

Total life expectancy at birth (year)- Life expectancy at birth is the number of years a newborn infant would live assuming mortality trends at the moment of birth remained constant throughout its life.

Total labor force- The total labor force is made up of persons aged 15 and up who provide work for the production of products and services over a set period of time. Persons who are currently working, people who are jobless but looking for employment, and first-time job searchers are all included. However, not everyone who works is included. Unpaid employees, family workers, and students are frequently overlooked, and members of the military forces are not counted in some nations. Seasonal workers enter and exit the labor market, causing the labor force size to fluctuate throughout the year.

School enrollment at primary (% gross)- The gross enrolment ratio is the ratio of overall enrollment, independent of age, to the population of the age group that corresponds officially to the degree of education displayed. Primary education teaches children fundamental reading, writing, and mathematical abilities, as well as an awareness of history, geography, natural science, social science, art, and music.

School enrollment at secondary (% gross)- The gross enrolment ratio is the ratio of overall enrollment, regardless of age, to the population in the age group that officially corresponds to the level of education represented. Secondary education completes the supply of fundamental education that began at the primary level, with the goal of establishing the groundwork for lifetime learning and human development by providing more subject- or skill-oriented training with more specialized teachers.

Descriptive statistics

	GDP	LE	PSE	GCF	SSE	TLF
Mean	1.532640	78.69390	102.7963	1.157017	101.7002	41168857
Median	1.736815	78.80610	102.7803	2.363972	101.9804	40953619
Maximum	5.108262	81.09024	105.4747	12.22313	105.6990	43562285
Minimum	-5.693836	75.31951	99.15635	-16.88906	97.59350	39672240
Std. Dev.	2.007255	1.809798	1.640164	6.174622	2.326274	1176271.
Skewness	-1.469474	-0.302817	-0.202773	-0.802331	0.042669	0.420667
Kurtosis	7.304698	1.838643	2.310027	4.033654	1.898069	1.958117
Jarque-Bera	31.69582	2.001466	0.747284	4.250609	1.425124	2.092258
Probability	0.000000	0.367610	0.688223	0.119397	0.490386	0.351295
Sum	42.91393	2203.429	2878.297	32.39646	2847.607	1.15E+09
Sum Sq. Dev.	108.7849	88.43494	72.63373	1029.401	146.1118	3.74E+13
Observations	28	28	28	28	28	28

Table 1.

The data in table 1 showed the descriptive statistics result of the following variables: Economic growth, Primary school enrolment, Secondary Education Enrolment, Gross capital formation, life expectancy and total labour force. There are 28 observations in the study.

Specifications for the Model

Human capital development has been identified as a major factor influencing economic growth in the majority of the world's economies. On this basis, it is possible to argue that there is a functional relationship between human capital development and economic growth. The study used a modified model of Hadir and Laurech (2015) to estimate the impact of human capital development on economic growth in Germany. Variable Economic growth = f (Primary school enrolment, Secondary Education Enrolment, Gross capital formation, life expectancy and total labour force).

METHODOLOGY

The Johnsen Co-integration Approach would be used to capture the study's objective, and the model would be based on the work of Jayeoba (2015), which was based on augmented Solow theory and an extension of Makiw, Romer, and Weil (1992) with modifications.

Therefore, the model for this study is specified below:

RGDP=f (SSE, PSE, GCF, LE, TLF) 1

$RGDP = \alpha 0 + \alpha 1 SSE + \alpha 2 PSE + \alpha 3 GCF + \alpha 4 LE + \alpha 5 TLF + Ut$ 2

Equation would be transformed into equation 3 in order to linearize the non-linear variables.

$lnRGDP = \alpha + \alpha 1\ lnSSE + \alpha 2\ lnPSE + \alpha 3\ lnGCF + \alpha 4\ ln\ LE + \alpha 5\ lnTLF + Ut$ 3

UNIT ROOT TEST

Variables	Test	T- statistics	P-value	T- statistics	P- value	Order of Integration
		Level		**1st Difference**		
GDP	ADF	-6.059145	0.0000	-5.076333	0.0005	I (0)
	P-P	-11.96782	0.0000	-14.46922	0.0000	I (0)
SSE	ADF	-1.521773	0.5076	-4.029797	0.0047	I (0)
	P-P	-1.929654	0.3145	-3.981466	0.0053	I (0)
PSE	ADF	-3.316217	0.0245	-3.493800	0.0177	I (0)
	P-P	-2.004620	0.2832	-4.609706	0.0012	I (0)
LE	ADF	- 2.561023	0.1136	- 7.595834	0.0000	I (0)
	P-P	- 3.358707	0.0219	- 7.588061	0.0000	I (0)
TLF	ADF	1.364358	0.9983	- 4.286604	0.0026	I (0)
	P-P	1.291444	0.9979	-4.260611	0.0027	I (0)
GCF	ADF	-6.240583	0.0000	-8.388896	0.0000	I (0)
	P-P	-8.194221	0.0000	-14.62967	0.0000	I (0)

