Education Policy, Human Capital Development, and Economic Growth

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Abstract Education policy plays an important role in human capital development and long-term economic growth. This study examines the relationship between education policy, human capital accumulation, and economic performance by integrating human capital theory with endogenous growth perspectives. The study develops a conceptual framework linking education policy to human capital development and subsequently to labor productivity, technological adoption, innovation, and economic growth. The analysis shows that the economic contribution of education depends not only on educational participation and public expenditure but also on the quality, relevance, and distribution of educational opportunities. High-quality education can improve workers' knowledge and skills, enhance productivity, facilitate technological adoption, and support innovation. However, the effectiveness of education policy is influenced by several factors, including educational quality, equality of access, labor-market relevance, institutional capacity, and economic structure. Based on these findings, the study argues that governments should move beyond a narrow focus on enrollment expansion and increase attention to learning outcomes, vocational and industry-oriented education, digital and future-oriented skills, and evidence-based policy evaluation. Overall, effective education policy can help transform educational investment into productive human capital and strengthen the foundations of sustainable and inclusive economic growth.

Keywords education policy; human capital development; economic growth; labor productivity; technological adoption; innovation; education quality; public policy

1. Introduction

Education plays a fundamental role in economic development by improving individuals' knowledge, skills, and productive capabilities. From an economic perspective, education can be understood as an investment in human capital because it enhances workers' productivity and contributes to their future economic opportunities (Becker, 1964; Schultz, 1961). At the macroeconomic level, the accumulation of human capital can also support technological adoption, innovation, and long-term productivity growth. Consequently, education policy has increasingly been recognized not only as a social policy but also as an important component of economic development strategies.

Governments employ a range of education policies to influence human capital development, including public investment in education, compulsory schooling, higher education expansion, vocational training, teacher development, and financial support for students. However, increased educational participation or expenditure does not necessarily translate into equivalent improvements in economic performance. The quality of education and the skills actually acquired by students may be more important than years of schooling alone. Empirical research has demonstrated that measures of cognitive skills can have a stronger relationship with economic growth than conventional measures of educational attainment (Hanushek & Woessmann, 2008). This suggests that effective education policy should focus not only on expanding access to education but also on improving learning outcomes and developing skills relevant to changing labor markets.

Against this background, this study examines the relationship between education policy, human capital development, and economic growth. It addresses three main questions: how education policies contribute to human capital development, through what mechanisms human capital influences economic growth, and what factors determine the effectiveness of education policies. By examining these relationships, the study aims to demonstrate how education policy can contribute to productivity, innovation,

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and sustainable economic development while also highlighting the importance of educational quality, equality, and labor-market relevance.

2. Literature Review

2.1 Human Capital Theory

The relationship between education and economic development is strongly grounded in human capital theory. Schultz (1961) conceptualized education and other forms of skill development as investments that enhance individuals' productive capacities. Rather than treating labor as a homogeneous input, human capital theory emphasizes differences in workers' knowledge, skills, and capabilities. Becker (1964) further developed this framework by demonstrating that investments in education and training can generate economic returns through higher productivity, earnings, and employment opportunities. From this perspective, education represents both a private investment that benefits individuals and a social investment that can contribute to broader economic development.

2.2 Education and Economic Growth

Economic growth theory provides several explanations for the relationship between education and long-term economic performance. In the neoclassical growth framework, economic growth is influenced by capital accumulation, labor, and technological progress. The extension of this framework to include human capital suggests that education can affect economic output by increasing the quality and productivity of labor (Mankiw et al., 1992).

Endogenous growth theory provides a further explanation. Lucas (1988) emphasized human capital accumulation through schooling and learning-by-doing as mechanisms that can contribute to economic growth. In this framework, human capital is not simply an input into production; its accumulation can generate broader effects on productivity and economic development. Education may also facilitate the creation and diffusion of knowledge, allowing economies to adapt to technological change and improve productive efficiency.

The relationship between education and growth is therefore potentially multidimensional. Education can directly improve worker productivity while also supporting technological adoption, innovation, and knowledge creation. Consequently, education policy may affect economic growth not only through the number of educated workers but also through the quality and relevance of the skills developed within the education system.

