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EVIDENCE IN LABOR MARKET POLICIES AND
IMPLICATIONS FOR BRAZIL:

FUTURE OF WORK



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EVIDENCE IN LABOR MARKET POLICIES AND IMPLICATIONS FOR BRAZIL: FUTURE OF WORK

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INTRODUCTION

Recent technological progress, such as automation, digitalization, and artificial intelligence, are influencing the evolution of the job market, as part of what has been called the fourth industrial revolution¹. Although historically the benefits of these transformations have seemed to outweigh their costs, experts are debating whether this pattern will hold in the coming years ([IDB, 2020](#)). For example, empirical evidence indicates that the integration of robots into production systems may have adverse effects on local employment levels and workers' wages ([Acemoglu and Restrepo, 2020](#), [Doorley et al., 2023](#)).

In an increasingly interconnected world, there is also evidence that the effects of automation extend beyond geographical boundaries, impacting workers in countries that share trade relations and generally have lower income per capita ([Stemmler, 2023](#), [Kugler et al., 2024](#), [Rodrigo, 2022](#)). Therefore, we expect to see automation affecting even low- and middle-income countries that are not directly using these new technologies.

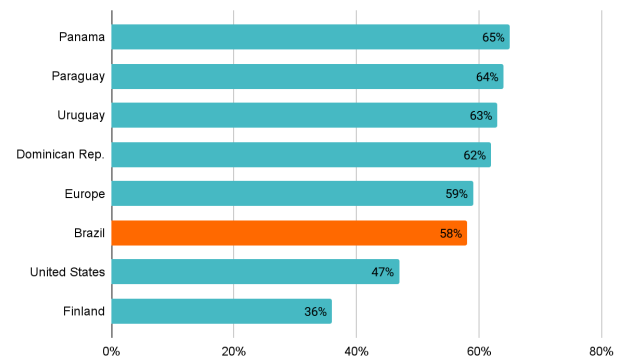
Another important characteristic of the fourth industrial revolution is the speed at which changes are occurring, as the implementation of new technologies appears to be faster compared to other periods ([IDB, 2018](#)). This poses a challenge to policymakers: how can we ensure

¹ The first industrial revolution took place between 1750 and 1840, marked by the invention of the steam engine, which gave rise to factories. The second industrial revolution, starting around 1850, introduced mass production, assembly lines, and electric power. The third industrial revolution, starting around 1970, was characterized by the advancement of mechanization, electronics, and computers. For a more detailed description of each industrial revolution, see [IDB, \(2019\)](#).

that workers are prepared with the right skills to thrive in this evolving job market?

Such socio-economic changes can have considerable effects on Latin America and the Caribbean (LAC). As indicated in Figure 1, these countries exhibit high risks of job loss from automation, surpassing those found in the United States and Europe. For Brazil, several estimates suggest that more than fifty percent of the jobs performed in the country could be replaced by automation over the next ten or twenty years ([Ottoni et al., 2022](#), [Lima et al. 2019](#), [Albuquerque et al., 2019](#)).

Figure 1 - Share of Jobs at High Risk of Automation Worldwide



Source: Data for Brazil based on [Ottoni et al. \(2022\)](#). Data for the other countries from [Albuquerque et al. \(2019\)](#), based on [Bosch, Pagés, and Ripani \(2018\)](#), [Bowles \(2014\)](#), [Brzeski and Burk \(2015\)](#), [Frey and Osborne \(2017\)](#), and [Pajarinen and Rouvinen \(2014\)](#).