TABLE 2

The variables in table 2 were subjected to the unit root test in order to determine their stationarity at level and 1st difference using the Augmented Dickey Fuller (ADF) and the Philip-perron tests. The unit root calculation reveals GDP, PSE and GCF are stationary at both level and 1st difference. SSE, LE and TLE were not stationary at level, but became stationary at 1st difference. This indicates that a unit root exists in the given scenario. This means that the null hypothesis, which asserts that no unit root exists in the variables at the level and first difference, has been rejected. Thus, the variables of order I (0) are integrated, indicating that the variables meet the co-integration requirements. As a consequence, the co-integration of the various variables may be evaluated.

Long run Johansen Co-integration test

Table 3.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.838171	153.4505	95.75366	0.0000
At most 1 *	0.791450	106.0989	69.81889	0.0000
At most 2 *	0.690613	65.34200	47.85613	0.0005
At most 3 *	0.489781	34.83974	29.79707	0.0121
At most 4 *	0.392189	17.34395	15.49471	0.0260
At most 5 *	0.155646	4.398782	3.841465	0.0360

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.838171	47.35156	40.07757	0.0064
At most 1 *	0.791450	40.75693	33.87687	0.0065
At most 2 *	0.690613	30.50226	27.58434	0.0205
At most 3	0.489781	17.49580	21.13162	0.1499
At most 4	0.392189	12.94516	14.26460	0.0799
At most 5 *	0.155646	4.398782	3.841465	0.0360

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3 showed of the long run Johansen co-integration test. The test indicates that there is a co-integration among

variables. Therefore, we reject the null hypothesis at 5%. The test revealed that there is positive significant relationship between human capital development and economic growth or there is a long run relationship among variables.

Short Run Co-integration test

Dependent Variable: GDP
Method: Least Squares
Date: 10/16/21   Time: 04:54
Sample: 1 28
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LE	0.111174	0.280436	0.396433	0.6956
PSE	-0.102280	0.120140	-0.851342	0.4038
GCF	0.297533	0.031130	9.557849	0.0000
SSE	-0.134612	0.091282	-1.474687	0.1545
TLF	-5.09E-07	4.49E-07	-1.134374	0.2688
C	37.59265	19.52373	1.925485	0.0672

R-squared	0.820876	Mean dependent var		1.532640
Adjusted R-squared	0.780165	S.D. dependent var		2.007255
S.E. of regression	0.941132	Akaike info criterion		2.903943
Sum squared resid	19.48605	Schwarz criterion		3.189415
Log likelihood	-34.65520	Hannan-Quinn criter.		2.991214
F-statistic	20.16392	Durbin-Watson stat		2.231245
Prob(F-statistic)	0.000000			

Table 4.

Table 4 showed the OLS Co-integration test. This showed that 82% predicting the dependent variable. Independent variables such as life expectancy at birth (year) and Gross Capital Formation have positive relationship with the dependent variable. The result showed that if life expectancy increases by 1%, GDP growth will increase 0.11%; if Gross Domestic Product increases by 1%, gross capital formation will increase by 0.29%. Therefore, life expectancy and gross capital formation have a positive relationship with GDP in the short run.

Test	Null hypothesis	Statistic value	Probability
Breusch-Godfrey Serial Correlation LM test	No serial correlation at up to 2 lags	2.654545	0.0935
Jarqua-Bera Normality test	Residuals are normally distributed	1.077187	0.583568
Heteroscedasticity test	No heteroscedasticity	1.292623	0.3028

TABLE 5.

Table 5 showed the result of the normality test, Breusch –Godfred Serial correlation LM test and the Heteroscedasticity test of the variables. The result revealed that there is no serial correlation at up to 2 lags. The result also revealed that the Jarqua- Bera normality test residuals are not normally distributed and there is no heteroscedasticity but rather homoscedasticity.
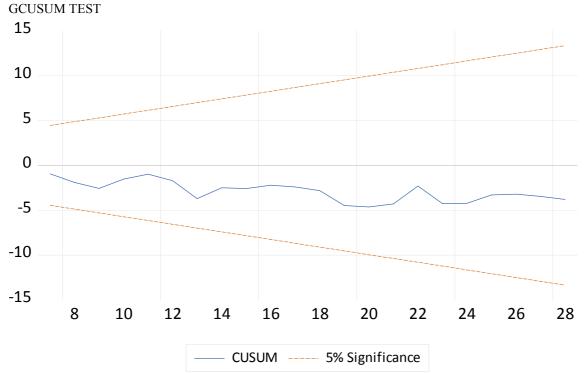
GCUSUM TEST

TABLE 6.

