WILL AGI ACCELERATE ALGORITHMIC PATRIARCHY? DIGITAL GENDER CIRCULARITY IN THE GENERATIVE AI ERA

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ABSTRACT

As generative AI systems become pervasive tools for knowledge work, a central socioeconomic question is whether their diffusion reduces inequality through broad-based productivity gains or reproduces existing hierarchies through unequal participation and control. We introduce *digital gender circularity* as a measurable risk model for the generative AI era: digital gender inequality and offline gender inequality can co-evolve in feedback loops, so unequal access and skills shape who benefits from AI adoption, while AI-mediated labor markets and information systems can in turn reshape offline gender outcomes.

We argue that the most policy-relevant inequality mechanisms may occur before downstream model audits, at the diffusion stage: who adopts, what uses are legitimized, and which institutions convert AI usage into rewards. This perspective reframes *algorithmic patriarchy* as an institutional-diffusion phenomenon, not only a model-behavior problem. To make these dynamics testable, we propose a compact empirical agenda: (i) construct country-level indicators of generative AI diffusion (awareness, access constraints, intensity, and use-case mix), (ii) link diffusion parameters to established gender-development indices and pre-existing digital parity, and (iii) test whether earlier digital gender parity predicts faster convergence in AI usage and outcomes, versus divergence driven by skill, safety, and legitimacy barriers. We close with actionable measurement and governance implications for capability building, affordability, safety, and auditability so that productivity gains do not amplify entrenched inequality.

1 INTRODUCTION

Generative AI systems are becoming default interfaces for searching, writing, coding, tutoring, and creative production. As capabilities improve, the bottleneck for societal benefit may shift from generating information to allocating opportunities, validating outputs, and governing deployment. In this setting, inequality is not only about whether models are powerful, but about who can use them effectively, which uses are institutionally rewarded, and who bears the risks of automated allocation.

We operationalize "AGI" as frontier general-purpose models and agents that expand the scope and stakes of generative AI diffusion. Empirically, we focus on present-day generative AI diffusion as an observable leading indicator, because AGI-level impacts cannot yet be directly measured.

We use gender inequality as a concrete lens on broader stratification dynamics. Global evidence indicates persistent gender gaps in digital access and use: the International Telecommunication Union reports that men are more likely than women to use the Internet worldwide (International Telecommunication Union, 2023), and the GSMA reports substantial gender gaps in mobile Internet adoption in low- and middle-income countries (LMICs) (GSMA, 2023). These gaps matter because digital participation increasingly mediates access to education, work, health information, and civic life, while the World Bank emphasizes that digital dividends are not automatic and depend on "analog complements" such as skills, institutions, and accountability (World Bank, 2016).

Most discussions of "AI inequality" implicitly assume a one-directional mapping: either technology empowers marginalized groups or reflects pre-existing disadvantage. This paper formalizes a bidirectional alternative, *digital gender circularity*. The contribution is not a deterministic forecast, but a research design that makes competing trajectories measurable and comparable across contexts.

2 DIGITAL GENDER CIRCULARITY

2.1 DEFINITION

We define *digital gender circularity* as the recursive relationship between digital gender inequality and offline gender inequality across time and scale:

- **Offline-to-digital:** offline inequality shapes digital participation through education, income, norms, safety constraints, time constraints, and institutional access.
- **Digital-to-offline:** digital participation shapes offline inequality through capability expansion, labor-market access, information flows, social networks, and political voice.

This aligns with the literature on digital inequality and stratified diffusion, where returns to technology adoption are uneven and can compound existing advantage (DiMaggio & Hargittai, 2001; Robinson et al., 2015).

2.2 WHY GENERATIVE AI CAN STRENGTHEN CIRCULARITY

Generative AI can increase the strength of these feedback loops via three testable channels:

1. **Skill and workflow thresholds.** Returns may depend on complementary skills (verification, task decomposition, domain knowledge, tooling) and workplace integration. This can produce "second-order" gaps even where connectivity gaps shrink, consistent with evidence on digital skills and gendered patterns of advanced ICT participation (Organisation for Economic Co-operation and Development, 2018).
2. **Institutional mediation and allocative power.** Benefits and harms are mediated by employers, schools, and states. Institutions determine access rules, monitoring, acceptable use, and how AI-enabled productivity converts into pay, promotion, and credentials.
3. **Datafied feedback and representational asymmetry.** Models trained on historically skewed data can reproduce stereotypes, unequal visibility, and differential error costs. Feminist scholarship argues that apparently neutral technical systems can encode social power (Noble, 2018; Benjamin, 2019; D'Ignazio & Klein, 2020).

