

Balancing Higher Education, Vocational Training, and Lifelong Learning: Evidence on Skills Mismatch and Labor Market Outcomes

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Abstract

The rapid expansion of higher education has reshaped workforce qualification structures in many countries, yet concerns persist regarding skills mismatch and uneven labor market outcomes. This study examines the implications of imbalances between higher education, vocational education, and lifelong learning for workforce composition and employment outcomes. Using secondary data and comparative evidence from prior empirical studies, this analysis documents substantial growth in higher education attainment while limited expansion of intermediate vocational skills. Results indicate that while higher education graduates generally experience favorable employment outcomes, vocational graduates with strong work-based training demonstrate competitive and sometimes superior long-term trajectories. Participation in adult education and training has increased but remains uneven across age groups and skill levels. Evidence on apprenticeship reforms suggests a shift toward higher-level qualifications and younger participants, accompanied by overall declines in participation. These findings underscore the structural nature of skills mismatch and the limitations of education systems that prioritize academic pathways without providing adequate support for vocational and continuing training. The study contributes to the literature by integrating evidence across education pathways and emphasizing the need for balanced policy approaches to skill formation, workforce adaptability, and inclusive labor market development.

1. Introduction

The rapid expansion of higher education over the past two decades has significantly reshaped the structure of the Indonesian workforce. Universities have increasingly been positioned as central drivers of human capital formation, expected to supply graduates capable of supporting innovation-led economic growth. In response, higher education institutions have adopted industry-oriented curricula and partnership models designed to enhance employability and align learning outcomes with labor market needs (Fachrizal et al., 2025; Kuntadi et al., 2020). As participation in tertiary education has expanded, the formal qualification profile of the workforce has improved. However, this transformation has not been consistently aligned with the practical and technical skill requirements of many sectors within the Indonesian economy (Goulart et al., 2021; Chukwuedo et al., 2023).

Extensive literature documents a generally positive relationship between higher education attainment and labor market outcomes, including higher employment probability, increased earnings, and greater job stability. Higher education is widely regarded as a mechanism for human capital accumulation that enables individuals to access skilled occupations and contribute to productivity growth. Yet empirical findings demonstrate that these benefits are heterogeneous and contingent upon field of study, institutional quality, and economic structure (Meza & Bragg, 2022; Chen et al., 2025). Graduates from applied and vocationally oriented higher education institutions often experience stronger employment outcomes when curricula are closely aligned with industry demands (Meza & Bragg, 2022; Chen et al., 2025). Institutional reputation also influences outcomes, as graduates from more prestigious institutions tend to secure higher-quality employment and higher wages (Tavares et al., 2023; Prikshat et al., 2019). Nevertheless, when higher education expansion outpaces labor market absorption capacity, mismatches between qualification supply and job demand become increasingly visible (Fachrizal et al., 2025; Tavares et al., 2023).

These mismatches manifest in the forms of overeducation and underemployment. Overeducation occurs when individuals possess qualifications exceeding job requirements, leading to inefficiencies in human capital utilization and potential productivity losses (Kiryushina & Rudakov, 2021; Дудырев et al., 2020). Underemployment refers to employment situations that fail to fully utilize workers' skills, education, or

experience, often resulting in precarious or temporary job arrangements (Triyono et al., 2023; Kugler et al., 2020). Both phenomena reflect broader skill mismatch dynamics, in which the types and levels of skills produced by the education system diverge from those demanded by employers (Triyono et al., 2023; Ibrahim & Nashir, 2022). In developing and middle-income economies undergoing structural transformation, such mismatches can constrain productivity growth and reduce the efficiency of labor market allocation.

Policy orientation in Indonesia has largely favored higher education expansion under the assumption that tertiary degrees yield higher private and social returns (Kuntadi et al., 2020; Suyantiningsih et al., 2023). Within this paradigm, vocational education has often been perceived as a secondary pathway, receiving comparatively lower social recognition and institutional support (Tavares et al., 2024; Clement et al., 2021). Public financing patterns reflect this orientation, with disproportionate allocation toward higher education institutions relative to vocational education and training systems (Langthaler et al., 2022; Kosack, 2025). Limited and unstable funding constrains vocational institutions' ability to modernize training facilities, update curricula, and strengthen partnerships with employers. Consequently, while the number of university graduates continues to increase, shortages of intermediate and technical skills persist across various sectors (Prikshat et al., 2019; Triyono et al., 2023).

