

Productivity through transition: Redesigning education, industrial policy and fiscal incentives for South Africa's AI transition

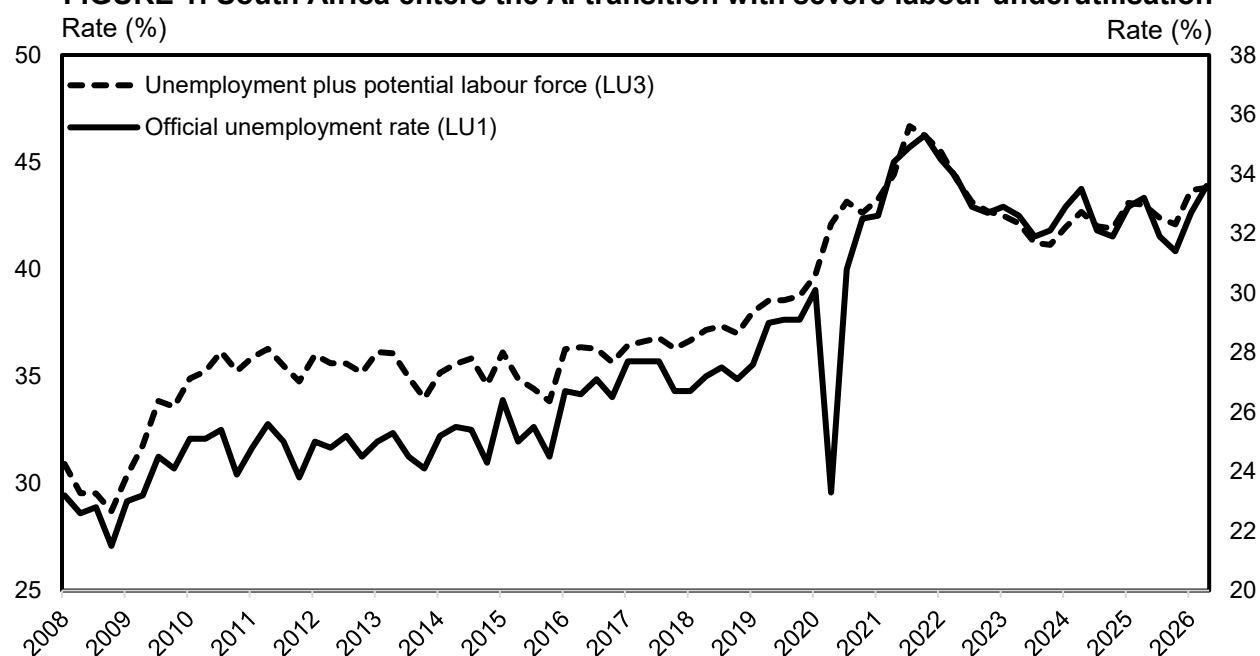
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Introduction

Artificial intelligence (AI) confronts South Africa with a difficult economic trade-off. It can raise the productivity of firms and workers in an economy that has struggled to expand, yet it is arriving in a labour market already unable to absorb millions of people (Figure 1). South Africa's economy grew by only 0.7 percent a year over the decade to 2024, four times more slowly than other middle-income economies, while real gross domestic product per capita remained around its 2007 level (World Bank, 2025a). In the second quarter of 2026, 16.7 million people were employed and 8.5 million were unemployed. The official unemployment rate was 33.6 per cent, while the combined rate of unemployment and the potential labour force reached 43.8 per cent (Statistics South Africa, 2026).

FIGURE 1: South Africa enters the AI transition with severe labour underutilisation



Source: BER database, based on Statistics South Africa Quarterly Labour Force Survey.

Note: LU3 is the combined rate of unemployment and the potential labour force as a percentage of the extended labour force. The QLFS questionnaire and labour-underutilisation reporting framework were revised from 2025Q3.

In such conditions, the objective cannot be to maximise AI adoption. It must be to maximise AI-enabled productivity while limiting labour-market disruption and preserving fiscal sustainability. The same technology can either remove workers from existing tasks,

make workers more productive, or reduce costs sufficiently to expand output and labour demand. Hence, policy should shift adoption away from pure substitution and towards complementarity and expansion, while helping workers move between tasks, occupations and firms (Acemoglu and Restrepo, 2019; Cazzaniga et al., 2024).

