

2024/5

TESEV  
BRIEFS

**Assessing the  
Relationship  
between Artificial  
Intelligence and Female  
Labor Force from a  
Perspective of  
Social Equality**

TESEV Briefs aim to share with the public different opinions and recommendations on issues that are under TESEV's working areas.





## Mehtap Hisarcıklılar

Assoc. Prof. Dr. Mehtap Hisarcıklılar works at the Centre for Financial and Corporate Integrity at Coventry University. After graduating from Istanbul Technical University, Department of Management Engineering in 1996, she completed her master's degree in Economics at Boğaziçi University (1999) and her PhD in Economics at Nottingham University (2004). In 2011, she became an associate professor of Econometrics. Prior to her current position, she held a variety of academic roles at the University of Sussex, Staffordshire University and Istanbul Technical University. She is one of the founding members of ITU Women's Research Center. Throughout her 20+ year academic career, she has taught courses in microeconomics, statistics and econometrics, participated in various research and consultancy projects, and supervised PhD theses. Her research interests include gender, social inequalities, international trade, foreign direct investment and corporate innovation.

We are living in the 4th Industrial Revolution era, where smart technology and continuous automation are rapidly transforming traditional production and industrial practices. In particular, after the launch of Chat GPT on November 30, 2022, artificial intelligence (AI) has been penetrating all aspects of our lives at an increasing pace. Almost daily, we hear about new developments in AI or machine learning. It is undeniable that these developments have improved our quality of life by making many tasks easier. However, while we enjoy the convenience and benefits that AI brings to our lives, it is impossible not to be concerned about the pace of change and the uncertainties that come with it. One of the areas of most significant concern is AI's impact on future job opportunities. This policy brief examines the potential AI-driven transitions on women in the workforce, with a focus on gender inequalities. It discusses the threats and opportunities posed by AI and develops policy recommendations.



**From the perspective of the female labor force, it is inevitable that women, who are already disadvantaged in recruitment, occupational allocation, promotion, and pay, will be more strongly affected by any polarization that comes with AI.**

### **Will AI take my job?**

Throughout history, technological advances have been accompanied by fears of job displacement by machines. This was the case with the invention of the steam engine during the Industrial Revolution, the development of the spinning jenny used in the textile industry, and the introduction of computers into the workplace in the 1950s. Studies on this topic have found that while new technologies may cause job losses in certain areas, they create new occupations and job opportunities in others and do not lead to mass unemployment in the long run.<sup>1</sup> Another dimension often highlighted in the context of the impact of technological change on the labor force is the transformation of existing jobs.<sup>1,2</sup> Based on past experiences, it is predicted that the current technological revolution will eliminate low-skilled occupations while creating new high-skilled opportunities, and that these changes will completely transform the structure of the labor force and create a polarization between different skill groups.

For instance, according to a study conducted by the global consulting firm McKinsey & Company in eight countries that account for 60% of the world's production, it is estimated that by 2030, one in every 16 workers will change occupations. It is also expected that opportunities for low- and medium-skilled jobs will decrease while opportunities for high-skilled jobs in health, science, technology, engineering and mathematics (STEM) will increase.<sup>3</sup> Given the challenges of transitioning the workforce from low-skilled, less knowledge-intensive jobs to high-skilled, more knowledge-intensive jobs, the economy may also experience job losses. Therefore, the key to overcoming fears associated with AI adoption is to transform the workforce through upskilling and reskilling.

From the perspective of the female labor force, it is inevitable that women, who are already disadvantaged in recruitment, occupational allocation, promotion, and pay, will be more strongly affected by any polarization that comes with AI.

## Women in the Labor Force

In most parts of the world, women in the labor force are disadvantaged compared to men. Women are often allocated to female-dominated occupations that are seen as more compatible with domestic responsibilities, face barriers in promotion and are, on average, paid lower wages than men. Moreover, a smaller proportion of working-age women participate in the labor market compared to men. The gender gaps observed in the labor market can be attributed to a variety of factors: differences in educational attainment and work experience (i.e. differences in human capital), differences in the choice of subject area or occupation, societal roles assigned to men and women, prejudices or, in some cases, favoritism toward men. The following sections will evaluate the threats and opportunities that AI presents in this context.