Vocational education and apprenticeship systems are widely recognized as effective mechanisms for developing intermediate-level competencies. By integrating theoretical instruction with structured practical training, vocational pathways equip learners with job-relevant skills directly applicable in industry settings (Perić et al., 2020; Tynyskhanova et al., 2025). Apprenticeship models further reinforce this linkage through work-based learning arrangements that foster technical expertise, work discipline, and problem-solving capabilities (Naegele, 2025; Li & Rohayati, 2024). Empirical evidence indicates that graduates of vocational and apprenticeship programs often experience smoother school-to-work transitions and relatively higher employment rates in occupations requiring intermediate skills (Amante & Fernandes, 2023; Okolie et al., 2020). Despite this evidence, enrollment and investment in vocational pathways remain limited compared to academic tracks.

In addition to initial education pathways, work-based training and lifelong learning have become increasingly important in the context of rapid technological change and evolving occupational structures. Structured workplace learning such as internships, traineeships, and cooperative education enhances employability by bridging formal education and practical experience (Okolie et al., 2020; Schulz et al., 2023). Continuous upskilling and reskilling are essential to maintaining workforce adaptability and preventing skill obsolescence (Naegele, 2025; Zakharchenko et al., 2023). Individuals with access to lifelong learning opportunities are generally less vulnerable to displacement and better positioned to sustain long-term employability (Tynyskhanova et al., 2025; Li & Rohayati, 2024). However, participation in continuing training remains uneven and insufficiently supported by coordinated policy frameworks.

Although existing studies provide valuable insights into the returns to higher education, the effectiveness of vocational pathways, the prevalence of overeducation, and the role of lifelong learning, these elements are predominantly examined in isolation. Current research rarely analyzes how higher education expansion, vocational underinvestment, and uneven lifelong learning participation interact with one another to influence aggregate labor market performance. As a result, the structural interdependencies within the education and training system remain insufficiently theorized and empirically integrated.

In the Indonesian context, empirical evidence is particularly fragmented. Studies tend to focus separately on graduate employability, vocational outcomes, or skill mismatch indicators, without systematically linking education financing priorities, workforce qualification composition, and productivity outcomes within a unified analytical framework. Consequently, there is limited understanding of how policy-driven imbalances across education pathways contribute to persistent overeducation, underemployment, and constrained productivity growth. This absence of an integrated perspective restricts the formulation of coherent human capital development strategies.

Accordingly, this study aims to examine the implications of the current imbalance between higher education, vocational education, and continuing training for labor market performance and productivity in Indonesia. By synthesizing evidence on educational expansion, skill mismatch dynamics, intermediate skills formation, and lifelong learning participation, this research develops an integrated framework connecting education financing structures, workforce qualification composition, and labor market outcomes. The contribution of this study lies in its systemic approach, offering a comprehensive perspective to inform more balanced and sustainable human capital development policies.

2. Method

This study adopts a policy-oriented analytical design combining quantitative descriptive analysis with insights from existing empirical and qualitative research. Such an approach is commonly used to examine

imbalances in education and training systems, as it allows researchers to relate educational pathways to labor market outcomes while accounting for institutional and structural contexts (Дудырев et al., 2020; Suryadi et al., 2024). Quantitative techniques, including regression-based and trend analyses, are widely applied in prior studies to assess relationships between educational attainment, skill supply, and employment outcomes, while longitudinal perspectives are used to trace transitions from education to work and to identify persistent patterns of skill mismatch over time (Olofsson & Panican, 2023; Gogescu, 2024). Complementing these approaches, qualitative evidence from interviews and focus group discussions reported in the literature provides contextual understanding of how individuals experience overeducation, underemployment, and skill mismatch in the workplace (Santiago-Vela & Hall, 2022; Mayombe, 2023).

The analysis relies on secondary data sources commonly employed in studies of skill mismatch and labor market performance. These data typically include demographic characteristics (such as age, gender, and educational background), employment indicators (employment status, occupation, sector, and earnings), and aggregate labor market statistics related to unemployment and workforce absorption (Дудырев et al., 2020; Tavares et al., 2023; Haasler, 2020). In addition, survey-based measures capturing required competencies and perceived alignment between education and job requirements are used in the literature to assess the degree of skill mismatch (Mayombe, 2023; Arthur & Koomson, 2023). In this study, such indicators are synthesized to describe changes in workforce qualification structure, graduate labor market outcomes, participation in vocational education and apprenticeship, and trends in adult training. Descriptive tables summarizing workforce qualification distribution, apprenticeship participation by level and age, and adult training trends are used to support the analysis and to visually illustrate key empirical patterns.