This essay proposes a worker-complementary AI diffusion strategy organised around one fiscal centerpiece which is an AI Productivity and Transition Incentive (APTI). Education policy should build adaptable foundational, occupational and mid-career capabilities. Industrial policy should lower the fixed costs of diffusion in sectors where South Africa already has productive capacity. Fiscal policy should subsidise only additional, socially valuable adoption, rather than ordinary technology purchases. APTI would therefore rest on three conditions which are additional investment, verified productivity and worker capability or transition. Education creates complementarity, industrial policy creates diffusion, and fiscal design creates additionality.

1. The economic problem - productivity, tasks and additionality

Productivity matters because sustained improvements in wages, public revenue and living standards ultimately require more value from available inputs. Yet technology does not translate mechanically into shared prosperity. Productivity SA reports that labour and capital productivity improved in 2024 while multifactor productivity declined, indicating continuing weakness in the efficiency with which inputs are combined (Productivity SA, 2025). AI may help, but its effect depends on the tasks it changes and complementary investment in software, data, organisational capital and skills, much of which is intangible and imperfectly measured (Corrado, Haskel and Jona-Lasinio, 2021).

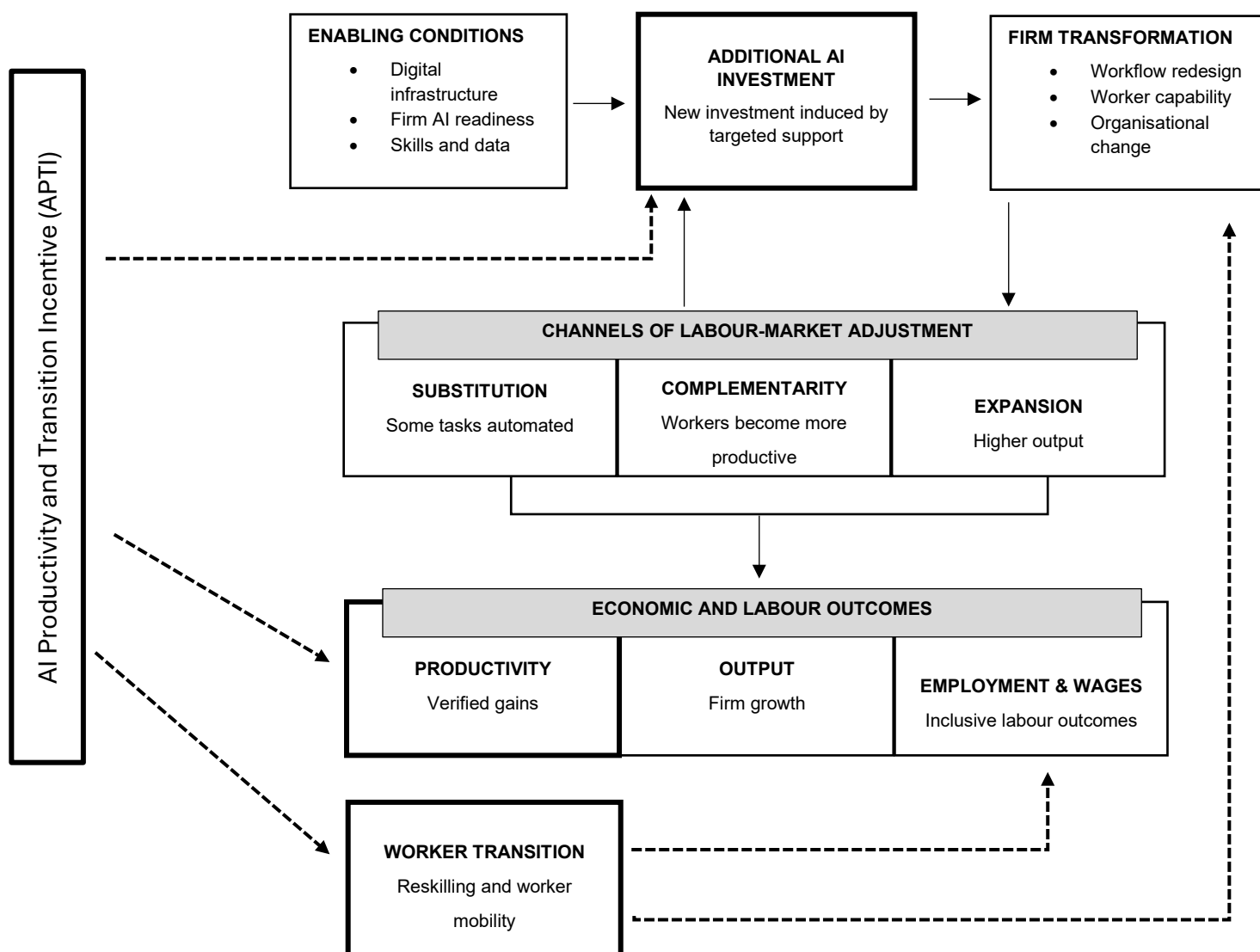
A task-based framework clarifies the labour-market channels. Acemoglu and Restrepo (2019) distinguish a displacement effect, through which capital takes over tasks previously performed by labour, from a reinstatement effect, through which new tasks raise labour demand. Applied to AI, a third channel is useful and that is expansion. If lower costs, better quality or new products increase sales, adoption can raise labour demand elsewhere in a firm or value chain (Vivarelli, 2014; Romer, 1990). AI can therefore generate substitution, complementarity and expansion simultaneously. Exposure is not a forecast of job loss.