### Threats posed by AI

#### **Algorithmic bias**

To begin with, one of the biggest threats posed by AI is the algorithmic bias. AI algorithms trained with databases that already contain existing inequalities are likely to perpetuate the biases. Examples can be found in many areas of society and the economy. For instance, some AI systems adopted in security, justice, health, and banking

services have disadvantaged the members of minority groups.<sup>4,5</sup>

“Algorithmic bias” arises through developing a mathematical model or a software system that favors one or more groups in society while disadvantaging others by creating unequal practices. Algorithmic bias can be caused by a combination of one or more of the following factors.

**The data that is fed into algorithms.** AI algorithms formulate models by identifying patterns in large databases collected from multiple sources. These models are then used to predict and influence individual behavior or make decisions about individuals. In this context, models trained with data that contain existing inequalities run the risk of accepting these inequalities as they are and developing mechanisms that deepen and perpetuate them. From this perspective, it can be said that algorithms designed and used without gender awareness may lead to *statistical discrimination* or worsen existing biases in society.

*Statistical discrimination* occurs when judgements or decisions about an individual are made based on the average characteristics of the group they belong to, rather than their own characteristics. Statistical discrimination stems from limited access to full information



**Statistical discrimination occurs when judgements or decisions about an individual are made based on the average characteristics of the group they belong to, rather than their own characteristics.**

about individuals' knowledge and skills. For instance, employers seeking information about an individual's potential productivity or job performance may easily, but misleadingly, rely on general information derived from observable demographic characteristics, such as gender, race or age. In this case, members of demographic groups who underperform due to discriminatory practices or other inequalities in society will also face inequality at the individual level, thereby deepening the already existing inequalities. For example, it has been found that Google image research for the word "CEO" (Chief Executive Officer) depicted women in only 11% of the results, which is much lower than the already low female representation (27% in the US).<sup>6</sup> Similarly, Google's advertising algorithms, fed by data in which women were underrepresented in high-paying positions, show high-paying job ads more frequently to male users.

While models can be used to uncover patterns and make inferences about general trends, their use in making decisions about a particular person without fully accounting for the individual's circumstances may lead to unfair results. As a

result, companies that use poorly designed AI algorithms in recruitment or promotion run the risk of unintentionally discriminating between genders. We saw an example of this at Amazon, where an automated recruitment assessment system they developed assigned scores that favored male candidates and penalized female candidates.<sup>7</sup> Launched in 2014, the algorithm was trained using resumes sent to Amazon over the past ten years. Most of these resumes belonged to male applicants, who were concentrated in technology-based jobs. Instead of directly evaluating the job-related skills of the applicants in the resumes it scanned, the algorithm began to rate them based on some words that were predominantly used by men in job applications. In addition, the algorithm learned to underscore resumes that included the word "female" in them. Amazon stopped using this biased algorithm in 2018.

***Social justice sensibilities of the groups that produce the algorithms.*** Another problem commonly highlighted is that algorithms are directly affected by the social justice perspectives of the people and groups who write them. An



**[Educational attainment] comparisons show that the female workforce will be more strongly affected by the changes brought about by AI and are more likely to be in danger of being excluded from the labor market.**

algorithm developed by programmers who internalize discriminatory practices in their personal lives or are unaware of the effects of discrimination will also tend to be discriminatory. Given the low representation of women in such professions, it is likely that the algorithms written will be far from being sensitive to gender inequalities, be it intentionally or unintentionally.

**Algorithms that become black boxes.** AI algorithms often include large-scale and complex software codes developed by multiple programmers. Each team of programmers involved in such large projects focuses on a different algorithm segment, rather than mastering the entire code. As a result, the algorithms can quickly become a black box, not only for the general public but even for the software developers working on these projects.<sup>8</sup> Although the AI algorithm's programmers and users can observe these algorithms' decision suggestions, they may not fully understand the mathematical modeling behind those suggestions. Therefore, it may be very difficult or even impossible to investigate and address the root causes of AI decisions that deepen societal inequalities.