To address common data limitations in education policy research, this study draws on methodological strategies established in prior work. The use of administrative and large-scale secondary data enables robust analysis despite constraints on primary data collection, as demonstrated in evaluations of vocational training programs using administrative records (Kugler et al., 2020). Advanced statistical models, such as linear regression and fractional probit models, have been employed in related studies to examine differential labor market outcomes by educational pathway and institutional type, illustrating how secondary data can yield meaningful policy insights (Tavares et al., 2023). Cross-national comparative evidence is also referenced to strengthen external validity and situate national findings within a broader international context (Shala & Badivuku-Pantina, 2023). Ethical considerations are addressed by relying exclusively on anonymized secondary data and published studies, ensuring that no identifiable personal information is used and that the analysis adheres to established standards of research integrity.

3. Results and Discussion

3.1. Results

3.1.1. Changes in Workforce Qualification Distribution Over Time

The results indicate substantial changes in the distribution of workforce qualifications over the past two decades, reflecting broader economic transformation and shifts in education systems. Across multiple contexts, including emerging and advanced economies, the proportion of workers holding higher education qualifications has increased steadily, while the share of workers with intermediate vocational qualifications has grown more slowly or remained stagnant. Evidence from technical and vocational education reforms in Chile shows that rising completion rates in vocational education were accompanied by improvements in training quality, largely driven by changing labor market demand toward more technology-intensive skills (Valdebenito & Sepúlveda, 2021; Li, 2023). Similar dynamics are observed in other countries where education systems have been required to adapt to expanding skill requirements.

Studies focusing on education-to-work transitions highlight that labor markets increasingly demand broader and more complex qualification profiles, compelling education systems to expand formal credentials (Roberts, 2020). However, this expansion has not always translated into balanced skill structures. Instead, the growing dominance of higher education qualifications alongside limited growth in intermediate vocational skills suggests the emergence of structural skill gaps. These trends provide an empirical backdrop for understanding why labor markets may simultaneously experience graduate surplus and shortages of technically skilled workers.

Table 1 summarizes the broad shift in workforce qualification structure, showing a pronounced increase in higher education attainment alongside a decline in low or no qualifications. In contrast, intermediate vocational qualifications exhibit limited expansion, indicating a potential imbalance in the development of middle-level skills.

Table 1. Distribution of Workforce Qualifications Over Time (Illustrative Summary)

Qualification Category	Early Period	Recent Period	Direction of Change
Higher education	Low-moderate	High	Strong increase
Intermediate vocational	Moderate	Moderate	Stagnant/slow growth
Low or no qualification	High	Low	Decline

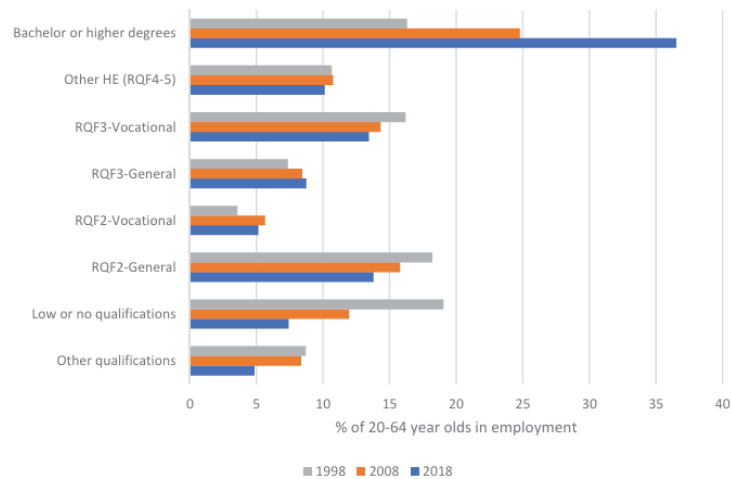


Figure 1. Percentage Distribution of Employed Adults Aged 20-64 by Highest Qualification Level, 1998-2018

3.1.2. Labor Market Outcomes of Higher Education versus Vocational Graduates

Clear differences emerge when comparing labor market outcomes between higher education graduates and vocational graduates. On average, higher education graduates tend to experience lower unemployment rates and higher earnings than those completing vocational programs. However, this aggregate advantage masks important heterogeneity. Research shows that individuals who combine vocational education with subsequent higher education often achieve higher earnings than purely academic graduates without prior practical training, suggesting complementarities between academic knowledge and work-based skills (Lukesch & Zwick, 2020).

