الجامعة الإسلامية العالمية ماليزيا
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Garden of Knowledge and Virtue

POLICY BRIEF

Process Innovation, Skill-Biased Technical Change, and Regional Skill Penalties: Evidence from Malaysian SMEs

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Key Insights

- **Process innovation (a proxy for artificial intelligence and automation adoption), significantly increases the share of skilled labour within Malaysian small and medium enterprises, confirming the skill-biased technical change hypothesis.**
- **Managerial experience is a critical determinant of workforce skill intensity, indicating that technology adoption requires capable leadership to translate investments into productive workforce restructuring.**
- **The upskilling benefits of digitalization are geographically concentrated in the central economic corridor (Kuala Lumpur and Selangor), while peripheral regions like Sabah and Sarawak face severe skill penalties.**
- **Financial constraints significantly limit the capacity of small and medium enterprises to invest in technology and complementary organizational upgrades, keeping them confined to low-skill, labour-intensive production methods.**

1. Introduction

The integration of artificial intelligence and advanced process automation into the global economy is expected to disrupt the job market. Unlike previous industrial revolutions, which largely complemented human labour, the Fourth Industrial Revolution presents an empirical question regarding whether technology augments human capabilities or renders them

obsolete. The prevailing economic arguments posit a displacement effect whereby capital substitutes for labour in routine tasks, counterbalanced by a reinstatement effect where technology generates new, more complex tasks.

In this context, the main concern is not widespread unemployment but rather the swift polarization of the workforce. As companies digitize to stay competitive, they risk creating a divide between those with access to technology and those without, thereby worsening inequality within firms even if there are no overall job losses.

Malaysia's economic trajectory offers a salient case for studying the relationship between AI innovation, automation, and workforce restructuring. As an upper-middle-income economy with a globalized manufacturing sector, Malaysia faces the dilemma of adopting technologies that are disruptive to its labour force. The New Industrial Master Plan 2030 explicitly targets a transition toward high-value, high-technology industries, aiming to increase manufacturing GDP by 6.5% annually and significantly raise median wages by 2030. Central to this agenda are capacity-building for small and medium enterprises, automation adoption, and deeper integration into global value chains.

2. Evidence of Skill-Biased Technical Change

An analysis of firm-level data from the 2024 World Bank Enterprise Survey, comprising 813 small and medium enterprises in Malaysia, finds evidence of skill-biased technical change. The empirical results demonstrate that process innovation, which serves as a proxy for artificial intelligence and automation adoption, has a positive and statistically significant effect on the proportion of skilled production workers. This finding indicates that firms engaging in process innovation actively restructure their workforce composition toward higher-skilled labour, confirming that technology adoption complements skilled workers while displacing unskilled workers.

The data also highlights the critical role of human capital at the leadership level. Managerial experience is a significant determinant of skill intensity, indicating that each additional year of top-managerial experience is associated with a higher proportion of skilled production workers. This suggests that experienced managers possess greater absorptive capacity, enabling them to identify, adopt, and effectively deploy technology-enabled process innovations in ways that systematically favour more skill-intensive labour. Technology adoption alone is insufficient; it requires leadership capable of translating investment into productive workforce restructuring.

3. Spatial and Sectoral Disparities

The benefits of digitalization and skill upgrading are not uniformly distributed across the country. The analysis reveals a significant geographic polarization in skilled labour composition. High-skilled labour is spatially concentrated in the central economic corridor of Kuala Lumpur and Selangor. In contrast, peripheral regions exhibit severe skill gaps, with small and medium enterprises in Sabah and Sarawak facing the most substantial skill penalty. This spatial disparity suggests that the benefits of digitalization are highly concentrated in the

industrial core, where agglomeration economies, superior infrastructure, and a deeper talent pool facilitate the transition to higher value-added production.

Furthermore, the data shows statistically significant heterogeneity in skilled labour composition across different sectors. Knowledge-intensive and service-intensive sectors, such as professional activities, other services, hotels, and retail, exhibit a higher proportion of skilled workers. Conversely, sectors like chemicals and chemical products show a heavier reliance on semi-skilled, process-oriented labour despite their capital intensity. This disparity highlights the uneven ability to integrate advanced technologies across different industries.

4. Conclusion

Malaysia is at a critical juncture in its effort to escape the middle-income trap, positioning digitalization as its next primary engine of growth. Small and medium enterprises, constituting 97% of all business establishments, are the backbone of the Malaysian economy. The empirical evidence confirms that AI and automation are significant factors in explaining skill-biased technical change, increasing the demand for skilled labour while displacing routine tasks. However, the concentration of these benefits in the central region and specific sectors poses a risk of widening inequality.

If AI and automation adoption in Malaysia proves to be skill-biased and geographically concentrated, state-led digitalization might unintentionally displace the semi-skilled workforce without providing clear pathways for their reintegration. Addressing these structural challenges requires a shift from generic technology adoption subsidies to targeted interventions that enhance managerial capacity, alleviate financial constraints, and promote regional equity.

Policy Recommendations

- **Policy Recommendation 1: Enhance managerial capacity through targeted training programs. Government agencies should design and implement leadership development initiatives focused on digital transformation and change management. Strengthening the absorptive capacity of managers will enable small and medium enterprises to effectively deploy advanced technologies that complement skilled labour, rather than simply substituting routine tasks.**

- **Policy Recommendation 2: Implement place-based digitalization strategies to address regional disparities. Infrastructure investments and tailored digitalization initiatives should be directed toward peripheral areas, particularly Sabah and Sarawak, where skill deficits are most severe. Establishing regional innovation hubs and providing location-specific incentives can help mitigate spatial polarization and promote equitable technological advancement.**

- **Policy Recommendation 3: Alleviate financial constraints to support comprehensive skill enhancement. Access to finance serves as a critical constraint on technological advancement. Financial institutions and government programs should offer specialized credit facilities or grants that are conditional on both technology acquisition and workforce upskilling, ensuring that capital investments are accompanied by human capital development.**

- **Policy Recommendation 4: Develop sector-specific policies that recognize the heterogeneity in skill intensity. A standardized digitalization strategy is likely to produce varied outcomes contingent upon industrial specialization. Policymakers should promote differentiated strategies that correspond with the unique technological and workforce needs of various manufacturing and service subsectors, facilitating targeted skill-driven technological advancement.**

For questions, feedback and comments, please contact
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