

# Youth Labour Market Dynamics, Human Capital, and Economic Growth: An Endogenous Growth Model

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## Research Article

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# Youth Labour Market Dynamics, Human Capital, and Economic Growth:

An Endogenous Growth Model

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## Abstract

This paper builds on endogenous growth and integrates youth labour market dynamics into the analysis of long-run economic growth. Youth Labour and physical capital are the two factors of production used in this paper, where youth total labour is divided into employed labour, youth in education or training, and unemployed youth to examine how human capital accumulation and labour market allocation interact to influence growth. Human capital accumulates through educational participation but depreciates due to skill loss from unemployment of unemployed youth. The model introduces the Absorption Rate (AR), which is a measure of human capital–employment efficiency that captures the extent to which human capital accumulated is translated into productive employment. The findings of the model indicate that long-run growth depends not only on human capital accumulation but also on the sensitivity of how human capital is absorbed into productive employment, emphasizing the role of human capital–employment efficiency in long-run economic growth.

**Keywords:** Endogenous Growth; Human Capital; Absorption Rate

**JEL Classification:** O41; J21; J24; O15

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# 1 Introduction

Human capital's role in long-run economic growth has been emphasized for several decades. While neoclassical growth models have attributed long-run growth to exogenous technological progress, endogenous growth models highlight the accumulation of human capital, knowledge, and innovation as the internal drivers for economic growth. Endogenous models theorized that investments in education, training, and health would enhance labour productivity, stimulate the creation of knowledge, and generate persistent improvements in economic growth. Though most theoretical growth models implicitly assume that the productive benefits of human capital are realised when skills are accumulated, little attention is given to the labour market mechanisms through which that human capital can be transferred into productive employment.

This omission becomes very crucial in the context of changing labour market conditions. Though many economies have experienced enhancements in educational attainments, they have simultaneously faced persistent youth unemployment, prolonged school-to-work transitions, and skill mismatch. Accumulation of human capital would not be enough to sustain long-run growth if educated youth are unable to secure employment. Consequently, the relationship between education and growth does not only rely on human capital formation but also on the efficiency of labour market allocation.

Youth occupy a very distinctive position as new entrants in the labour market, where they represent the principal channel through which the accumulated human capital enters the economy. Transition from education to employment determines not only current labour market outcomes but also the future productive capacity of the economy. Any delay in labour market integration would cause productivity decay through depreciation of acquired skills, lower labour market attachment, and weaker incentives for further human capital investment, whereas efficient integration of youth into productive employment strengthens the returns to educational investments that further bolsters economic growth. The importance of youth labour market dynamics is highlighted by these observations, which further suggest that youth labour market dynamics must be considered as an integral component of growth theory rather than a separate labour market phenomenon.

Capital accumulation and technological progress are highlighted by the

Harrod–Domar and Solow models, whereas human capital theory and endogenous growth models focus on the role of education, skills, and knowledge accumulation for long-run growth. Labour market theories explain employment outcomes through labour market frictions and matching efficiency. These strands of literature have substantially contributed to the understanding of economic growth, but they have largely analyzed human capital formation and labour market allocation independently. Existing theoretical approaches do not provide an integrated framework linking human capital formation and labour market absorption to economic growth, as limited emphasis is given to how the transition from education to employment influences the long-run growth process.

This gap is addressed in this paper by developing a theoretical growth model, which integrates youth labour market dynamics into an endogenous growth framework. Human capital accumulation and labour market allocation are simultaneously analyzed by dividing the youth labour into employed labour, youth engaged in education and training, and unemployed youth. Unlike conventional models in which human capital contributes directly to production once accumulated, the proposed framework recognizes that unemployment among youth generates depreciation of productive skills and weakens human capital’s contribution to economic growth. The model therefore emphasizes the efficiency through which human capital is effectively absorbed into productive employment and thus introduces *Absorption Rate*, which is defined as the efficiency with which accumulated human capital is translated into productive employment. This absorption rate captures the interaction between human capital formation and labour market integration. This provides a theoretical mechanism through which differences in labour market efficiency can generate different growth outcomes among economies with similar levels of human capital. This framework extends the conventional endogenous growth frameworks by taking cognizance that economic growth not only relies on human capital accumulation but also on the structural capacity of labour markets to absorb its skilled workers into productive employment.