At the same time, graduates from vocational and technical programs may face initial challenges during early career stages, particularly in economies where vocational pathways are less socially valued. Nevertheless, longitudinal evidence indicates that these graduates can realize long-term career benefits as they accumulate work experience and firm-specific skills (Gamboa et al., 2020). Moreover, vocational graduates involved in high-quality apprenticeship or internship programs demonstrate faster adaptation to labor market requirements and smoother school-to-work transitions (Suyantiningsih et al., 2023; Gogescu, 2024).

These findings suggest that differences in labor market outcomes are not solely determined by education level, but also by the degree of alignment between training content and workplace requirements. Vocational pathways that integrate structured work experience appear particularly effective in narrowing outcome gaps with higher education graduates.

Table 2 highlights systematic differences in labor market outcomes between higher education and vocational graduates. While higher education graduates perform better on average in terms of initial employment and earnings, vocational graduates show stronger task adaptability and improved long-term progression when supported by work-based experience.

Table 2. Selected Labor Market Outcome Patterns by Education Pathway

Indicator	Higher education graduates	Vocational graduates
Average unemployment risk	Lower	Moderate
Initial earnings	Higher	Lower-moderate
Long-term career progression	Heterogeneous	Improves with experience
Adaptability to job tasks	Variable	Generally strong

3.1.3. Trends in Adult Education and Training Participation

Participation in adult education and training has increased in many countries over the past one to two decades, largely in response to technological change and rising skill requirements. Countries such as Germany

and Sweden have invested heavily in continuing vocational education and training systems to maintain workforce adaptability and competitiveness (Haasler, 2020; Schmees et al., 2025). These investments have supported upskilling and reskilling for workers facing occupational transitions.

Empirical studies further show that vocational education plays an important role in facilitating labor market entry for previously untrained individuals, particularly young people and displaced workers. Evidence indicates rising participation in vocational programs among individuals without prior formal training, contributing to improved employability outcomes (Olofsson & Panican, 2023). Nevertheless, access to adult training remains uneven, with lower participation among older workers, those in small firms, and individuals in precarious employment.

Table 3. summarizes major trends in adult education and training, emphasizing overall growth alongside persistent participation gaps among specific population groups, which limit the equalizing potential of lifelong learning systems.

Table 3. Key Trends in Adult Education and Training

Indicator	Observed trend
Overall participation	Increasing, uneven
Investment focus	Technology- and skills-oriented
Beneficiary groups	Primarily younger and mid-career workers
Coverage gaps	Older workers, small firms

Figure 2 depicts trends in participation in adult education and training over time, disaggregated by training level and age group. Panel (a) shows that total participation increased sharply from the late 2000s, driven primarily by growth in intermediate (Level 2) and advanced (Level 3) training, before stabilizing and declining toward the end of the period. Participation in higher-level training (Level 4+) remained comparatively limited, although it increased gradually after 2013. Panel (b) indicates that growth in adult training participation was concentrated among individuals aged 25 and above, while participation among younger age groups remained relatively stable. Toward the end of the period, participation declined across all age groups, suggesting a contraction in adult training provision.

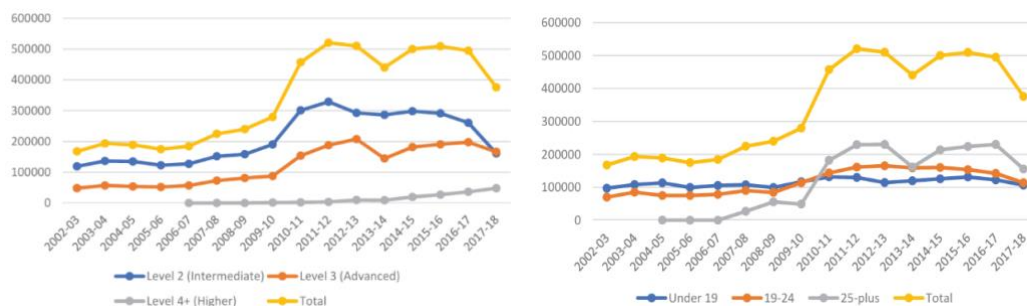


Figure 2 Trends in Adult Education and Training Participation by Level and Age Group

3.1.4. Effects of Apprenticeship Reforms on Participation and Composition

Reforms to apprenticeship systems have produced measurable effects on both participation levels and the composition of participants. Evidence from Germany demonstrates that strengthening the dual training system contributed to higher apprenticeship participation and improved integration of underrepresented groups into vocational pathways (Haasler, 2020; Fleckenstein et al., 2023). These reforms enhanced coordination between firms, training institutions, and public authorities, improving the attractiveness and effectiveness of apprenticeships.