2.3 Education Quality versus Education Quantity

An important issue in the literature concerns whether the quantity of education is an adequate measure of human capital. Traditional indicators such as average years of schooling, enrollment rates, and educational attainment provide useful information about access to education, but they do not necessarily capture what students actually learn. The economic value of education may depend substantially on the knowledge and cognitive skills acquired during the educational process.

Therefore, education policy should be evaluated in terms of both educational access and the skills produced by the education system. A focus on learning outcomes is particularly important in economies experiencing rapid technological and structural change, where workers increasingly require analytical, technical, and adaptive skills.

2.4 Education Policy and Inequality

Education policy is also closely associated with the distribution of economic opportunities. Unequal access to high-quality education can contribute to persistent differences in skills, employment opportunities, and earnings across socioeconomic groups. Becker (1964) demonstrates that education generates returns at the individual level, implying that unequal access to educational opportunities can translate into unequal economic outcomes.

Public education policies can potentially reduce these disparities by expanding access to basic education, providing financial assistance, improving educational infrastructure, and directing resources toward disadvantaged populations. However, unequal educational quality across regions and socioeconomic groups may limit the ability of education systems to promote social mobility. Thus, the economic contribution of education policy should be considered not only in terms of aggregate human capital accumulation but also in terms of how effectively educational opportunities are distributed across society.

2.5 Research Gap

The existing literature establishes a strong theoretical connection between education, human capital, productivity, and economic growth. Human capital theory explains education as an investment in productive capabilities, while growth theories demonstrate how human capital accumulation can contribute to long-term economic performance (Becker, 1964; Lucas, 1988; Mankiw et al., 1992). Empirical research further indicates that the quality of skills may be more important for economic growth than educational attainment measured solely by years of schooling (Hanushek & Woessmann, 2008).

Nevertheless, an important area for further examination concerns the policy mechanisms linking education systems to economic outcomes. Educational expenditure, enrollment, and attainment do not automatically produce equivalent improvements in human capital or economic growth. The effectiveness of education policy depends on factors including educational quality, equality of access, curriculum relevance, and the relationship between skills and labor-market demand. Therefore, this study focuses on the interconnected relationship between education policy, human capital development, and economic growth, emphasizing the mechanisms through which policy inter-

ventions can translate educational investment into productivity and broader economic outcomes.

3. Theoretical Framework

3.1 Education Policy as an Economic Intervention

Education policy can be understood as a form of government intervention designed to influence the accumulation and distribution of human capital. Because education generates benefits that extend beyond individual students, including higher productivity, knowledge diffusion, and potential social mobility, government intervention may play an important role in determining the quantity and quality of human capital within an economy. Education policies can include public expenditure, compulsory schooling, higher education provision, vocational training, teacher development, and financial support for students. These policies influence both individuals' access to education and the resources available for acquiring knowledge and skills.

From the perspective of human capital theory, education represents an investment that increases productive capabilities (Becker, 1964; Schultz, 1961). However, the economic effects of this investment depend on how effectively educational resources are transformed into actual skills. Therefore, education policy should not be evaluated solely according to the amount of financial resources allocated to education or the number of students enrolled. Instead, attention should also be given to educational quality, learning outcomes, and the relevance of acquired skills to economic activity.

3.2 Human Capital Development Mechanism

The first stage of the proposed framework is the relationship between education policy and human capital development. Education policies affect human capital by determining individuals' opportunities to acquire knowledge, cognitive abilities, technical skills, and professional competencies. Greater access to effective education can increase the stock of human capital available within an economy.

This relationship is consistent with the human capital accumulation framework developed by Schultz (1961) and Becker (1964). Education increases the capabilities of individuals and can therefore improve their future productivity and economic opportunities. At the aggregate level, the accumulation of human capital can increase an economy's productive capacity. Mankiw et al. (1992) incorporated human capital into an augmented Solow model and demonstrated that a model including human capital accumulation provides a stronger explanation of cross-country differences in income than a model based solely on physical capital and labor.

Accordingly, this study conceptualizes human capital development as an intermediate mechanism through which education policy can influence economic performance. The effectiveness of education policy depends on its ability to convert educational participation and resources into meaningful improvements in knowledge and skills.