The evidence supports caution rather than either technological fatalism or hype. The ILO estimates that one in four workers globally is in an occupation with some generative-AI

exposure but concludes that job transformation is more likely than complete redundancy because human input remains necessary across most occupations (Gmyrek et al., 2025). The IMF finds that exposure is generally higher in advanced economies than in emerging and low-income economies, while distributional outcomes depend on complementarity and workers' capacity to adapt (Cazzaniga et al., 2024). Acemoglu (2025) estimates that plausible aggregate productivity gains over a decade are non-trivial but modest, especially when future applications involve context-dependent tasks that are difficult to learn and evaluate.

The fiscal rationale turns on additionality. A firm may invest because AI is already privately profitable. Subsidising such expenditure changes who pays, not whether investment occurs, providing little additionality while imposing a fiscal cost. Intervention is justified where fixed adoption costs, imperfect information, finance constraints, training externalities or knowledge spillovers produce underinvestment from society's perspective. The relevant question is counterfactual, what would the firm have done without support? Government should fund incremental capability, not relabelled expenditure that was already commercially viable.

Figure 2: From AI investment to inclusive productivity



Source: Author's framework, informed by Acemoglu and Restrepo (2019), Corrado et al. (2021), Cazzaniga et al. (2024) and Gmyrek et al. (2025).

2. Education for complementarity and continuous adaptation

“AI skills” cannot mean coding alone. South Africa needs specialist engineers, data scientists and governance professionals, but most workers will use AI inside existing occupations. The education system should therefore operate at three levels precisely foundational capability, occupational application and continuous modular learning.

First, schools must prioritise literacy, numeracy, problem-solving and digital literacy. These are the capabilities that allow a worker to frame a problem, interrogate an output, detect an unsupported claim and exercise judgement. Weak foundations raise the risk that AI widens

inequality between workers who can direct and verify technology and those whose routine tasks are more readily substituted (Cazzaniga et al., 2024; World Bank, 2026).

Second, universities and TVET colleges should embed AI within occupational programmes. The aim is not to turn every student into a programmer. Accountants should test machine-generated classifications, artisans and engineers should interpret predictive-maintenance systems, and managers should understand data quality, cyber risk and accountability. Prediction is an input into decision-making, not a substitute for the decision itself, which makes domain judgement a critical complement (Agrawal, Gans and Goldfarb, 2019).

Third, existing workers need short, stackable and portable modules. Workers facing task change cannot routinely leave employment for multi-year qualifications. Public support should favour independently assessed credentials that accumulate towards recognised qualifications and retain value across employers. Employer participation is needed for relevance, but training should not be confined to a proprietary system whose value disappears when a worker moves.