The model aims to contribute to the literature in three respects. First, it integrates endogenous growth theory, human capital theory, and labour market allocation within a unified analytical framework centred on youth labour market dynamics. Second, it introduces unemployment-induced depreciation of human capital as an explicit channel linking labour market conditions with

long-run economic growth. Third, it develops a theoretical measure of human capital–employment efficiency as the absorption rate, which provides a conceptual basis for analysing how labour market mechanisms influence the translation of human capital investment into economic performance.

The rest of the paper is organized in the following way. Section 2 reviews the literature on the role of capital accumulation, human capital formation, and labour market allocation in economic growth. Section 3 develops the theoretical growth model and derives the balanced growth path and comparative static results. Section 4 discusses the implications of the model and Section 5 mainly concludes the paper.

## 2 Literature Review

In this section, the relevant literature is reviewed, and gaps are identified, motivating the proposed model.

Early growth theories primarily emphasized the role of capital accumulation and technological progress (Domar, 1946; Harrod, 1939; Solow, 1956; Swan, 1956). Schumpeter (1911) concentrated on innovation and entrepreneurship. While Malthus (1798) associated population growth with resource constraints, Boserup (1965) argued that agricultural innovation will improve productivity and boost growth. The demographic-dividend literature showed that a youth bulge can have a positive impact on economic growth if demographic changes can create favourable conditions for growth through labour supply, saving, investment, and human-capital accumulation (Bloom & Canning, 2004; Bloom et al., 2001; Gbehe et al., 2024; Kelley, 2001; Thompson, 1929). These theories suggest that the youth population acts as a potential productive resource, but its actual contribution depends on how effectively that potential is utilized.

Human-capital theory offers a mechanism through which this potential can influence productivity. Investments in education, training, and skill formation raise productivity and earnings (Becker, 1962; Ben-Porath, 1967; Schultz, 1961), whereas endogenous growth is realized through human-capital accumulation and knowledge spillovers (Lim et al., 2018; Lucas, 1988; Mankiw et al., 1992; Romer, 1994). Evidence on education expenditure suggests that investment in education generates productive capabilities as it positively affects growth (E. N. Appiah, 2017; Mallick, 2016). Also, the quality and rel-

evance of human capital matters not only educational attainment, as skills, learning, and expenditure distribution are vital aspects in human capital formation (Adhvaryu et al., 2018; Angrist et al., 2021; Chen, 2025; Contreras et al., 2025; Gu et al., 2026; Okada, 2013; Udayakumar et al., 2024). These contributions highlights the crucial role of human capital, but they often presume that accumulated skills become productive once acquired. The transition between education and productive employment remains mostly implicit. As a result, these models provide very limited insight into circumstances where educational attainment grows, and labour markets fail to produce meaningful employment prospects. Under such conditions, the productive contribution of human capital depends on educational investment and also on the economy’s ability to utilise accumulated skills efficiently. This raises an important question of how this accumulated human capital can be converted into productive employment.

Labour market theories offer an important perspective on this issue. The life-cycle model of Ben-Porath (1967) views human capital accumulation as the outcome of intertemporal decisions regarding education, training, and labour market participation. Search and matching theory further explains employment outcomes through the interaction between job seekers and vacancies under conditions of imperfect information and matching frictions (Mortensen & Pissarides, 1994). As young workers transition from school to work, such friction can hinder job matching (Nilsson, 2019; Ryan, 2001). The productive value of accumulated skills falls due to unemployment through human capital depreciation (Becker, 1962; Doppelt, 2019). Further, the productivity gains from human capital investment are curtailed due to skills mismatch, over-education, and weak correspondence between qualifications and jobs (Arranz & García-Serrano, 2024; Habiyaemye et al., 2022; Rodrigues, 2020; Sun, 2026; Ueno & Krause, 2018). These studies clearly show the distinction between human capital accumulation and human capital utilization.