3.3 Human Capital and Labor Productivity

The second stage of the framework concerns the relationship between human capital and labor productivity. Workers with greater knowledge and skills may be able to perform more complex tasks, use productive resources more efficiently, and adapt more effectively to changes in technology and production processes. Education can therefore influence economic output by improving the productivity of individual workers.

Lucas (1988) places human capital accumulation at the center of an endogenous explanation of economic development. In his framework, the accumulation of human capital can generate persistent effects on productivity and economic growth rather than producing only temporary improvements in output.

Human capital may also influence productivity indirectly through technological adoption. Skilled workers are more capable of understanding, implementing, and adapting to new technologies. Consequently, investment in education can increase the economic returns from technological development by creating a workforce capable of using new technologies effectively. This mechanism connects educational policy with broader processes of industrial transformation and productivity improvement.

3.4 Human Capital, Innovation, and Economic Growth

The third stage of the framework connects human capital with innovation and long-term economic growth. Human capital does not only increase the productivity of existing production processes; it can also contribute to the creation and diffusion of new knowledge. Higher levels of education can support research activities, technological development, entrepreneurship, and knowledge-based industries.

Endogenous growth theory emphasizes the importance of knowledge, innovation, and technological change in explaining long-term economic growth. Romer (1990) argues that technological change can emerge from economic decisions involving knowledge and ideas, while human capital provides an important foundation for the production and application of such knowledge. The broader endogenous growth literature therefore provides a theoretical basis for linking education and human capital to sustained economic development.

Within this framework, human capital contributes to economic growth through several interconnected channels. First, skilled workers can increase labor productivity. Second, human capital can facilitate technological adoption. Third, education can support innovation and knowledge creation. Fourth, a more skilled workforce can improve

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firms' capacity to adapt to structural economic changes. These mechanisms suggest that education policy may have effects on economic growth that extend beyond the immediate outcomes of schooling.

3.5 Integrated Conceptual Framework

Based on the preceding theoretical arguments, this study proposes an integrated framework connecting education policy, human capital development, productivity, innovation, and economic growth.

Education Policy
↓
Access + Educational Quality + Skills Development + Equality
↓
Human Capital Development
↓
Labor Productivity + Technological Adoption + Innovation
↓
Economic Growth

The framework assumes that education policy is the initial policy input, while human capital represents the principal transmission mechanism. Improvements in education access and quality are expected to increase the knowledge and skills embodied in the workforce. These improvements can subsequently influence productivity, technological adoption, and innovation, which contribute to higher economic output and long-term economic growth. However, the relationship should not be understood as automatic or linear. The economic return to education can depend on institutional conditions, labor-market demand, technological development, and the quality of educational provision. Consequently, the framework emphasizes that education policy effectiveness, rather than education expenditure alone, is central to understanding the relationship between education and economic growth.

The theoretical framework integrates human capital theory with endogenous growth theory to explain how education policy can influence economic development. It provides the analytical foundation for examining whether and under what conditions investments in education can be transformed into productive human capital and, ultimately, sustainable economic growth.

4. Education Policy and Human Capital Development

4.1 Government Investment in Education

Government investment is an important mechanism through which education policy influences human capital accumulation. Public education expenditure can expand access to schooling, improve educational infrastructure, support teacher development, and reduce financial barriers for disadvantaged students. From the perspective of human capital theory, such investment can generate long-term economic returns because education increases individuals' productive capabilities (Becker, 1964; Schultz, 1961). However, the effectiveness of government spending depends on how resources are allocated and whether expenditure improves actual learning outcomes. Evidence suggests that the quality of education may have a stronger relationship with human capital and productivity than educational quantity alone (Hanushek & Woessmann, 2008). Therefore, effective education policy should emphasize both sufficient investment and the efficient use of educational resources.

4.2 Primary and Secondary Education

Primary and secondary education provide the foundation for subsequent human capital development. Basic education develops literacy, numeracy, problem-solving abilities, and other fundamental competencies that influence later educational and employment outcomes. Policies that ensure broad access to compulsory education can therefore increase the basic skill level of the population. At the same time, the quality of compulsory education is critical. Hanushek and Woessmann (2008) argue that cognitive skills are more closely associated with economic outcomes than years of schooling alone. This indicates that policies should focus not only on enrollment and completion rates but also on teacher quality, curriculum design, learning environments, and measurable learning outcomes. Early investment may also have particularly important effects for disadvantaged children, for whom unequal access to educational resources can otherwise create persistent skill gaps (OECD, 2022).