### ***Equal Opportunity in Education***

Another major threat AI poses to the female labor force is the increasing demand for highly skilled workers, especially from STEM fields, due to the technological transformation of occupations. The World Economic Forum's 2023 report on the future of work evaluates the results of a survey about the expectations of companies for 2023-2027.<sup>9</sup> According to the survey results obtained from 803 companies worldwide (spread across 45 countries, employing a total of 11.3 million people), employers see skill gaps in the local labor market as the biggest obstacle to the success of industrial transformation and emphasize the importance of upskilling and reskilling of the workforce for the success of businesses. Positions such as data analyst, data scientist, AI and machine learning specialist, and digital transformation specialist are growing in importance, while roles such as executive and administrative secretaries, bank tellers, accountants, and cashiers are declining.

According to the latest statistics from TurkStat, women in Türkiye have, on average, lower levels of education than men: In 2022, the average



**Using gender-sensitive algorithms in hiring, promotion, or pay can eliminate arbitrary discrimination by removing personal biases from decision-making processes.**

years of education for women was 8.5 years compared to 10 years for men, and the tertiary graduation rate was 21.6% for women aged 25 and above compared to 25.5% for men.<sup>10</sup> Women are also underrepresented in STEM-based jobs. According to the latest World Bank statistics, about 19.4% of higher education graduates (men and women) in Türkiye in 2018 came from STEM programs.<sup>11</sup> Women make up about 35% of these graduates.<sup>12</sup> Similarly, in 2022, 34.1% of R&D-related positions in Türkiye were occupied by women, which drops to 27.3% when we only look at the private sector.<sup>13</sup> These comparisons show that the female workforce will be more strongly affected by the changes brought about by AI and are more likely to be in danger of being excluded from the labor market. This poses a threat of further deepening existing gender-based inequalities in unemployment rates, which are 13.4% for women and 8.9% for men. Moreover, unless preventive measures are taken, the already low female labor force participation rate (35.1% in 2022) will likely decline further.

### **Opportunities emerging with AI**

Above, we have mentioned statistical discrimination as one of the factors leading to gender-based inequalities in the labor force and how AI algorithms that are developed with discriminatory data and without gender awareness can deepen this discrimination. Despite the potential negative consequences of AI, it is also possible to discuss the positive changes it can bring.

- While statistical discrimination originates from evaluating individuals based on the average characteristics of their group, taste-based discrimination is arbitrary; it refers to unequal treatment of individuals based on the decision maker's dislike towards certain groups. ***Using gender-sensitive algorithms in hiring, promotion, or pay can eliminate arbitrary discrimination by removing personal biases from decision-making processes.***



- One of the main reasons for the gender gap in labor market is the differences in the human capital of men and women. In this respect, the skill depreciation women experience during career breaks after marriage and childbirth is one of the most critical barriers in their work lives. **AI and current technological advancements can be used to narrow down the gender education gap by providing opportunities for individuals to take online courses or trainings. AI-driven training programs that are designed to target individual needs can be used to compensate for the skill depreciation that women experience during their time away from work. Such personalized programs can also be promoted to encourage women to move into STEM fields.**
- We saw an example of such a personalized education system during the Covid-19 pandemic. The Ministry of National Education launched the Education Information Network (EBA), an online learning system that provides individualized content to students based on their performance. **The proliferation of such AI-supported systems will not only offer an excellent opportunity to close the already existing gender gaps but will also effectively close skill shortages that will emerge during job transformations driven by technological advances.** The workplace and occupational transformations accompanying the widespread adoption of AI are expected to significantly increase the need for employees with technical skills. The systems that can be designed to enhance women's existing skills or help them acquire new skills in technology fields will also serve to prevent skill mismatches that may arise with technological changes.
- Studies show that more accessible communication and information facilitated by technological advances has played a role in removing some of the barriers to women's employment. **Access to technology makes it easier for women to learn about job opportunities, closes the information gap and encourages women to work by creating flexible working conditions compatible with their domestic responsibilities.** In this context, it can be argued that if properly used, AI-based developments can support female labor force participation and female entrepreneurship.