The Null hypothesis makes the assumption that the parameters are stable, while the alternative hypothesis makes the assumption that the parameters are not stable.

According to the results of the test, the BLUE line is contained inside the red lines. As a result, we accept the null hypothesis (which is desired) and reject the alternative hypothesis (which is not desirable), and we get to the conclusion that the residual variances are not unstable.
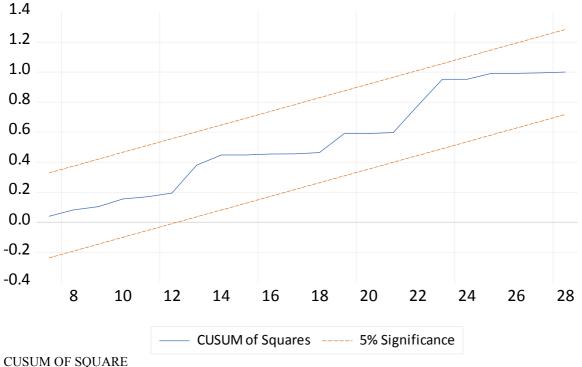

CUSUM OF SQUARE

Table 7.

Table 7 showed the result of the CUSUM of square test at 5% significance level. The result indicts that there is stability in the result because the blue line is found between the red lines.

Conclusion

Without a doubt, the study's empirical analysis shows that the level of human capital development in Germany has significantly influenced the level of their economic growth. Human capital development in Germany has a positive relationship with economic development. Human capital investment, with a focus on education, health, and school enrollment, has the potential to rapidly develop the economies of EUROPEAN member states. Human capital development in education may increase literacy rates due to additional schooling obtained for knowledge, skills, and technological know-how, and an increase in human capital may increase job opportunities because people are more willing to conduct business. This implies that they cannot be ignored if Germany is to achieve economic growth and development. Furthermore, the results show that, consistent with theory, all of the independent variables have a positive relationship with output level. This means that a greater amount of each would result in an increase in output or a rise in economic growth.

According to the findings of the study, human capital development has an impact on Germany's economic growth.

This is demonstrated by the positive and significant contribution of human capital indicators such as secondary school enrolment, tertiary school enrolment, government health expenditure, and government education expenditure to Germany's economic growth. As a result, the German government must ensure that it invests significantly in the development of Germany's human capital to the highest standards in order to ensure that Germany benefits optimally from such human capital development and experiences improved economic growth as a result.

One factor for Germany's low productivity growth over the last two decades has been the inflow of a huge number of immigrants who, on average, lack skills and higher education, as has been pointed out. Germany has made significant efforts to integrate these immigrants, teach them German, and assist them in acquiring the skills necessary for excellent employment. The role the educational system plays in preparing students for productive, impactful jobs and in stimulating the innovation essential for sustained economic development must be taken into consideration in order to enhance their long-term growth.

To increase physical capital formation in the education sector, the government should increase spending on social and economic infrastructure in order to improve labor force efficiency and productivity, and thus economic growth. The government's efforts to increase primary school enrollment through free compulsory Universal Basic Education should be sustained and extended to the end of junior secondary school.

Recommendations

As a result of these findings, the government and policymakers should prioritize human capital development as soon as possible. Since education remains the primary means of achieving long-term economic growth and development, concerted and sincere efforts should be made to build and develop human capacity through adequate educational funding at all levels. The government should implement the necessary education and training policies that aim to continuously upgrade a broad spectrum of human capital to a higher level and to re-energize innovation capacity that can ensure quality schooling for primary and tertiary education. Because an increase in life expectancy would boost economic growth, the government should devote more resources to the health sector in order to improve human capital development. The German government should increase total education spending in order to provide adequate educational facilities for thorough and proper quality education delivery. As a result of these findings, the government and policymakers should prioritize human capital development as soon as possible. Since education remains the primary means of achieving long-term economic growth and development, concerted and sincere efforts should be made to build and develop human capacity through adequate educational funding at all levels. The German government should make health care and education more affordable to the average person in society in order to boost German economic growth through human capital development.

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