Human capital utilization is shaped by technological change, structural transformation, and labour market institutions. Skill requirements are altered by technological changes, whereas structural and sectoral shifts affect the availability of suitable jobs (Acemoglu & Shimer, 2000; Autor, 2022; Sim & Oh, 2017). Though training improves prospects for jobs, but labour market rigidities, institutional constraints, and changing forms of work hinder this transition (Adhvaryu et al., 2018; Di Paolo & Matano, 2022; Joseph Jeyaraj

et al., 2025; Makame, 2024; Mseleku, 2024; Woodgate et al., 2025). Lack of formal jobs paves the way for more informal employment, self-employment, and entrepreneurship as alternate routes to work (Das, 2025; Kristensen & Birch-Thomsen, 2013; Kumawat & Meena, 2022; Nilsson, 2019; Thorsen, 2013). As these studies show that human capital accumulation is not enough to realize the economic returns to human capital, the emphasis is given on effective utilization of human capital in securing productive employment.

Further, the empirical literature establishes the relationship between economic growth and youth employment. Studies in ASEAN, WAEMU, and Sub-Saharan African economies establish the significant association between youth employment(unemployment) and economic growth (G. K. Appiah et al., 2020; Fung & L. H. Nga, 2022; Thioune & Sidy Kane, 2018), while the macroeconomic and structural determinants of youth employment are identified by Bal-Domańska (2022) and Bayrak and Tatli (2018) in OECD and EU economies, respectively. Skills, education-employment mismatch, entrepreneurship, and labour-market institutions play an important role in the determination of the productive participation of youth in employment (Mamgain & Tiwari, 2015; Mina, 2023; Mitra & Verick, 2013; Mukherjee & Majumder, 2023; Okada, 2013; Sharma, 2022; Venkatanarayana & Dev, 2012; Visaria, 1998). These studies points out that realization of demographic dividend is not automatic, it depends on successful integration of increasing youth into productive employment.

The literature is growing, but it remains fragmented, as demographic studies,human-capital studies,labour-market studies, and youth employment-growth studies are analyzed separately; little attention has been given to how effectively human capital is being converted to productive employment and its impact on economic growth. This paper addresses this gap by developing an endogenous growth model that jointly examines human capital accumulation and youth labour market outcomes. This paper divides the total labour force into youth participating in education and training, labour who are employed, and youth who remain unemployed, which allows for depreciation of human capital. It also introduces an indicator of human capital-employment efficiency, i.e., *Absorption Rate (AR)*, as a measure of how effectively the accumulated human capital is being converted into productive employment. By combining these mechanisms within a single analytical framework, the model will extend the existing growth theory and will provide a theoretical basis for analysing how labour market institutions shape the relationship

between human capital and long-run economic growth.

### 3 Model

This section discusses the theoretical growth model integrating youth into the growth dynamics in detail.

#### 3.1 General Introduction of the Model

The model assumes a closed economy with two main factors of production: youth labour ( $N$ ) and physical capital ( $K$ ). The non-youth labour is assumed to be productively utilized in the production process and it is assumed to be constant ( $\bar{L}$ ). The total youth population ( $N(t)$ <sup>1</sup>) is divided into employed youth labour ( $L_p(t)$ ), youth engaged in education or training ( $L_e(t)$ ), and unemployed youth ( $L_u(t)$ ). Youth engaged in education or training ( $L_e(t)$ <sup>2</sup>) is defined as that part of the total youth population that has invested in human capital formation through education or training, where  $e$  represents the share of total youth labour participating in education or training. The youth labour force ( $L_F(t)$ <sup>3</sup>) is defined as the part of the total youth population not included in education or training. Unemployed youth ( $L_u(t)$ <sup>4</sup>) is defined as that part of the youth labour force which is unemployed, where  $u$  denotes the youth unemployment rate. Employed youth labour ( $L_p(t)$ <sup>5</sup>) is defined as that part of the youth labour force that is employed. This specification implies that the total youth labour is distributed among employment, unemployment, and youth in education or training.