The deeper requirement is institutional adaptability. Government cannot predict the jobs of 2040 or redesign curricula around every new model. Departments, institutions and training authorities should continuously use occupation-level evidence on tasks, vacancies, wages, course completion, placement and employer demand. The World Bank identifies weak foundations, unequal access, programme misalignment and inadequate workplace learning as constraints in South Africa's digital-skills pipeline (World Bank, 2026). Teachers and trainers also need support to integrate validated tools into subject teaching. Otherwise, curriculum reform remains a document rather than a delivered capability.

Training incentives should therefore be judged by completion, independent assessment, placement, earnings progression or verified movement into higher-value tasks, with suitable adjustment for participant disadvantage. This aligns providers with transition outcomes rather than enrolment volumes.

3. Industrial policy for diffusion, not technological prestige

South Africa's comparative challenge is diffusion, not training the world's largest frontier model. Frontier research remains valuable in universities, science councils and specialised firms, but a substantial productivity opportunity may lie in enabling ordinary firms to apply

proven tools. OECD evidence shows that SMEs lag larger firms in AI adoption and face barriers involving connectivity, data, compute, skills and finance (OECD, 2025a). A broad tax deduction would favour firms already able to finance, classify and claim expenditure.

Industrial policy should select applications according to economic significance, feasible productivity gains, export potential, spillovers and labour-market effects. Three sectors illustrate different channels. In mining, predictive maintenance, geological analysis and safety monitoring may reduce downtime and improve asset use. In manufacturing, machine vision, production scheduling and quality control can reduce defects and strengthen suppliers, provided adoption is connected to technicians and artisans. In business services, AI can automate routine processing while allowing workers to handle more complex analysis and interaction, because the sector is employment-intensive and tradable, augmentation and expansion are especially important.

Government should lower shared fixed costs rather than choose vendors. Existing universities, TVET colleges, science councils and industrial-support programmes should be repurposed as sector-specific diffusion partnerships. No new agency is required. Their narrow role would be to conduct readiness diagnostics, demonstrate proven applications, connect firms to accredited training and publish non-confidential lessons. Infrastructure remains a binding complement where reliable electricity, connectivity, technical skills, institutions and absorptive capacity shape sub-Saharan Africa's ability to capture AI benefits (Schindler et al., 2026).

South Africa also has an immediate policy window. Cabinet approved publication of a draft national AI policy in April 2026, structured around talent, inclusive growth, governance, ethics, cultural preservation and human-centred deployment (SAnews, 2026a). The draft was withdrawn in June 2026 to be reworked and to establish national standards for ethical AI use (SAnews, 2026b; Department of Communications and Digital Technologies, 2026). The redesign should connect governance to education, productivity and fiscal choices rather than treat AI regulation as a standalone exercise.

4. International lessons: adapt instruments, not institutional models

International experience reinforces the importance of complementary capabilities, but no country should be copied wholesale. Singapore, Korea and China differ from South Africa

in state capacity, fiscal space, industrial structure and labour-market conditions. Their value lies in the instruments they use and the constraints those instruments address.

Singapore offers the clearest example of joining enterprise transformation to worker capability. National AI Strategy 2.0 integrates industry, government and research activity with talent, workforce capability, compute, data and a trusted environment (Smart Nation Singapore, 2023). Its National AI Impact Programme pairs enterprise adoption with bilingual AI workers who combine domain expertise and practical AI fluency, and it makes pre-approved solutions available to reduce SME adoption barriers (Infocomm Media Development Authority, 2026). The lesson is joint design where adoption assistance and occupational capability should reach the same firm and workflow, rather than sit in disconnected programmes.

Korea provides a second lesson on lowering fixed adoption costs. Its AI Voucher Programme allows SMEs and start-ups requiring AI-based products or services to purchase solutions from suppliers, alongside public support for data and computing infrastructure (OECD, 2022; OECD, 2025b). This supports a voucher or matched-grant channel for firms that receive little immediate value from a tax deduction. It also reveals a limitation where a payment tied only to purchasing a solution can reward a transaction rather than a result. South Africa should add co-financing, a pre-intervention baseline and outcome verification.