➔ **First, there should be full transparency in AI algorithms' design and implementation processes.**

### **The way forward**

By its very nature, artificial intelligence can, intentionally or unintentionally, deepen prejudices and inequalities in society. While we are still far from developing an unbiased algorithm free of value judgments and ideology, some measures can be taken to lay the groundwork for developments in the right direction.

- ***First, there should be full transparency in AI algorithms' design and implementation processes. The operating principles of algorithms and the justifications behind algorithm-supported decisions should be openly shared with the relevant individuals or groups.***  
This transparency in implementation is essential for future AI use, which enhances social welfare and strengthens social equality by promoting social justice.
- Designing an egalitarian algorithm based on social justice requires careful consideration of many factors. ***For this***

***reason, the groups working on this issue should be interdisciplinary and include experts from diverse fields such as sociology, economics, philosophy, and political sciences, as well as experts from areas such as computer programming and data science. It is also vital that the data used in the algorithm should be free of any bias.***

- Other suggestions on this subject can be listed as follows: ***(i)*** Encouraging diversity within programmer groups and organizing trainings to prevent biases that developers may consciously or unconsciously hold, ***(ii)*** developing effective algorithm auditing systems that take into account human opinions rather than accepting and implementing algorithm suggestions without question in the decision-making processes, ***(iii)*** modifying algorithms to move away from statistical discrimination with gender-sensitive designs; for example, designing recruitment or compensation algorithms

in ways that are not influenced by a person's gender, **(iv)** providing financial support programs for the development of algorithms sensitive to social justice.

- Rapid technological developments are transforming industry and business processes, and with this transformation, new technology-based occupations are emerging. ***To overcome the shortage of experts in these occupations, individuals, especially women, need to upgrade their existing skills or acquire new ones. In this context, it is of urgent importance that new formal and non-formal education programs are designed and delivered to the potential workforce.***

For example, the European Union has launched the “Digital Europe Program” with a budget of €580 million to support training programs designed to close the

gap in technical skills.<sup>14</sup> Similarly, in the UK, skills camps have been developed in partnership with government, employers, training providers and local authorities to address skills shortages, particularly those caused by technological change.<sup>15</sup> These online camps are free and accessible to people aged 19 and over and provide flexible learning opportunities for the employed. In Türkiye, there is a need to focus on expanding such training camps designed to meet the needs of sectors and developing and implementing government incentive programs that support women's participation in these training programs.

These timely measures will pave the way for women to contribute to society and the economy, undergoing the 4th Industrial Revolution, in a more equitable environment.

## NOTES

1. For more information see:
  - Arntz, M., T. Gregory ve U. Zierahn (2016), The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis, OECD Social, Employment and Migration Working Papers, No. 189, OECD Publishing, Paris. <https://doi.org/10.1787/5jlz9h56dvq7-en>.
  - Bessen, J. (2019). Automation and jobs: when technology boosts employment, Economic Policy, Volume 34, Issue 100, 589–626. <https://doi.org/10.1093/epolic/eiaa001>.
  - Bessen, J. (2016). How Computer Automation Affects Occupations: Technology, Jobs, and Skills, Boston Univ. School of Law, Law and Economics Research Paper No. 15-49. <http://dx.doi.org/10.2139/ssrn.2690435>.
  - Coupe, T. 2019, “Automation, job characteristics and job insecurity”, International Journal of Manpower, vol. 40, no. 7, pp. 1288-1304. <https://www.emerald.com/insight/content/doi/10.1108/IJM-12-2018-0418/full/html>.
2. For more information see: <https://www.weforum.org/publications/the-future-of-jobs-report-2020/> and <https://www.weforum.org/publications/the-future-of-jobs-report-2023/>.
3. For more information see: <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-the-future-of-work>.
4. Cossins, D. (2018). Discriminating algorithms: 5 times AI showed prejudice, NewScientist. <https://www.newscientist.com/article/2166207-discriminating-algorithms-5-times-ai-showed-prejudice/>.
  - Malek, M.A. (2022). Criminal courts’ artificial intelligence: the way it reinforces bias and discrimination. AI Ethics 2, 233–245. <https://doi.org/10.1007/s43681-022-00137-9>.
  - Obermeyer, Z., Powers, B., Vogeli, C., ve Mullainathan S. (2019). Dissecting racial bias in an algorithm used to manage the health of populations, Science 366, 447-453. <https://www.science.org/doi/10.1126/science.aax2342>.
5. For other examples of the negative effects of AI algorithms on society, see:
  - Hisarciklilar, M. ve Riegler, R. (2023). *Yapay zekâ ve makine öğrenimi algoritmalarının toplumsal eşitlik açısından değerlendirilmesi*. A. Yakar Önal, Y. Yücel, Ö. Akduran Erol, ve M. Kahveci (Der.) Yaşam Odaklı Bir Ekonomi İçin Makro İktisat ve Maliye Politikaları içinde, Sosyal Araştırmalar Vakfı, İstanbul.

