

Quantifying the Ethnic Diversity Dividend in Mathematical Sciences and AI

Policy brief for DSIT, Parliament and sector partners

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Executive summary

Mathematical-science (MS) skills now underpin a large and growing share of the UK economy, especially in artificial intelligence (AI), data science, finance, health and infrastructure. Recent Academy analysis estimates that MS skills support around **5.11 million jobs** (about **15%** of UK employment) and **£489bn** of direct GVA (around **19%** of UK GVA)[3].

At the same time, minoritised ethnic groups remain materially under-represented in MS roles. Using Census 2021 and APS data for England and Wales, they account for around **19.5%** of the working-age population but only **14.8%** of MS workers, implying roughly **240,000 “missing” minoritised-ethnic MS workers** if representation matched the population[4, 5].

Anchoring to the Academy’s 2023 Deloitte-aligned snapshot (£495bn GVA, 4.22m MS workers, £117k per worker[2]), a simple population-based shortfall method suggests that closing this representation gap would add approximately **£23bn per year** to UK GVA. Because England & Wales are used as a proxy for the UK, and because the calculation uses an average GVA per worker, this estimate is best interpreted as a *conservative* lower bound.

Crucially, MS and AI are areas of genuine skills shortage rather than static labour markets. The sector has expanded substantially since the 2010 Deloitte estimate of 2.8m MS-dependent jobs[1] and the Academy’s updated work suggests that a 1% increase in MS employment can be worth around £5bn of extra GVA[3]. Closing ethnic representation gaps in MS/AI should therefore be understood as a growth strategy, not a zero-sum reallocation.

Key recommendations

- 1. Embed ethnicity metrics in AI/MS growth programmes.**
DSIT and delivery partners should track and publish ethnicity-disaggregated participation and outcomes data for all major MS/AI skills and adoption schemes (scholarships, bootcamps, AI Growth Zones, public-sector pilots).
- 2. Align pay gap reporting with MS/AI roles.**
As mandatory ethnicity and disability pay gap reporting is introduced, employers in MS- and AI-intensive sectors should be encouraged or required to report representation and pay by occupation families that map to MS/AI roles, and to publish targeted action plans.
- 3. Grow a diverse MS/AI pipeline.**
Expand scholarships, conversion MScs and apprenticeships aimed at minoritised-ethnic candidates in mathematical sciences and AI, alongside sustained outreach at Key Stages 3–4 and into undergraduate study.
- 4. Reskill and open routes in.**
Scale publicly supported bootcamps and employer-led transitions into MS/AI roles, with incentives for organisations that demonstrably increase minoritised-ethnic representation in these occupations.
- 5. Make MS/AI workplaces inclusive.**
Encourage diverse leadership and governance in AI labs and decision-making bodies; require disaggregated workforce reporting and clear strategies for progression into senior MS/AI roles.

Methods in brief

The estimate is based on a *population-based shortfall* approach:

1. Use Census 2021 and ONS sources to obtain the share s_p of minoritised-ethnic individuals in the working-age population (19.5% in England & Wales)[4, 5].
2. Use APS and sectoral mapping to infer the share s_w of minoritised-ethnic individuals in MS roles (14.8%).
3. Compute the gap $\Delta s = s_p - s_w = 4.7$ percentage points.
4. Multiply Δs by the Academy’s MS headcount and per-worker GVA to obtain a GVA gap.

Key limitations, explored fully in the technical paper, include:

- England & Wales ethnic data is used as a proxy for the UK, which likely makes the UK-wide GVA gap estimate conservative.
- The calculation uses an average GVA per worker; diversity could in practice change the distribution of roles and productivity, so the true economic gain could be larger.
- The framing is explicitly *non-zero-sum*: the MS/AI sector is assumed to continue growing, with policy interventions shaping the composition of new jobs rather than displacing existing workers.

Relevance for DSIT and the AI Opportunities Action Plan

The *AI Opportunities Action Plan* sets out a strategy to make the UK an “AI superpower”, with measures on compute, AI Growth Zones, talent pipelines and diffusion of AI across the economy[6, 7, 8] The emphasis is rightly on growth, productivity and adoption.