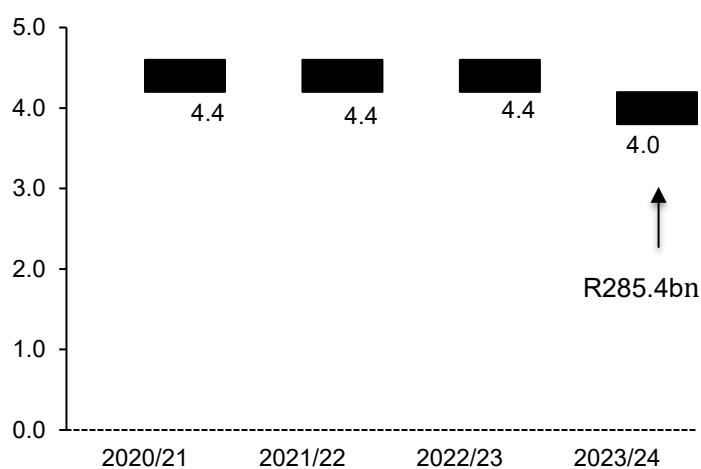
China demonstrates both the power and the danger of mission-oriented coordination. Its strategy spans infrastructure, talent, data, sector applications and the AI technology stack, with a strong focus on manufacturing and industrial upgrading (World Economic Forum, 2025; Chan et al., 2025). Yet RAND also reports waste, including inefficient allocation of AI chips, and bottlenecks that state support cannot readily remove (Chan et al., 2025). South Africa should borrow the focus on sector-specific production problems and complementary infrastructure, not China's scale of subsidy or administrative allocation.

The transferable lesson is disciplined complementarity. Singapore joins adoption to workforce capability, Korea targets SME adoption barriers, and China connects AI to industrial transformation. South Africa should combine these principles inside a smaller, capped and evaluable mechanism. The test is not whether the country reproduces foreign institutions, but whether public support induces additional investment, productive reorganisation and portable worker capability.

5. A budget mechanism: the AI Productivity and Transition Incentive (APTI)

South Africa should not announce an uncapped AI allowance. As shown in Figure 3, National Treasury estimates that tax expenditures already amounted to R285.4 billion, or 4 per cent of GDP, in 2023/24 (National Treasury, 2026). This does not imply that all tax expenditures are wasteful or available for AI. It establishes that preferential treatment carries a material fiscal cost and that any new incentive must demonstrate additional value.

Figure 3: Tax expenditure as % of GDP



Source: National Treasury

Note: Latest-year estimate subject to revision.

South Africa's R&D tax incentive was designed to encourage the creation of new knowledge, where uncertainty and knowledge spillovers can cause firms to underinvest in research (World Bank, 2019). By contrast, purchasing an existing AI product is primarily technology adoption rather than innovation. Extending R&D-style support to all AI expenditure could therefore subsidise spending that would have occurred anyway, reducing additionality and weakening fiscal targeting.

APTI should instead be a fixed, multi-year appropriation created by reallocating a defined portion of existing business-support spending towards competitive adoption and worker-transition projects. The Budget should announce the total envelope, annual ceilings and a sunset date. The Department of Trade, Industry and Competition could administer applications through existing systems, while National Treasury controls the envelope and evaluation. If qualifying demand exceeds the ceiling, projects should be ranked on expected additionality, productivity and spillovers. The benefit must not become an open-ended entitlement.

The instrument would have two stages but only three substantive conditions which are additional investment, verified productivity and worker capability or transition.

Stage 1: limited adoption support

Smaller firms should receive matched support for activities such as readiness assessments, data preparation, cybersecurity safeguards, initial training and pilot projects. Requiring firms to contribute part of the cost ensures that they share the risk and invest only in projects they believe will succeed. Grants or refundable tax credits are likely to be more effective than tax deductions for smaller firms with limited taxable income. Large firms should generally finance routine AI adoption themselves, unless a project generates broader benefits through supplier development, research spillovers or shared infrastructure.