In addition to increasing participation, reforms altered participant composition. Studies show greater inclusion of individuals from diverse socio-economic backgrounds, expanding access to skill development opportunities that were previously limited (Schmees et al., 2025). Such changes suggest that apprenticeship reforms can play a role not only in skill formation but also in reducing educational and labor market inequalities.

However, reform outcomes vary by context and design. While some systems experience increased enrollment and diversification, others face short-term declines as quality standards are raised. These findings underscore the importance of institutional design and sustained policy support in determining apprenticeship effectiveness.

Table 4. outlines the key effects of apprenticeship reforms, showing that while participation and inclusion generally improve, reforms often require higher levels of institutional coordination and may involve transitional adjustments.

Table 4. Observed Impacts of Apprenticeship Reforms

Dimension	Direction of impact
Participation levels	Increase or short-term adjustment
Skill relevance	Improved
Social inclusion	Expanded
System complexity	Increased coordination required

Figure 3 summarizes percentage changes in apprenticeship participation following reform, disaggregated by qualification level and age group. The results indicate substantial declines in participation at lower qualification levels, particularly at Level 2, where participation among individuals aged 25 and above decreased by more than half. Moderate declines are also observed at Level 3 across all age groups. In contrast, higher-level apprenticeships (Level 4+) experienced significant growth, especially among younger participants aged 19–24, while increases among older participants were more modest. Overall, the figure highlights a shift in apprenticeship provision toward higher-level qualifications and younger age groups, accompanied by an aggregate decline in total participation.

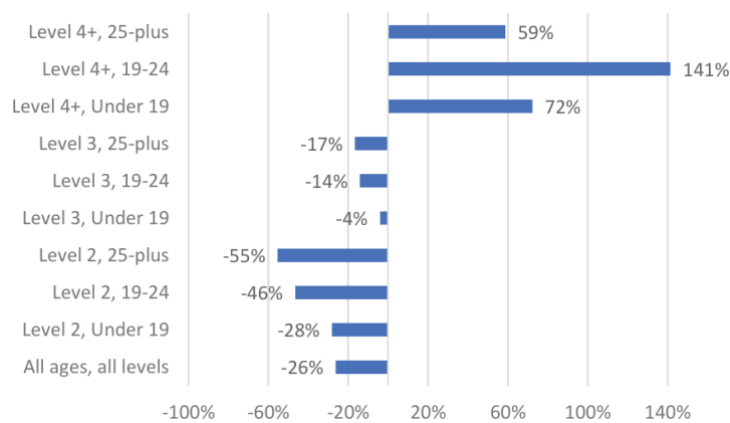


Figure 3 Percentage Change in Apprenticeship Participation by Qualification Level and Age Group Following Reform

3.1.5. Summary of Empirical Patterns

Taken together, the results reveal several consistent empirical patterns. Workforce qualification structures have shifted toward higher education, often without proportional growth in intermediate vocational skills. Labor market outcomes favor higher education graduates on average, but vocational graduates with strong work-based training demonstrate competitive and sometimes superior outcomes over the long term. Adult education and training systems have expanded, yet participation remains uneven. Finally, apprenticeship reforms show potential to enhance skill formation and inclusion when supported by coherent institutional frameworks.

These findings provide an empirical foundation for understanding how imbalances across education pathways contribute to skill mismatch and varied labor market outcomes, setting the stage for the subsequent discussion of policy implications and system-level reforms.

3.2. Discussion

The empirical results can be interpreted through the framework of human capital theory and skill mismatch, which conceptualize education and training as long-term investments that enhance productivity and labor market performance. The findings indicate that vocational education contributes not only to occupation-specific skill formation but also to broader socio-economic outcomes, consistent with evidence that vocational pathways can generate substantial returns when aligned with labor market demand (Kugler et al., 2020).