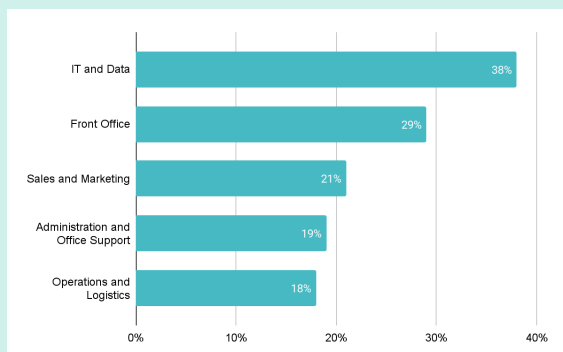
Given this scenario, an important question is how different technological changes will affect labor markets and how public policy and other interventions could counterbalance potential negative effects. The existing literature, which studies topics such as job training, robot adoption, integration of artificial intelligence, and remote work, has found mixed effects on employment, productivity, and workers' income ([ILO, 2018](#), [Acemoglu et al., 2022](#), [Brynjolfsson et al., 2023](#)). This work reviews the latest

evidence on the future of work and tools and practices for adapting to this new reality. It complements other reviews already conducted by both institutions, such as [IADB \(2018\)](#), [IADB \(2021\)](#), and [J-PAL \(2020\)](#), and gives special attention to how we apply experimental evidence to improve policies in Brazil and Latin American and Caribbean countries.

TRENDS IN THE BRAZILIAN JOB MARKET

A 2023 survey of employers in Brazil aimed to identify the most sought-after technical and socioemotional skills. The top technical areas that employers answered they demand more talent in were the IT and data sectors, front office, sales and marketing, administration and office support and operations and logistics.

Figure 2 - Areas with the highest demand for workers among employers in Brazil



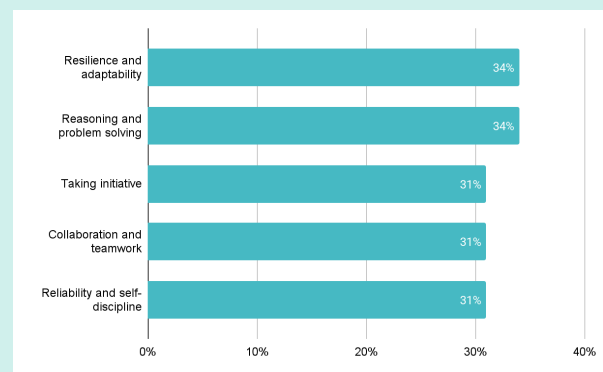
Source: [ManpowerGroup \(2023\)](#). Categories may sum to more than 100 percent as an employer may report demand for more than one area.

Additionally, the demand for skills directly or indirectly related to environmental sustainability is rising in Brazil's workforce. According to an IDB report that analyzed LinkedIn data, there was a notable increase in the hiring of workers with "green skills" from 2016 to 2021 ([IDB, 2022](#)). Experts also anticipate that combating climate

change will boost the requirement of these skills among the workforce ([LinkedIn, 2023](#)).

Also, as demonstrated in Figure 3, among the most desirable socioemotional skills according to surveyed employers were resilience and adaptability, reasoning and problem-solving, followed by initiative, collaboration and teamwork, and reliability and self-discipline.

Figure 3 - Most sought-after socioemotional skills among employers in Brazil



Source: [ManpowerGroup \(2023\)](#). Categories may sum to more than 100 percent as an employer may report demand for more than one skill.

EVIDENCE ON BEST PRACTICES FOR ADAPTING TO THE FUTURE OF WORK

In this section, we explore evidence on the best practices for adapting to the future of work



Offering training in future skills

Technological advancements are constantly reshaping the demands of the job market, requiring workers to adapt and acquire new

skills. For example, a study in the **United States** found a recent growth in jobs related to artificial intelligence, while hiring from other positions experienced a decline ([Acemoglu et al., 2022](#)). Investing in training to provide workers with new skills is a common policy strategy to support workers in transitioning from declining to emerging sectors. Evaluations of sectoral employment programs –programs that train job seekers for employment in industries considered to have strong labor demand and opportunities for career growth– in the **United States** have found positive effects on participants' incomes ([Katz et al., 2022](#))². These programs usually offer job search assistance and financial aid services in addition to technical training. Moreover, in **Kenya**, an evaluation found that providing training in digital skills related to artificial intelligence (AI), such as data segmentation and validation, along with a job recommendation led to an increase in participants' income and a reduction in unemployment ([Atkin et al., 2021](#))³.