Stage 2: payment for verified outcomes

Enhanced support would follow only after independent verification. First, the firm must show investment above a defensible baseline, such as its recent digital-investment path or a documented pre-application plan. No method identifies the counterfactual perfectly, but pre-approval, co-financing and a baseline are more credible than retrospective reimbursement.

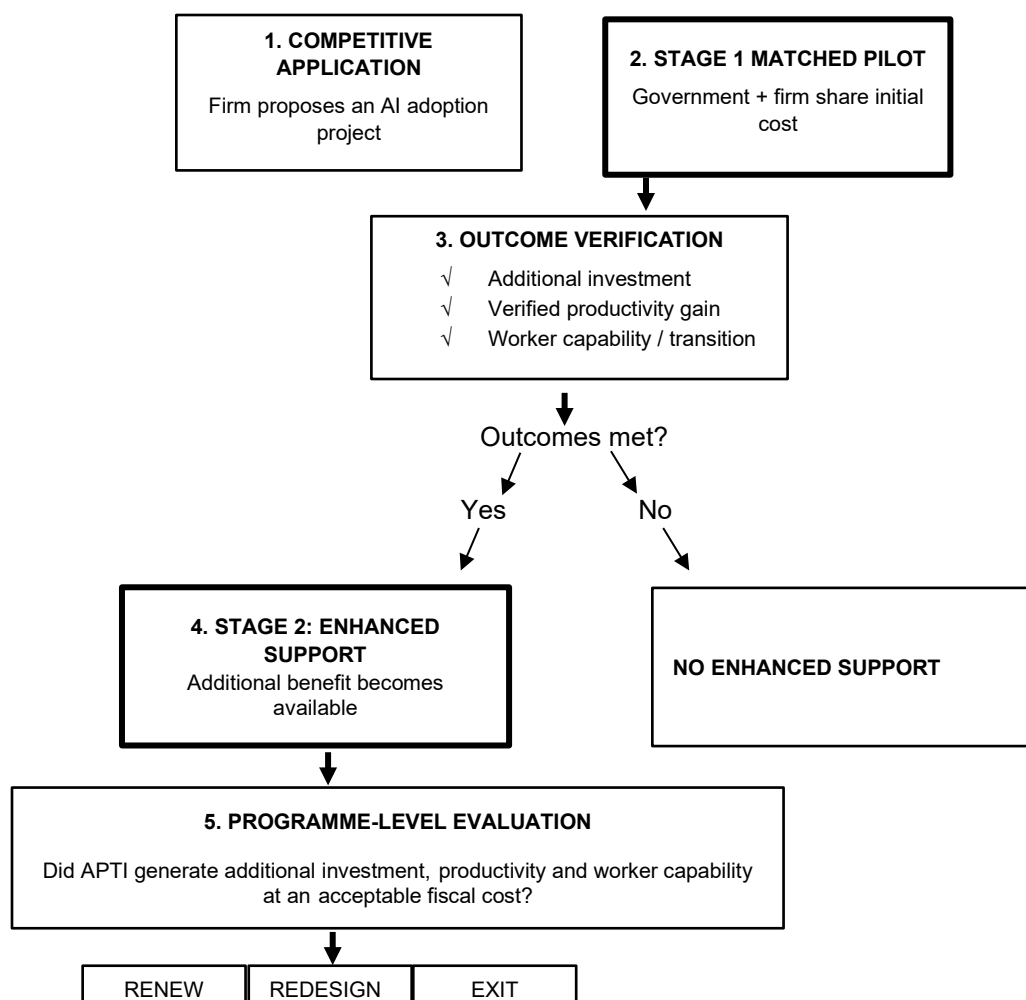
Second, the firm must report on a sector-appropriate productivity measure selected before implementation. Examples include value added per hour, defects, downtime, energy use per unit, processing time or delivery reliability. Headcount reduction alone cannot qualify, because output per worker can rise mechanically when workers are retrenched. Measurement should identify an operational improvement and, where possible, output or quality expansion.

Third, the firm must demonstrate worker capability or transition through independently assessed training, movement into redesigned tasks, redeployment or portable credentials. The rule should not prohibit every retrenchment, which would freeze adjustment. It should require firms receiving public support to bear part of the transition cost rather than shifting it entirely to workers and the state. Data protection, consultation and reporting remain safeguards, not separate scoring pillars.