Production in the economy is represented by a Cobb–Douglas production function as considered by Lucas (1988) in the following form:

$$Y(t) = K(t)^\alpha [H(t)L_p(t)]^{1-\alpha}, \quad 0 < \alpha < 1 \quad (1)$$

where  $Y(t)$  denotes total output,  $K(t)$  represents physical capital stock,  $H(t)$  indicates human capital stock, and  $L_p(t)$  refers to employed youth

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<sup>1</sup> $N(t) = L_p(t) + L_e(t) + L_u(t)$

<sup>2</sup> $L_e(t) = eN(t)$

<sup>3</sup> $L_F(t) = N(t) - L_e(t) = N(t) - eN(t) = (1 - e)N(t)$

<sup>4</sup> $L_u(t) = uL_F(t)$

<sup>5</sup> $L_p(t) = L_F(t) - L_u(t) = L_F(t) - uL_F(t) = (1 - u)L_F(t) = (1 - u)(1 - e)N(t)$

labour at time  $t$ . The parameter  $\alpha$  measures the contribution of physical capital to production. The specification assumes that labour productivity depends not only on employment but also on the level of human capital embodied in the workforce. The production is a function of capital, human capital, and employed youth labour.

Following Lucas (1988), the technology for human capital accumulation is considered to be intensive, i.e, proportional to the share of time or labour devoted to education. Therefore, the human capital stock is defined as,

$$\dot{H}(t) = \eta e H(t) - \delta_H H(t) \quad (2)$$

where  $\eta > 0$  is the education efficiency of youth in education or training,  $e$  is the share of total youth population engaged in education or training, and  $\delta_H$  is the depreciation rate of human capital.

Though the human capital stock form follows from Lucas (1988), but the depreciation of human capital is conceptualized by Becker (1962) as due to ageing, technological change, non-utilization of skills, and unemployment. Romer (1994) defines depreciation of human capital as technological obsolescence, as human skills become obsolete with technological change. This paper combines these theoretical foundations of depreciation of human capital and introduces depreciation of human capital as,

$$\delta_H = \delta_0 + \delta_u \quad (3)$$

, where  $\delta_0 > 0$ <sup>6</sup> refers to the natural rate of human capital depreciation, and  $\delta_u > 0$  refers to human capital depreciation that occurs due to skill loss from youth unemployment.

The depreciation rate of human capital due to skill loss from youth unemployment is assumed to reflect the human capital depreciation cost associated with skill loss of the unemployed youth labour in the economy. This is expressed in the following form:

$$\delta_u = c_u u \quad (4)$$

, where  $c_u > 0$  refers to the marginal human capital depreciation cost of youth unemployment and  $u$  refers to youth unemployment rate.

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<sup>6</sup> $\delta_0$  reflects the cost of youth labour that occurs due to ageing and technological obsolescence, which is assumed to be constant

From 3 and 4, the depreciation of human capital becomes,

$$\delta_H = \delta_0 + c_u u \quad (5)$$

This implies human capital grows with the participation of youth in education or training, but the cost of skill loss of unemployed youth, along with the natural rate of human capital depreciation, causes a drag on human capital formation. Further, prolonged unemployment causes individuals to enter low-paid, temporary, or gig-based employment that also offers limited opportunities for skill enhancement and productivity improvement. Therefore, while education and training contribute to human capital formation, persistent unemployment of youth, coupled with the natural rate of human capital depreciation, reduces the effective quality and productivity of the labour force over time.

The physical capital stock used in this paper follows from Solow (1956) are as follows,

$$\dot{K}(t) = sY(t) - \delta_K K(t) \quad (6)$$

where  $s$  represents the saving rate, with  $0 < s < 1$ , and  $\delta_K$  denotes the depreciation rate of physical capital. Capital accumulation depends positively on savings generated from output and negatively on depreciation.

### 3.2 Balanced Growth Path

The balanced growth path is derived under the assumption that employed labour remains constant over time. The growth equation of the model is given as,

$$g = \alpha g_K + (1 - \alpha) g_H \quad (7)$$

where  $g_H = \eta e - c_u u - \delta_0$  represents the growth rate of human capital, and  $g_K$  represents the growth rate of physical capital.