4.3 Higher Education

Higher education contributes to human capital development by providing advanced knowledge, specialized skills, and opportunities for research and innovation. Universities can prepare workers for professional occupations while also contributing to knowledge creation and technological development. From an economic perspective, higher education can therefore generate both private returns, such as improved employment opportunities and earnings, and broader benefits associated with innovation and knowledge diffusion (Becker, 1964). However, expansion in higher education needs to be accompanied by attention to the relevance of graduates' skills. If educational provision becomes disconnected from labor-market demand, increases in educational attainment may not translate proportionally into productivity improvements. Consequently, cooperation between universities, employers, and policymakers is important for maintaining the economic relevance of higher education.

4.4 Vocational and Technical Education

Vocational education and training (VET) represents another important mechanism for developing job-specific and practical skills. Compared with purely academic

education, VET is more directly connected to workplace requirements and can facilitate transitions from education into employment. The OECD (2014) emphasizes the importance of adapting vocational systems to changing economic conditions and strengthening connections between training institutions and employers. Effective VET can therefore reduce skill mismatches while providing workers with competencies relevant to specific industries. This is particularly important during periods of technological and industrial transformation, when employers' skill requirements may change rapidly (OECD, 2023).

4.5 Digital Education and Future Skills

Digital transformation has increased the importance of digital literacy, analytical thinking, adaptive problem-solving, and lifelong learning. Education systems therefore need to prepare students not only for existing occupations but also for changing labor-market requirements. Recent OECD evidence emphasizes that skills development must increasingly respond to technological change and support lifelong learning across different stages of individuals' careers (OECD, 2025). Digital education, therefore, should be understood as more than the introduction of digital technologies into classrooms; it should also involve developing students' ability to use technology effectively and adapt to new forms of work. In this respect, education policy can strengthen the adaptability of human capital and support economies facing technological and structural transformation.

5. Human Capital Development and Economic Growth

Human capital development can influence economic growth through several interconnected mechanisms, including higher labor productivity, technological adoption, innovation, entrepreneurship, and long-term economic competitiveness. While education policy provides the institutional foundation for human capital accumulation, the economic significance of human capital ultimately depends on how effectively knowledge and skills are transformed into productive economic activities.

5.1 Labor Productivity

One of the most direct channels connecting human capital to economic growth is labor productivity. Workers with higher levels of knowledge and skills are generally better equipped to perform complex tasks, solve problems, and use economic resources efficiently. Human capital theory suggests that investment in education increases workers' productive capabilities and can therefore generate higher earnings and economic output (Becker, 1964; Schultz, 1961). At the aggregate level, improvements in the skills of the workforce can increase the productive capacity of an economy. Mankiw et al. (1992) incorporated human capital into an augmented Solow growth model and demonstrated that differences in human capital help explain variations in income levels across countries. This indicates that human capital can complement physical capital and labor in determining economic performance.

5.2 Technological Adoption

Human capital also plays an important role in technological adoption. New technologies often require workers to possess appropriate technical knowledge and the ability to adapt to new production methods. A more highly skilled workforce can therefore improve the efficiency with which firms adopt and use new technologies. Nelson and Phelps (1966) argue that human capital can facilitate technological diffusion by increasing an economy's capacity to adopt technologies developed elsewhere. This mechanism is particularly relevant in economies experiencing rapid digitalization and industrial transformation. Education and skills development can thus increase not only the quantity of labor available to firms but also the ability of workers to benefit from technological progress.

5.3 Innovation and Knowledge Creation

Beyond technological adoption, human capital contributes to innovation and the creation of new knowledge. Researchers, engineers, entrepreneurs, and other highly skilled workers can generate ideas that improve production processes, develop new products, and create new technologies. Romer (1990) emphasizes the economic importance of knowledge and technological change within endogenous growth theory, suggesting that ideas can generate effects that extend beyond the individual or organization that produces them. Human capital therefore contributes to growth by supporting research and development, knowledge diffusion, and innovation. Economies with stronger human capital may possess greater capacity to generate and commercialize new knowledge.