Failure has a clear consequence. A compliant pilot that does not meet agreed outcomes receives no Stage 2 benefit. Materially misleading claims trigger recovery through existing

legal mechanisms. At programme level, the appropriation expires automatically unless an independent evaluation demonstrates additional investment and satisfactory social returns.

Figure 4: The APTI fiscal contract



Source: Author's proposal, informed by lessons from Singapore, Korea and China.

Evaluation must focus on the counterfactual. National Treasury should compare supported firms with credible non-participants using administrative tax, employment and programme data where legally possible. The questions are whether APTI accelerated or expanded investment, whether productivity improved for reasons beyond labour shedding, whether workers gained portable capability and whether benefits justified fiscal and administrative costs. Results should be published by sector and firm size while protecting confidential information.

This creates a recognisable Budget Speech mechanism, a capped vote, competitive allocation, staged payment, verified outcomes and automatic exit. If demand exceeds the

cap, ranking replaces first-come-first-served access. If the programme fails, the sunset clause closes it rather than converting a pilot into a permanent tax expenditure.

6. Limiting labour-market disruption

APTI changes firm incentives, but transition policy must operate before, during and after displacement. Before disruption, sector bodies and employers should use task-level evidence to identify vulnerable work and train people while they remain employed. During transition, workers need portable credentials, vacancy matching and assistance moving between occupations or locations. After displacement, income protection remains necessary but should be joined to accessible employment services and credible training rather than expected to restore employment alone.

The goal is not to compel firms to retain every task. It is to reduce avoidable displacement, expand new work and lower the cost of movement. Workers possess operational knowledge about bottlenecks, safety and task design, which makes social dialogue economically useful rather than merely procedural. The ILO therefore emphasises dialogue in managing generative AI's effects on job quality and productivity (Gmyrek et al., 2025). A firm receiving public support should disclose material task changes and its plan for affected workers.

Success should be measured beyond jobs “saved”. Indicators should include redeployment, time to re-employment, earnings after transition, movement into higher-value tasks and employment created through expansion or suppliers. This recognises the expansion channel and avoids turning worker protection into technological stagnation.

Conclusion

South Africa does not need an AI strategy that celebrates adoption statistics. It needs one that changes the composition and consequences of adoption. Education should make workers complementary to AI through strong foundations, occupational application and continuous modular learning. Industrial policy should diffuse proven tools into sectors with productive capacity, using existing institutions rather than building a new agency. Labour-market policy should speed movement between tasks and firms while protecting those who bear adjustment costs.

International evidence strengthens rather than displaces this domestic logic. Singapore shows how enterprise adoption can be joined to workforce fluency, Korea shows how targeted instruments can lower SME adoption barriers, and China shows why sector missions require complementary infrastructure, while also warning against wasteful allocation. The lesson is to adapt instruments, not copy institutional scale.

Fiscal design binds the package together. Through a capped envelope and staged payment, APTI would support additional investment only when it produces verified productivity and worker capability or transition. Competitive allocation limits exposure, outcome verification limits deadweight loss, and a sunset clause prevent permanence without evidence.

AI creates substitution, complementarity and expansion. South Africa cannot eliminate substitution, but it can strengthen the latter two channels. Education creates complementarity. Industrial policy creates diffusion. Fiscal incentives create additionality. Together, these can turn AI from a source of labour exclusion into an instrument of productivity-enhancing structural transformation. The objective should not be to maximise the number of machines that can perform human tasks. It should be to maximise the number of South Africans who can use better machines to produce more valuable work.