Adopting artificial intelligence and new technologies in the workplace

Several studies demonstrate that adopting new technologies in the workplace can have a positive effect on productivity and worker satisfaction. Two evaluations measured the impacts of adopting AI technology in the workplace and found that it increased worker productivity. The first randomized evaluation

² However, job training programs in general have not always had positive impacts. For more insights about this, see the publication about Job Training of this series.

³ Workers receiving only training faced challenges finding employment after the training and had a small and temporary negative impact on earnings.

considered the effects on intermediate-level professional writing activities and found that the adoption of AI technology benefited primarily lower-skilled professionals through increased productivity. Additionally, job satisfaction increased and the productivity inequality among workers decreased ([Noy and Zhang, 2023](#)). The second, in a quasi-experimental evaluation, found that introducing an AI tool led customer support agents to solve more issues per hour on average and also increased employee retention ([Brynjolfsson et al., 2023](#)). Other technologies have also been evaluated. A study on an online platform demonstrated that providing a detailed dashboard available to small and medium-sized entrepreneurs increased data-driven decision-making. Furthermore, the dashboard also increased the quality of the service offered and the quantity of goods sold, which translated into higher revenues ([Bar-gill et al., 2024](#)).



Using algorithms in the job search

The use of data and algorithms can also change the way workers search for jobs and how firms select candidates. Using candidate and job vacancy data, algorithms can create methods to automatically screen resumes, recommend job-relevant candidate profiles to recruiters, and offer training suggestions to candidates ([IDB, 2020](#)). In **France**, an evaluation studied an online job search platform that offered personalized tips and recommended new job types and locations to jobseekers based on personal and labor market data. The research found that while users adopted some of the platform's advice and utilized public employment services more, there was no significant impact on job search duration, scope,

well-being, or employment outcomes ([Ben Dhia et al., 2022](#)). In another study, an evaluation of a large online job platform showed that using an algorithm to match candidates to jobs improved the accuracy of recruitment and increased hiring ([Horton, 2017](#)). Another evaluation found that job seekers who received algorithmic assistance in writing their resumes in an online labor market were more likely to be hired ([Wiles et al., 2023](#)).



Investing in hybrid or remote forms of work

The coronavirus pandemic accelerated the development of technologies associated with remote work, increasing the quality and efficiency of remote arrangements for both companies and workers ([Bloom et al., 2021](#)). Descriptive evidence in high-income countries found a substantial increase in vacancies that allowed remote or hybrid work between 2019 and 2023 ([Hansen et al., 2023](#)). Currently, most LAC countries have laws related to teleworking and in several of them reforms are being implemented that incorporate more flexible work arrangements ([IDB, 2022](#)). In this context, some evaluations have found positive effects on working remotely. Research in **India** has found that freedom to work from home increased the likelihood of women accepting job offers ([Ho et al., 2024](#), [Jalota and Ho, 2024](#)). A randomized evaluation measured the effect of hybrid working on the performance of call center workers in **China** and found that working four days a week from home led to an improvement in performance and was the preferred work configuration when workers had this choice

([Bloom et al., 2014](#))⁴. However, it is worth noting that the dynamics of remote work can vary widely according to the specific nature of each occupation and sector, and it can lead to negative results in some cases. For example, [Brucks and Levav \(2022\)](#) found that remote work reduced the production of ideas in activities that required creativity and group work.

GIG ECONOMY AND SOCIAL PROTECTION

Nowadays, many jobs are based on short and flexible contracts through online platforms and mobile applications. These jobs are part of what is called the "gig economy". In this context, freelance workers perform specific tasks, choosing when and where to work.

In the **United States**, researchers estimate that about 10 percent of the country's workers were employed in jobs with non-traditional arrangements as of 2017 ([Katz and Krueger, 2019](#)). One study in **Brazil** from 2022 found that around 2.1 million workers performed jobs in the gig economy, which corresponds to 2.4 percent of the employed population ([IBGE, 2023](#)).