At the balanced growth path, the growth rates of output, physical capital, and human capital converge to a common steady-state growth rate:

$$g = g_K = g_H$$

Accordingly, the long-run growth equation of the economy is obtained as :

$$g = \eta e - c_u u - \delta_0 \quad (8)$$

The balanced growth equation shows that long-run economic growth is a function of the share of total youth labour in education or training, education efficiency, the marginal human capital depreciation cost of youth unemployment, youth unemployment rate, and the natural rate of human capital depreciation. The model highlights that sustained growth not only depends on capital accumulation but also on the effective utilization and development of human capital within the economy.

### 3.3 Comparative Statistics

This section examines the effects of parameter changes on the model's long-run economic growth rate.

**Proposition 1 :** *An increase in the share of total youth labour in education or training ( $e$ ) increases the long-run growth rate.*

From (8), it follows that :

$$\frac{\delta g}{\delta e} = \eta > 0 \quad (9)$$

The result indicates that the long-run growth rate is positively associated with the proportion of youth participating in education or training activities.

**Proposition 2 :** *An increase in the unemployment rate ( $u$ ) of total youth labour decreases the long-run growth rate.*

From (8), it follows that :

$$\frac{\delta g}{\delta u} = -c_u < 0 \quad (10)$$

The result shows that the long-run growth rate is negatively related to the youth unemployment rate. As  $c_u > 0$ , persistent unemployment weakens the productive quality of the labour force due to erosion of skills and reduces the contribution of human capital to long-run economic growth.

**Proposition 3 :** *An increase in the education efficiency of total youth labour in education and training ( $\eta$ ) increases the long-run growth rate.*

From (8), it follows that :

$$\frac{\delta g}{\delta \eta} = e > 0 \quad (11)$$

The result indicates that the long-run growth rate is positively influenced by the education efficiency of total youth labour engaged in education and training activities. The proposition suggests that as the education efficiency of youth integration rises, it will result in higher economic growth over time.

**Proposition 4 :** *An increase in the marginal human capital depreciation cost of youth unemployment( $c_u$ ) reduces the long-run growth rate.*

From (8), it follows that :

$$\frac{\delta g}{\delta c_u} = -u < 0 \quad (12)$$

The result shows that the long-run growth rate is negatively related to the marginal human capital depreciation cost of youth unemployment.

**Proposition 5 :** *An increase in the natural rate of human capital depreciation reduces the long-run growth rate one for one.*

From (8), it follows that :

$$\frac{\delta g}{\delta \delta_0} = -1 \quad (13)$$

From above, the natural rate of human capital depreciation reduces in the long run growth rate for one on one, but it doesn't alter the marginal returns to education, education efficiency, or unemployment driven skill loss as  $\frac{\delta^2 g}{(\delta \delta_0)(\delta x)} = 0$  for  $x \in e, u, \eta, c_u$ .

$\delta_0$  is a level shifter, not a mediator or other channel.

**Proposition 6 :** *An increase in the Absorption Rate ( $AR$ )<sup>7</sup> measuring human capital employment efficiency will have a positive effect on the long-run growth rate.*

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$$AR(t) = \frac{L_p(t)}{L_F(t)}$$

From the definition of youth unemployment ( $L_u(t) = uL_F(t)$ ) and the absorption rate definition, the following relationship is derived,

$$u(t) = 1 - AR(t) \quad (14)$$

From (8) and (14), it follows that

$$\frac{\delta g}{\delta AR} = c_u > 0 \quad (15)$$

The result indicates that the effect of absorption rate, i.e., a measure of human capital-employment efficiency, on long-run economic growth is positive.

Improvements in absorption rate (AR) increase the long-run growth rate by lowering unemployment and preventing skill decay due to unemployment of youth. This also enhances the productive absorption of human capital into employment. In this case, education, training, and skill formation are effectively translated into productive labour market outcomes, thereby strengthening productivity and economic growth.

This proposition, therefore, suggests that the growth effects of human capital formation depend not only on the accumulation of skills and education but also on the ability of its economy to efficiently integrate human capital into productive employment opportunities.

## 4 Discussion

The proposed framework is an extension of the conventional endogenous growth framework where youth labor market outcomes are taken as part of the growth process itself and not a result of growth as in previous frameworks. While the existing growth frameworks acknowledge education and human capital's role in productivity, they tend to ignore the process between skill acquisition and productive labor participation. The suggested framework addresses this issue by classifying youth as being enrolled in education, those who are employed, and those who are unemployed.