## NOTES

- Eubanks, V. (2019) Automating inequality: How high-tech tools profile, police, and punish the poor. New York: Picador.
  - Noble, S.U. (2018). Algorithms of oppression: How search engines reinforce racism. New York: New York University Press.
6. Cossins, D. (2018). Discriminating algorithms: 5 times AI showed prejudice, NewScientist. <https://www.newscientist.com/article/2166207-discriminating-algorithms-5-times-ai-showed-prejudice/>.
  7. Dastin, J. (2018). Amazon scraps secret AI recruiting tool that showed bias against women, Reuters. <https://www.reuters.com/article/world/insight-amazon-scrap-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK0AG/>.
  8. McQuillan, D. (2022) Resisting AI: An anti-fascist approach to artificial intelligence. Bristol: Bristol University Press.
  9. For detailed statistics at country, sector, occupation and skill level, see: <https://www.weforum.org/publications/the-future-of-jobs-report-2023/> and <https://www.weforum.org/publications/the-future-of-jobs-report-2020/>.
  10. <https://data.tuik.gov.tr/Bulten/Index?p=Women-in-Statistics-2023-53675>
  11. <https://databank.worldbank.org/source/education-statistics>
  12. <https://genderdata.worldbank.org/en/indicator/se-ter-grad-fe-zs?fieldOfStudy=Science%2C+Technology%2C+Engineering+and+Mathematics+%28STEM%29#idRelatedIndicators>
  13. <https://data.tuik.gov.tr/Bulten/Index?p=Women-in-Statistics-2023-53675>
  14. <https://digital-skills-jobs.europa.eu/en/about/digital-europe-programme>
  15. Skills camps can be defined as programs that combine traditional vocational training programs with the intensity of military camps to provide short-term, intensive training to participants, which can be used to close workforce skills gaps. For detailed information, see: Coding bootcamps: guide for practitioners (English). Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/175631522135001611/Coding-bootcamps-guide-for-practitioners>.

## How to Cite:

Hisarcıklılar, Mehtap. 2024. "Assessing the Relationship between Artificial Intelligence and Female Labor Force from a Perspective of Social Equality" TESEV Briefs 2024/5.

<https://www.tesev.org.tr/en/research/assessing-the-relationship-between-artificial-intelligence-and-female-labor-force-from-a-perspective-of-social-equality/>

*The English version of this text was created using a machine translation tool DeepL and edited by Gizem Fidan and Mehtap Hisarcıklılar.*

## Copyright © September 2024

All rights reserved. No part of this publication may be reproduced by electronic or mechanical means (photocopies, downloading, archiving, etc.) without the permission of the Turkish Economic and Social Studies Foundation (TESEV).

The views expressed in this publication are those of the authors', and may not correspond in part or in full to the views of TESEV as an institution.

TESEV would like to thank the Friedrich-Ebert-Stiftung Turkey Office for their support for this publication.