References

- Acemoglu, D. 2025. 'The simple macroeconomics of AI'. *Economic Policy*, 40(121): 13–58. <https://doi.org/10.1093/epolic/eiae042> .
- Acemoglu, D. and Restrepo, P. 2019. 'Automation and new tasks: How technology displaces and reinstates labor'. *Journal of Economic Perspectives*, 33(2): 3–30. <https://doi.org/10.1257/jep.33.2.3> .
- Agrawal, A., Gans, J.S. and Goldfarb, A. 2019. 'Artificial intelligence: The ambiguous labor market impact of automating prediction'. *Journal of Economic Perspectives*, 33(2): 31–50. <https://doi.org/10.1257/jep.33.2.31> .
- Cazzaniga, M., Jaumotte, F., Li, L., Melina, G., Panton, A.J., Pizzinelli, C., Rockall, E. and Tavares, M.M. 2024. Gen-AI: Artificial intelligence and the future of work. IMF Staff Discussion Note SDN/2024/001. Washington, DC: International Monetary Fund.
- Chan, K., Smith, G., Goodrich, J., DiPippo, G. and Pilz, K.F. 2025. Full stack: China's evolving industrial policy for AI. Santa Monica, CA: RAND Corporation.
- Corrado, C., Haskel, J. and Jona-Lasinio, C. 2021. 'Artificial intelligence and productivity: An intangible assets approach'. *Oxford Review of Economic Policy*, 37(3): 435–458. <https://doi.org/10.1093/oxrep/grab018>.
- Department of Communications and Digital Technologies. 2026. Withdrawal of the Draft South Africa National Artificial Intelligence (AI) Policy. Government Gazette No. 54840, Notice 3978, 12 June.
- Gmyrek, P., Berg, J., Kamiński, K., Konopczyński, F., Ładna, A., Nafradi, B., Roślaniec, K. and Troszyński, M. 2025. Generative AI and jobs: A refined global index of occupational exposure. ILO Working Paper 140. Geneva: International Labour Organization.
- Infocomm Media Development Authority. 2026. National AI Impact Programme: Empowering enterprises and workers to transform with AI. Singapore: IMDA.
- National Treasury. 2022. Tax expenditure statement: 2022 Budget Review. Pretoria: National Treasury.
- National Treasury. 2024. Tax expenditure statement: 2024 Budget Review. Pretoria: National Treasury.
- National Treasury. 2025. Tax expenditure statement: 2025 Budget Review. Pretoria: National Treasury.

National Treasury. 2026. Tax expenditure statement: 2026 Budget Review. Pretoria: National Treasury.

OECD. 2022. Korea's AI Voucher Programme. Paris: Organisation for Economic Co-operation and Development.

OECD. 2025a. AI adoption by small and medium-sized enterprises. Paris: Organisation for Economic Co-operation and Development.

OECD. 2025b. National AI policy initiatives: Korea. OECD.AI Policy Observatory. Paris: Organisation for Economic Co-operation and Development.

Productivity SA. 2025. Productivity statistics summary 2025. Midrand: Productivity SA.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, 98(5, Part 2), S71–S102. <https://doi.org/10.1086/261725>

SAnews. 2026a. 'Draft AI policy approved for publication for public comment'. 2 April. Pretoria: Government Communication and Information System.

SAnews. 2026b. 'Cabinet approves withdrawal of AI policy'. 5 June. Pretoria: Government Communication and Information System.

Schindler, M. et al. 2026. Unlocking the potential: AI in sub-Saharan Africa. Washington, DC: International Monetary Fund.

Smart Nation Singapore. 2023. National AI Strategy 2.0: AI for the public good, for Singapore and the world. Singapore: Smart Nation and Digital Government Office.

Statistics South Africa. 2026. Quarterly Labour Force Survey, Quarter 2: 2026. Statistical Release P0211. Pretoria: Statistics South Africa.

Vivarelli, M. (2014). Innovation, employment and skills in advanced and developing countries: A survey of economic literature. *Journal of Economic Issues*, 48(1), 123–154. <https://doi.org/10.2753/JEI0021-3624480106>

World Bank. 2019. Impact evaluation of the R&D tax incentive in South Africa. Washington, DC: World Bank.

World Bank. 2025a. Driving inclusive growth in South Africa: Quick wins with competitive markets and efficient institutions. Washington, DC: World Bank.

World Bank. 2026. From demand to delivery: Strengthening South Africa's digital skills pipeline to deliver more and better jobs. Washington, DC: World Bank.

World Economic Forum. 2025. Blueprint to action: China's path to AI-powered industry transformation. Geneva: World Economic Forum.