5.4 Entrepreneurship and Business Development

Human capital can also support entrepreneurship and business development. Education may provide individuals with analytical, managerial, financial, and organizational skills that improve their ability to identify opportunities and manage resources. Entrepreneurship can contribute to economic growth by creating employment, introducing new products and services, and increasing market competition. The relationship between human capital and entrepreneurship is particularly relevant in knowledge-intensive economies, where business opportunities are often closely connected to technological and professional expertise.

5.5 Long-Term Economic Competitiveness

The effects of human capital extend beyond short-term improvements in output. Continuous investment in knowledge and skills can strengthen an economy's ability to respond to technological change, industrial restructuring, and shifts in global demand. Lucas (1988) emphasizes the

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importance of human capital accumulation for sustained economic growth, while endogenous growth theory highlights the role of knowledge and innovation in maintaining long-term productivity improvements. Consequently, human capital can be viewed as a strategic economic resource that supports an economy's capacity to adapt and remain competitive over time.

Overall, the relationship can be summarized as human capital development → higher productivity and technological capability → innovation and economic adaptation → long-term economic growth. However, the strength of this relationship depends on whether workers' skills are effectively utilized within firms and labor markets. Human capital investment is therefore most economically productive when education and skills development are aligned with technological opportunities, institutional conditions, and labor-market demand.

6. Factors Affecting Policy Effectiveness

Although education policy can contribute to human capital development and economic growth, the effectiveness of policy interventions varies considerably across countries and regions. Differences in educational quality, access to opportunities, labor-market conditions, institutional capacity, and economic structure can determine whether educational investment is successfully transformed into productive human capital. Therefore, evaluating education policy requires attention not only to the amount of resources invested but also to the conditions under which those resources are implemented.

6.1 Quality of Education

The quality of education is one of the most important factors determining the economic returns to educational investment. High enrollment rates and longer years of schooling do not necessarily indicate that students have acquired the skills required for productive employment. Hanushek and Woessmann (2008) find that cognitive skills have a stronger relationship with economic growth than years of schooling alone. Consequently, teacher quality, curriculum design, learning environments, and assessment systems can substantially affect the effectiveness of education policy. Governments that increase educational expenditure without improving learning outcomes may therefore achieve limited improvements in human capital.

6.2 Equality of Educational Opportunity

The distribution of educational opportunities also affects the effectiveness of education policy. Socioeconomic background, geographic location, and household resources can influence access to high-quality education. When disadvantaged students have limited access to educational resources, human capital accumulation may become concentrated among higher-income groups, reducing the potential benefits of education for the wider economy. The OECD (2022) emphasizes that socioeconomic differences remain closely associated with educational outcomes across many education systems. Policies targeting disadvantaged students, improving resource distribution, and reducing regional disparities can therefore increase the inclusiveness and potential economic returns of human capital investment.

6.3 Labor-Market Relevance

The economic value of education depends partly on whether acquired skills correspond to labor-market demand. Skill mismatches can occur when educational institutions produce graduates whose knowledge and competencies do not adequately correspond to employers' requirements. Such mismatches may result in unemployment, underemployment, or underutilization of human capital. The OECD (2014) highlights the importance of stronger connections between education and employment, particularly within vocational education and training systems. Cooperation among governments, educational institutions, and employers can therefore improve curriculum relevance and facilitate transitions from education to employment.

6.4 Institutional Quality

Institutional capacity influences how effectively education policies are designed, implemented, and evaluated. Even when governments allocate substantial financial resources to education, weak governance, inefficient resource allocation, limited accountability, or inconsistent policy implementation can reduce policy outcomes. Effective institutions can improve the allocation of educational resources and support long-term policy continuity. From a broader development perspective, institutional quality can influence the extent to which human capital is converted into productive economic activity (Acemoglu et al., 2005). Education policy should therefore be considered within the wider institutional environment rather than as an isolated intervention.

6.5 Economic Structure

Finally, the economic structure of a country or region influences the returns to human capital. Different industries require different combinations of knowledge and skills. Manufacturing-oriented economies may place greater emphasis on technical and engineering skills, while service- and knowledge-based economies may require advanced analytical, digital, managerial, and communication capabilities. Human capital is therefore most economically valuable when its composition corresponds to the structure and development needs of the economy. As technological change alters occupational demand, education systems must continuously adapt their curricula and training mechanisms to changing economic conditions (OECD, 2023).