At the same time, the persistence of skill mismatch suggests that expanding educational participation alone is insufficient to guarantee efficient labor market allocation. When educational attainment does not correspond to industry needs, inefficiencies such as overeducation, underemployment, and constrained productivity

emerge (Soliz, 2023). These results reinforce the argument that the effectiveness of human capital investment depends on structural alignment between qualification systems and labor market demand.

In comparative perspective, the findings are broadly consistent with international patterns. Prior studies report disparities in labor market outcomes between higher education and vocational graduates, with vocational pathways often demonstrating strong employment outcomes but facing institutional and social constraints (Tavares et al., 2024). Similarly, research on adult education shows that while participation has expanded globally, benefits remain uneven and highly dependent on institutional design and policy coherence (Fachrizal et al., 2025; Ollikainen & Karhunen, 2021). The Indonesian case therefore reflects a broader structural challenge in balancing higher education expansion, vocational investment, and lifelong learning participation within a coherent skill formation system.

3.3. Implications

The findings carry both theoretical and policy implications. From a theoretical perspective, the study underscores the importance of examining education systems as integrated skill formation structures rather than isolated segments. The results suggest that labor market efficiency depends not solely on increasing educational attainment levels but on maintaining proportional development across higher education, vocational pathways, and continuing training systems.

From a policy standpoint, the evidence highlights the need to rebalance education financing and institutional priorities. Strengthening vocational education and apprenticeship programs is essential to address shortages of intermediate-level skills and reduce the risk of overeducation (Дудырев et al., 2020; Tavares et al., 2023). Expanding structured work-based learning through industry collaboration can enhance training relevance and facilitate smoother school-to-work transitions (Kugler et al., 2020; Kulzer et al., 2023). Additionally, increasing access to lifelong learning opportunities is critical to maintaining workforce adaptability amid technological change (Mugler, 2025; Mitze & Javakhishvili-Larsen, 2020). Policy measures should also address inequalities in training access to prevent widening socio-economic disparities (Tavares et al., 2023; Kulzer et al., 2023).

3.4. Limitations

Several limitations should be acknowledged. First, the study relies primarily on secondary and aggregate-level data, which may not fully capture individual-level variation in skill acquisition and labor market trajectories (Tavares et al., 2023). Second, the cross-sectional analytical approach limits the ability to establish causal relationships between education pathways and productivity outcomes.

Third, measurement of skill mismatch based on formal qualifications may not fully reflect actual competencies or job task requirements, potentially leading to under- or overestimation of mismatch dynamics. Fourth, as the analysis is situated within the Indonesian institutional context, caution is warranted in generalizing findings to other countries with different education and labor market structures.

Future research would benefit from longitudinal designs tracking individuals across education and employment stages, as well as from incorporating firm-level and sectoral data to better capture demand-side dynamics (Okolie et al., 2020; Lewandowska & Stopa, 2020). Integrating qualitative evidence on employer perspectives may also deepen understanding of alignment mechanisms within the skill formation system.

4. Conclusion

This study examined how imbalances between higher education, vocational education, and lifelong learning shape workforce qualifications and labor market outcomes. The findings show a clear expansion of higher education attainment over time, accompanied by relatively stagnant growth in intermediate vocational skills. While higher education continues to deliver average employment and earnings advantages, these benefits are uneven and increasingly constrained by skill mismatch and underemployment. In contrast, vocational and apprenticeship pathways that integrate structured work-based learning demonstrate strong potential to supply job-relevant skills and support smoother school-to-work transitions. The analysis also highlights the growing importance of adult education and lifelong learning in maintaining workforce relevance amid technological change. Although participation in continuing training has expanded, access remains unequal, limiting its capacity to offset structural imbalances in skill supply. Evidence from apprenticeship reforms further indicates a shift toward higher-level qualifications and younger participants, raising concerns about inclusivity and access for adult learners. Overall, the results underscore that expanding higher education alone is insufficient to address labor market needs. Effective skill formation requires a balanced education system that values vocational pathways and supports continuous skill development across the life course. Policymakers should therefore focus on rebalancing investment across education sectors, strengthening links between education providers and industry, and expanding inclusive lifelong learning opportunities. Such an approach is essential

for reducing skills mismatch, enhancing productivity, and promoting more equitable and sustainable labor market outcomes.

Author Contributions

All authors have equal contributions to the paper. All the authors have read and approved the final manuscript.

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Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/ or publication of this article.

Data Availability

The datasets generated during and/ or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration on AI Use

The authors declare that no artificial intelligence (AI) or AI-assisted tools were used in the preparation of this manuscript.

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