3 ALGORITHMIC PATRIARCHY AS A DIFFUSION-STAGE PHENOMENON

Bias discussions often focus on model behavior after deployment, but inequality can arise earlier at the diffusion stage. We use "algorithmic patriarchy" as shorthand for a specific, measurable mechanism: gender-skewed access, use-case routing, and institutional reward conversion that reproduces unequal outcomes even when model-level performance is held fixed across users (Noble, 2018; Benjamin, 2019; D'Ignazio & Klein, 2020; Eubanks, 2017).

In the generative AI context, diffusion-stage mechanisms include:

- **Participation gaps:** who adopts AI and who is excluded by cost, safety, language, accessibility, or legitimacy constraints.
- **Use-case segmentation:** whether some groups are channeled into lower-return uses while others capture high-return workflows.
- **Institutional gatekeeping:** whether workplaces and schools reward AI-enabled productivity in ways that widen pay, evaluation, or advancement gaps.

4 TESTABLE PREDICTIONS

P1: Path dependence in generative AI adoption. Countries with larger baseline digital gender gaps (e.g., sex-disaggregated Internet or mobile Internet use) will exhibit larger gender gaps in generative AI participation (e.g., female-to-male awareness, trial, or weekly-use ratios), absent equalizing interventions (International Telecommunication Union, 2023; GSMA, 2023).

P2: Divergence under skill-biased adoption. Where generative AI complements advanced skills and institutional legitimacy, early diffusion will be associated with increased dispersion in knowledge-work outcomes. A falsifiable implication is that gender gaps in AI-intensive occupational transitions or wage premia will be larger in contexts with stronger skill complements (e.g., higher ICT-skill stratification) (Organisation for Economic Co-operation and Development, 2018).

P3: Institutions can weaken circularity. Policies that reduce affordability barriers, expand training access, and improve safety and accountability will reduce the association between baseline digital gender gaps and AI participation gaps, consistent with the claim that digital dividends depend on institutions and skills (World Bank, 2016).

5 MINIMAL MEASUREMENT AGENDA

5.1 BASELINE INEQUALITY: ACCESS AND READINESS

Track sex-disaggregated access and usage indicators:

- Internet use by sex (International Telecommunication Union, 2023)
- Mobile Internet use gaps in LMICs (GSMA, 2023)

Where official indicators are missing, validated digital-trace approaches can complement surveys (Fatehkia et al., 2018).

5.2 AI PARTICIPATION: DIFFUSION AND INTENSITY

Measure gender gaps in (i) awareness, (ii) access constraints (cost, language, safety), (iii) trial, (iv) intensity (weekly/daily), and (v) use-case mix (education, job search, workplace tasks, entrepreneurship), plus perceived safety and harms. Feasible proxies include repeated survey modules and platform-agnostic digital traces such as search interest, app rankings, or web traffic to major generative AI services, combined into a country-year diffusion index.

5.3 OUTCOMES

Link AI participation to outcomes: employment and wages, occupational transitions, education attainment and learning outcomes, health information access, and civic participation. A minimal design is to estimate whether changes in AI diffusion indices are associated with changes in gender gaps in these outcomes, conditional on baseline parity and time-varying macro controls.

5.4 INSTITUTIONS AND GOVERNANCE

Record adoption rules and safeguards:

- School policies (access, integrity regimes, equity accommodations)
- Workplace policies (permitted use, monitoring, evaluation practices)
- Safety and reporting mechanisms
- Subsidies or capability-building programs (training, affordable access)

These moderators operationalize whether institutions dampen or amplify diffusion-stage inequality.

6 Implications and Limitations

Implications. Digital gender circularity reframes "AI for empowerment" as a systems question: whether interventions reduce both first-order access gaps and second-order capability, legitimacy, and reward gaps.

Limitations. This paper is a conceptual and measurement roadmap rather than a causal identification claim about specific tools. Causal attribution will require designs leveraging plausibly exogenous variation (policy shocks, rollouts, pricing changes, or natural experiments). Gender intersects with class, race, geography, and age; the agenda should extend to intersectional analyses where data allow (D'Ignazio & Klein, 2020).

Ethics Statement

This paper proposes a conceptual framework and measurement agenda based on published literature and public reporting. It does not involve new human-subject data collection. Any future survey or platform-data work should follow applicable ethics review and privacy safeguards.

Reproducibility Statement

All claims are grounded in cited public reports and published literature. The measurement agenda specifies a minimal set of indicators and linkages implementable using publicly available statistics and standard survey instruments.

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