The growth equation makes it clear that the economic significance of human capital lies in the realization of two processes that complement each other. While the first is concerned with the accumulation of productive

skills through education and training, the second is the successful integration of those skills into employment. These processes reinforce each other. Productive human capital stock is enriched with higher educational participation, but prolonged unemployment among youth reduces its productive value through skill depreciation. So, the growth implications of human capital cannot be evaluated independently of labour market outcomes. The model therefore departs from the conventional assumption that education automatically translates into higher productivity.

The model further demonstrates that the economic value of human capital depends on the ability of labour markets to translate acquired skills into productive employment. If barriers to employment persist for skilled workers, then investment in education will not be enough to generate sustained growth. Economic returns to accumulated human capital will fall if structural frictions such as skill mismatch, occupational segmentation, delayed school-to-work transitions, or limited employment opportunities prevent the full utilization of human capital. In that case, further educational investment may increase the stock of skills but will not be sufficient to produce a proportional increase in output. This identifies labour market allocation as an essential component of the growth process rather than a separate labour market issue.

The theoretical link between human capital formation and labour market outcomes is established by the introduction of *Absorption Rate*, which focuses on the extent to which accumulated skills are being converted to productive employment. Educational attainment and employment outcomes are treated as separate dimensions under conventional measures, which makes it very difficult to measure the efficiency with which investment in human capital is translated into economic production. This limitation is overcome by the *Absorption Rate*, which captures the efficiency of this transition and offers a more comprehensive view on the relationship between education, employment, and economic growth. This is important in explaining why countries with the same level of educational investment may exhibit different growth rates depending on the efficiency of how successfully their labour markets have integrated their skilled young workers into productive activities. This process can be hindered by differences in institutional quality, labour market flexibility, matching efficiency, and the availability of suitable employment opportunities. The absorption rate's positive impact on economic growth is contingent on the capacity of the labour market institutions to efficiently

utilise their accumulated human capital. Timely and efficient matching of skilled workers with jobs enhances labour productivity and strengthens the positive impact of the absorption rate on economic growth. But economic returns to human capital investment are reduced in the presence of structural rigidities, persistent skill mismatch, or limited employment opportunities. In that case, continued investment in education will fail to have a desired positive impact on economic growth as the contribution to human capital weakens.

This framework explains that a favourable age structure is not enough to ensure realization of a demographic dividend. Though the potential stock of future human capital is increasing due to the rising youth population, its utilization remains dependent on the mutually reinforcing relationship of educational systems and labour market outcomes. The gains from investment in education through the creation of skills and productive capabilities will only contribute to long-run growth when educated young workers can be absorbed by the labour market into productive employment. Institutional weaknesses, labour market rigidities, or limited employment opportunities will make a substantial portion of accumulated human capital underutilised, which will reduce labour productivity and dampen economic performance. This framework suggests that the demographic dividend will be realized through the effectiveness of the transfer of accumulated human capital to productive employment. Through the integration of human capital formation, youth labour market allocation, and structural transformation into a single analytical framework, this model identifies a labour market pathway through which the productive potential associated with youth bulge can contribute to economic growth.

## 5 Conclusion

This study develops an endogenous growth model that explicitly incorporates youth labour market dynamics into the long-run economic growth process. Unlike conventional growth models, which primarily emphasize human capital accumulation as a source of sustained growth, the proposed framework argues economic benefits of human capital ultimately depend on its successful integration into productive employment. The model therefore treats labour market outcomes as an integral component of the growth process rather than

as a consequence that follows economic expansion. By distinguishing between youth participating in education and training, employed labour, and youth who remain unemployed, the framework captures the different pathways through which demographic change influences economic performance. In doing so, it provides a more thorough understanding of how the interaction between labour market allocation and human capital formation shapes long-run growth and highlights the significance of utilising, rather than merely accumulating, human capital within the economy.