Overall, the effectiveness of education policy depends on a combination of quality, equality, labor-market relevance, institutional capacity, and economic structure. These

factors determine whether educational resources are successfully transformed into productive human capital and, subsequently, into economic growth. Thus, effective education policy requires not only greater investment but also appropriate policy design, implementation, and adaptation to changing economic conditions.

7. Policy Implications

The analysis of the relationship between education policy, human capital development, and economic growth suggests several policy implications. Effective education policy should focus not only on expanding educational participation but also on improving learning outcomes, reducing inequality, strengthening labor-market relevance, and developing skills that support technological and economic transformation.

7.1 Shift from Educational Quantity to Quality

Governments should place greater emphasis on educational quality rather than relying primarily on enrollment rates or years of schooling as indicators of policy success. Improving teacher quality, curriculum design, assessment systems, and learning environments can strengthen the skills generated by education systems. Since cognitive skills have been shown to have a stronger relationship with economic growth than educational attainment alone, policy evaluation should incorporate measurable learning outcomes (Hanushek & Woessmann, 2008).

7.2 Strengthen Vocational and Industry-Oriented Education

Education systems should establish stronger connections with labor-market demand. Governments can encourage cooperation among universities, vocational institutions, employers, and industry organizations to ensure that curricula reflect changing occupational requirements. Work-based learning, internships, and practical training can improve the transition from education to employment and reduce skill mismatches (OECD, 2014).

7.3 Promote Equal Access to Educational Opportunities

Policies should address socioeconomic and regional differences in access to high-quality education. Targeted financial assistance, improved educational infrastructure, and additional support for disadvantaged students can help reduce inequalities in human capital accumulation. More equitable access may also expand the pool of productive talent available to the economy (OECD, 2022).

7.4 Invest in Teachers and Future Skills

Teacher development should be treated as a central component of human capital policy. At the same time, curricula should increasingly incorporate digital literacy, analytical thinking, problem-solving, and lifelong learning. These capabilities can improve workers' adaptability to technological change and support productivity growth in changing economic environments (OECD, 2023).

7.5 Establish Evidence-Based Policy Evaluation

Finally, governments should evaluate education policies using both educational and economic indicators. In addition to enrollment and graduation rates, policymakers should consider learning outcomes, employment, earnings, productivity, and innovation. Evidence-based evaluation can help governments identify which interventions generate meaningful improvements in human capital and adjust policies accordingly. Such an approach can improve the efficiency of public investment while strengthening the long-term contribution of education to economic development.

8. Conclusion

Education policy plays an important role in shaping human capital development and, consequently, long-term economic performance. This study has examined the relationship between education policy, human capital, and economic growth by integrating human capital theory with endogenous growth perspectives. The analysis demonstrates that education contributes to economic development not simply through increased years of schooling, but through the knowledge, cognitive abilities, technical skills, and adaptive capabilities developed by individuals (Becker, 1964; Schultz, 1961).

The theoretical framework proposed in this study identifies a chain of relationships from education policy to human capital development, and from human capital to productivity, technological adoption, innovation, and economic growth. Human capital can increase workers' productive capacity while also improving an economy's ability to adopt new technologies and generate knowledge (Lucas, 1988; Romer, 1990). However, the economic benefits of education are not automatic. The effectiveness of education policy depends on educational quality, equality of opportunity, labor-market relevance, institutional capacity, and the structure of the economy. In particular, evidence suggests that cognitive skills and learning outcomes may be more closely associated with economic growth than educational attainment alone (Hanushek & Woessmann, 2008).

The study therefore suggests that governments should adopt a broader approach to education policy. Rather than focusing primarily on expanding enrollment or increasing expenditure, policymakers should improve educational quality, strengthen vocational and industry-oriented training, promote equal access, develop future-oriented skills, and establish evidence-based evaluation systems. Such measures can help transform educational investment into productive human capital.

Nevertheless, this study is primarily conceptual and does not empirically test the causal relationship between specific education policies and economic growth. Future

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research could employ cross-country panel data, regional comparisons, or case studies to examine how different education policies affect human capital accumulation and economic performance under varying institutional and economic conditions. Such research could provide further evidence on how education systems can support sustainable and inclusive economic growth.

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