In parallel, government has launched consultation on *mandatory ethnicity and disability pay gap reporting* for large employers, as part of the Equality (Race and Disability) Bill, extending principles already used for gender pay gaps[9].

At present, however:

- AI and MS policy documents focus heavily on overall headcounts, compute capacity and generic skills supply, with limited attention to *who* fills MS/AI roles by ethnicity and other protected characteristics.

- The AI Opportunities Action Plan benchmarks success primarily in terms of adoption and aggregate output, without quantifying the cost of ethnic under-representation in MS/AI-intensive sectors or setting explicit diversity objectives.

- Pay gap reporting is being developed in parallel to, rather than fully integrated with, AI and MS skills policy.

This creates a risk that the UK successfully expands its MS/AI footprint while leaving structural ethnic inequalities largely untouched, and foregoing a measurable share of potential GVA.

Policy implications and levers

The evidence suggests that closing the ethnic representation gap in MS and AI is both a fairness imperative and a material growth opportunity. Three clusters of levers stand out.

1. Embed ethnic diversity metrics in MS/AI growth programmes

- DSIT and delivery partners should adopt ethnicity-disaggregated metrics for all major MS/AI skills and adoption programmes, with transparent annual reporting.
- Targets can be indicative rather than rigid quotas, but should be benchmarked against working-age population shares and the headline GVA opportunity.
- Evaluation frameworks for the AI Opportunities Action Plan and related initiatives should explicitly track whether growth in MS/AI employment is closing, rather than widening, the gap.

2. Align pay gap reporting with MS/AI workforce data

- As ethnicity and disability pay gap reporting is rolled out, government could encourage or require large employers in MS- and AI-intensive sectors to report workforce and pay data disaggregated by occupation families that map to MS/AI roles.
- Employers should be encouraged to publish action plans focused on representation and progression in high-growth, high-GVA MS/AI jobs.

3. Targeted levers for inclusive MS/AI growth

1. **Grow a diverse pipeline.** Scholarships, conversion MScs and apprenticeships targeted at minoritised-ethnic candidates in mathematical sciences and AI; sustained outreach at Key Stages 3–4 and into undergraduate study.
2. **Reskill and open routes in.** Publicly supported bootcamps and employer-led transitions into MS/AI roles, with incentives for organisations that demonstrably increase representation of minoritised groups in these occupations.
3. **Make MS/AI workplaces inclusive.** Clear diversity targets, disaggregated reporting, and diverse leadership in AI labs and governance structures, so that the people designing and deploying AI systems reflect the UK population.

Near-term parity scenarios (5–10 years) rely more heavily on reskilling and accelerated progression, whereas 10–15 year horizons better align with pipeline reforms in schools and universities. Given the scale of the MS/AI footprint and the Academy’s

estimates of marginal GVA, the economic case for closing the ethnic gap is strong.

Conclusion

The UK has an opportunity to link its ambition to be an AI superpower with a concrete, quantified agenda for ethnic inclusion in the MS/AI workforce. The estimated £23bn annual GVA dividend from closing the representation gap should be seen as a conservative lower bound, consistent with existing economic-contribution work and growth assumptions.

By embedding ethnicity-aware metrics and levers into DSIT’s AI and MS policy architecture — rather than treating diversity as an afterthought — government can:

- accelerate growth in a strategically vital sector;
- reduce entrenched ethnic inequalities in high-value jobs; and
- enhance the legitimacy and fairness of the AI systems that will increasingly shape everyday life.

About the author

Dr Howard Haughton is a mathematician, risk specialist and non-executive leader working at the intersection of quantitative finance, AI and equity, diversity and inclusion (EDI). He serves as:

- a Council Member of the Institute of Mathematics and its Applications (IMA), and Chair of the IMA Equality, Diversity and Inclusion Committee;
- Chair of Sporting Equals, a UK charity focused on race equality in sport and physical activity;
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He has advised boards, regulators and charities on inclusive governance, risk and the economic implications of under-representation in STEM.

A longer technical paper and supporting code are available on request.

References

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