Greater educational participation and improvements in the efficiency of human capital formation strengthen long-run economic growth. Both expand the productive capacity of the workforce. Simultaneously, the productive value of educational investment falls through the depreciation of accumulated skills due to persistent unemployment. The findings suggest that human capital returns depend not only on the resources devoted to education and training but also on the extent to which acquired skills are continuously used in productive economic activities. Labour market conditions determine the utilisation of accumulated human capital in productive employment or wasted potential, as it becomes an essential determinant of long-run growth. Human capital formation and labour market allocation serve as fundamental pillars of the long-run growth process, where their complementary functioning is central for sustained economic growth.

The proposed model develops *Absorption Rate* theoretically, as an indicator of human capital-employment efficiency. This measure explicitly captures the intensity with which the accumulated human capital is being successfully translated to productive employment. This provides a comprehensive understanding of the pathway connecting educational investment to economic performance. The model further demonstrates that the growth implications of the absorption rate depend critically on the functioning of labour market institutions. When labour markets efficiently match skilled individuals with productive employment opportunities, improvements in the absorption rate enhance productivity and support long-run growth. But institutional rigidities, labour market frictions, or inadequate employment opportunities limit the productive utilization of acquired skills; the economic returns to human capital are diminished. This framework therefore emphasizes that the long-run benefits of investing in human capital are realised only when labour markets are capable of effectively integrating skilled workers into productive economic activity.

The insights from the human capital theory, endogenous growth theory, and labour market theory are integrated into a unified analytical model that explicitly incorporates youth labour market dynamics into the growth dynamics. This expands the conventional understanding of economic growth by highlighting that the contribution of human capital is not solely dependent on its accumulation but also on its productive utilization and absorption into productive economic activities. This perspective underscores the importance of the transition from education to employment as a key mechanism linking human capital formation with long-run economic performance. Apart from contributing to the existing theoretical literature, this framework paves the way for future empirical research and can be further extended to examine the roles of labour market heterogeneity, technological progress, institutional quality, and employment quality in determining how human capital contributes to sustained economic growth.

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## 6 Appendix

### 4.1 General Introduction of the Model:

From 2 and 5, it follows,

$$\dot{H}(t) = \eta e H(t) - (\delta_0 + c_u u) H(t)$$

Dividing both sides by  $H(t)$ ,

$$\frac{\dot{H}(t)}{H(t)} = \eta e - \delta_0 - c_u u$$

Rearranging,

$$\frac{\dot{H}(t)}{H(t)} = \eta e - c_u u - \delta_0$$

Hence, it derives 3.2,

$$g_H = \eta e - c_u u - \delta_0$$

### 4.2 Balanced Growth Path:

From 1,

$$Y(t) = K(t)^\alpha [H(t)L_p(t)]^{1-\alpha}$$

Taking log on both sides,

$$\ln(Y(t)) = \alpha * \ln(K(t)) + (1 - \alpha) * \ln[H(t)L_p(t)]$$

Differentiating both sides w.r.t time,

$$\frac{\dot{Y}}{Y} = \alpha * \frac{\dot{K}}{K} + (1 - \alpha) * \left[ \frac{\dot{H}}{H} + \frac{\dot{L}_p}{L_p} \right]$$

Here,  $\frac{\dot{Y}}{Y} = g$  ,  $\frac{\dot{K}}{K} = g_K$  ,  $\frac{\dot{H}}{H} = g_H$ , and  $\frac{\dot{L}_P}{L_P} = 0$ , as employed labour is assumed to be constant along the balanced growth rate.

$$g = \alpha * g_K + (1 - \alpha) * [g_H + 0]$$

Hence, it derives 7,

$$g = \alpha g_K + (1 - \alpha) g_H$$

### 4.3 Comparative Statistics:

From 14,

$$u = 1 - AR$$

Substituting this in 8,

$$g = \eta e - c_u(1 - AR) - \delta_0$$

Rearranging,

$$g = \eta e - c_u + c_u AR - \delta_0$$

Again rearranging,

$$g = (\eta e - c_u - \delta_0) + c_u AR$$

Using partial derivatives with respect to the absorption rate (AR), it derives 15,

$$\frac{\delta g}{\delta AR} = c_u$$