Despite the advantages of greater flexibility, workers in the gig economy often encounter challenges such as a lack of social benefits and financial stability. In this context, social protection programs can play a significant role in mitigating the associated risks with this work arrangement ([IDB, 2019](#)). Nonetheless, designing such programs has proven difficult, as highlighted by various studies. Challenges

⁴ In this study, participants were required to have a private room at home in which they could work. Also, in interviews, workers attributed the increased output per minute to the relative quiet at home. Thus, it is important to notice that results could differ in other contexts where this is not available.

include accommodating the diverse preferences of workers, managing labor provision across multiple platforms, and addressing the irregular use of these platforms ([Gruber, 2022](#)).

Furthermore, it is worth noting that these platforms may unintentionally perpetuate existing gender inequalities observed in traditional job markets. A study conducted in the **United States**, analyzed over one million app drivers and identified a gender pay gap in this sector. This study suggested three main factors that may contribute to women's lower earnings: less experience on average, resulting in reduced earnings compared to more experienced drivers; avoidance of high-crime or alcohol-licensed areas, which typically offer higher tariffs; and slower driving speeds compared to male counterparts, impacting earnings based on distance traveled ([Cook et al., 2018](#)).

Impact evaluations can offer insights into the design of services and benefits offered to gig workers and strategies to address the gender pay gap to guide potential improvements on jobs created by app-based platforms.

GENDER-SPECIFIC BARRIERS

Changes in the labor market can disproportionately affect some social groups, such as women and Black individuals. Using data from the **United States, Bolivia, Chile, Colombia, and El Salvador**, researchers found that women and Black individuals perform jobs that have a higher average risk of being replaced by automation ([Bustelo et al., 2020](#), [Kugler et](#)

[al., 2024](#), [Broady et al., 2021](#)).⁵ As we anticipate further technology-induced labor market disruptions, reducing racial and gender inequalities should be a key policy priority.

A frequent concern is how to increase women's participation in sectors with growing demand for workers ([UNESCO, OECD and IDB, 2022](#)). A 2016 survey conducted in 80 economies showed that women constituted 40 percent or more of the workforce of the information and communication sectors in only 12 of the countries ([World Bank, 2018](#)). Moreover, in some of these sectors, women were less likely to report having the relevant technical skills. For example, a 2022 survey found that women reported fewer professional skills related to artificial intelligence in multiple countries using LinkedIn data ([AI Index, 2023](#)).

In **Poland**, researchers evaluated the effect of two interventions to increase women's participation in the technology sector: a one-on-one mentoring program and an online platform that helps participants develop relevant portfolios in the areas in which they seek employment ([Athey and Palikot, 2022](#)). The authors found that the one-on-one mentoring program was especially beneficial for women who lived in smaller cities and had been active in the labor market for over five years. Working with mentors who had managerial experience and a long period of experience in the technology field also resulted in larger effects. In contrast, the program aimed at

⁵ Some researchers argue that women have a lower risk of being replaced by automation, as they mostly work in sectors that require greater interpersonal interaction, such as professions related to care ([UNESCO, OECD and IDB, 2022](#), [Webb, 2020](#)). Such heterogeneous results seem to demonstrate that gender inequality in relation to exposure to automation appears to be context-dependent and varies between countries and regions ([UNESCO, OECD and IDB, 2022](#)).

creating portfolios was more effective among women who just entered the labor market without a STEM degree. The authors argue that this difference can be attributed to the fact that the programs supported employability through different mechanisms. Mentoring improved chances of employment by enhancing interview skills and expanding professional networks, whereas the online platform helped the participants to signal specific job-relevant skills.

Also, studies found exposure to role models in STEM careers impacted women ([J-PAL, 2023](#)). In **France**, researchers evaluated the impact of a one-hour in-class talk given by women scientists, who informed high school students about science-related careers, addressed gender stereotypes, and shared their own experiences. They found that this intervention increased the likelihood of girls enrolling in male-dominated STEM programs. One way that role model interventions shifted girls' preferences toward STEM careers was by improving their perceptions of such careers and increasing their aspirations of holding jobs in these fields ([Breda et al., 2023](#)).

In **Peru** and **Mexico**, an evaluation studied the effect of correcting misperceptions about women's potential success in tech. To this aim, a group of women received generic information about a coding bootcamp program, while another group also received a message that also included role models and information on the expected returns of women in pursuing a career in tech. Researchers found that this additional message increased the application rate to the training program and attracted a higher number of applicants across various cognitive abilities ([Del Carpio and Guadalupe, 2021](#)).

Another frequently debated issue concerns the possible racial and gender biases that can be

perpetuated in the configuration of candidate selection algorithms ([IDB, 2020](#)). A recent study found that two resume screening algorithms improved hiring rates but selected fewer Black and Hispanic applicants ([Li et al., 2021](#)). However, the same study showed that using another algorithm increased the selection of underrepresented groups while maintaining high hiring rates.⁶ Hence, while certain algorithms can perpetuate biases, they also have the potential to promote demographic diversity in selection processes.

EVIDENCE FROM LATIN AMERICA AND THE CARIBBEAN

Several evaluations on the impact of technological transformations have been performed in LAC. Most of these studies use descriptive and quasi-experimental methods.

Analyzing the six largest countries in LAC⁷, including Brazil, researchers found suggestive evidence that the probability of replacement by automation varies across demographic and socioeconomic groups and is higher among low-skilled and low-relative wage occupations ([Gasparini et al., 2021](#)).⁸

A quasi-experimental study in **Brazil** found that greater exposure to foreign automation led to a

⁶ This algorithm selected candidates based on the upper confidence interval of their hiring potential estimates instead of their point estimates. This tends to favor under-represented individuals, since they usually have higher confidence bands due to less precise estimates.

⁷ Argentina, Brazil, Chile, Colombia, Mexico, and Peru, which represent 79% of the population and 86% of LAC's Gross Domestic Product ([Gasparini et al., 2021](#)).

⁸ Despite this, recent studies have shown that some high-skilled positions are also at risk of automation, mainly due to the development of artificial intelligence algorithms that can perform complex analyzes with a high degree of precision, such as medical diagnoses ([OECD, 2021](#), [Webb, 2020](#)).

decrease in the proportion of employment in the manufacturing sector and an increase in the proportion of employment in the mining sector.⁹ These changes suggest that there was a shift in the demand for exporting raw materials in local labor markets to support the automation process in foreign countries. Domestic automation had smaller effects but benefited higher-skilled and female workers ([Stemmler, 2023](#)). The author argues that these groups generally work in sectors which are complementary to sectors with greater automation.

A similar quasi-experimental analysis in **Colombia** looked at the impact of robot adoption in the United States on Colombian workers. Increased adoption of robots in the US reduced employment and wages for Colombian workers in sectors that were most exposed to automation. The affected sectors also increased layoffs and decreased hiring as the US increased the use of robots in industry. Women, older workers, those employed in small and medium-sized enterprises, and those employed in the manufacturing industry were most affected. Furthermore, local labor markets that exported most to the United States in the past were also particularly affected ([Kugler et al., 2024](#)).

Finally, another quasi-experimental study also found that the adoption of robots in the United States had a significant negative impact on employment in **Mexico**. The authors argue that using robots instead of humans could decrease

⁹Automation is measured by the share of the sectoral stock of robots for every 1000 workers. It was considered that a region is affected by domestic automation when it has a high fraction of workers working in sectors with high adoption of robots nationally. Furthermore, it was considered that a region would be more affected by foreign automation if its products were exported to an industry with a high level of automation ([Stemmler, 2023](#)).

the relative cost of domestic production, which might lower reliance on imports from countries engaged in offshoring. This negative effect in employment was stronger for men than for women and also for machine operators with low education in the manufacturing sector. Furthermore, the effect on employment is reflected in significant reductions in Mexican exports and in manufacturing plants producing goods for export ([Faber, 2020](#)).

TRAINING YOUTH FOR FUTURE SKILLS IN ARGENTINA AND COLOMBIA

In **Argentina** and **Colombia**, women represent 57 and 58 percent, respectively, of university graduates, but they account for only 15 and 9 percent of those graduating in the field of computer science. This is reflected in the low presence of women employed in the technology sector. They represent 22 percent of technology workers in Argentina, and 20 percent in Colombia ([Aramburu et al., 2021](#)).

Therefore, digital training courses can provide a pathway to increase female participation in the technology sector. Researchers assessed the impact of a coding bootcamp specifically designed for women in Argentina and Colombia.¹⁰ In this evaluation, students also received job readiness training and individual career mentorship sessions.

The program increased the coding skills of the participants and the likelihood of finding employment in the IT sector within 2 to 5 months after program completion. They also found a higher probability of students working remotely and with flexible schedules, leading to increased job satisfaction. The program also decreased the likelihood of participants

¹⁰ Bootcamps are intensive courses designed to teach technical programming skills in a short period

experiencing negative economic effects due to the economic recession in the job market caused by the coronavirus pandemic.

FINAL REMARKS

The labor market is undergoing profound transformations that are redefining what we do and how we do it. Understanding these changes is essential for designing effective programs that are aligned with this reality.

Investing in workers' skills

Technologies have the potential to increase the well-being of workers by enhancing their productivity, efficiency, and quality of life. However, these changes also have the potential to completely or partially replace jobs and functions, forcing existing workers to acquire new skills. In this context, job training programs should be aiming not only for entry into the job market but also for the professional enhancement of those who desire it.

Adapting social programs to the new forms of work

Work possibilities are changing with the emergence of flexible jobs, such as remote work, gig economy jobs, and project-based work. In this context, it is necessary to consider innovative mechanisms for social protection for these individuals, taking into account the fluid nature of employment.

Capturing new trends and long-term effects

The future of work is a reality under construction that cannot be fully predicted. Given this, new challenges such as the transition of the economy to become greener and more sustainable can significantly change the

demands of the economy ([OECD, 2012](#), [IDB, 2022](#), [LinkedIn, 2023](#)). Finally, it is also necessary to consider that while some new work arrangements may offer temporary income gains, their long-term effects still have not been extensively studied. New studies on these topics would be valuable contributions.

THE IMPORTANCE OF IMPACT EVALUATIONS

Randomized evaluations are a powerful tool for identifying the impact of a program or policy and can provide reflections on the reasons behind the impact of an intervention. These insights can help practitioners and decision-makers looking to improve their program design and use their resources efficiently. J-PAL's Jobs and Opportunity Initiative (JOI) Brazil was created in 2021 to expand the body of evidence on solutions to Brazil's labor market challenges by supporting randomized evaluations. If your company, organization, or government agency is implementing a labor market-related intervention and would like to explore the opportunity to collaborate with researchers to assess your intervention accurately, please contact us at jo-br@povertyactionlab.org.

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Using the most recent rigorous evidence in the literature, this publication consolidates the main reflections on the topic of microcredit,

indicating paths for the promotion of quality jobs in Brazil. We hope that this study has contributed to this discussion, and we welcome new efforts aimed at expanding the frontiers of knowledge. We invite readers to explore the other publications of this series, such as the study on job training or job search assistance.

JOI Brazil is a J-PAL initiative whose objectives are to strengthen innovative actions, foster rigorous research, qualify the debate about the Brazilian labor market, and disseminate knowledge to governments, civil society, companies, and foundations in the country. We seek to promote a policy-making culture informed by evidence. We would like to thank our partners - Arymax Foundation, B3 Social, Tide Setubal Foundation, Potencia Ventures, the Inter-American Development Bank, and Inesper - for their support in fostering rigorous research in Brazil. We would also like to thank Claudio Ferraz, Michael Hou, Natalie Valent and David Kaplan for the valuable feedback that allowed us to improve this article. We extend our thanks to all who put effort into making this publication possible.

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