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Abstract[1]

We examine the impact of mobile internet access on labor market outcomes through a comprehensive analysis combining literature review, regional trends, and empirical evidence. We begin by reviewing studies on how information and communication technologies have shaped labor markets in both developed and developing countries, examining the literature on mobile phones, internet broadband, and mobile internet. We then analyze recent trends in mobile internet access across Latin America and the Caribbean (LAC), documenting the region's performance relative to OECD countries and examining gaps within countries across socioeconomic groups. Finally, using Chile as a case study, we estimate the relationship of expanding cutting-edge mobile internet infrastructure with labor force participation.

JEL classifications: J24, J82, J60, J46, J30, O14, O31, O33.
Keywords: Internet Mobile, Latin America and the Caribbean, Labor Markets

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1 Introduction

The rapid expansion of mobile internet access across Latin America and the Caribbean (LAC) represents one of the most significant technological transformations of the past decade, fundamentally altering how individuals access information, conduct business, and participate in labor markets. As governments and international organizations increasingly recognize digitalization as a cornerstone of economic development strategies, understanding the labor market implications of mobile internet expansion has become critical for designing effective policies that can harness technology's potential while addressing persistent inequalities. This study examines the impact of mobile internet access on job creation, labor force participation, and flexible work adoption in the LAC region, with particular attention to how these effects vary across different socioeconomic groups and geographic areas.

The intersection of digitalization and labor markets in LAC occurs against a backdrop of considerable heterogeneity in both technological infrastructure and economic conditions. While the region has experienced remarkable progress in mobile internet penetration—with several countries achieving coverage rates comparable to developed economies—significant digital divides persist along socioeconomic, geographic, and demographic lines. These disparities raise important questions about whether the benefits of digital connectivity are being distributed equitably and whether mobile internet access can serve as a tool for reducing rather than exacerbating existing inequalities. Understanding these dynamics is particularly relevant for policymakers seeking to leverage digital technologies as instruments of inclusive economic development.

The theoretical framework underlying this analysis draws from multiple strands of economic literature, including studies of technological diffusion, labor market flexibility, and impact in other areas of human well-being. Mobile internet access can potentially affect labor markets through several channels: reducing search costs and improving market efficiency, enabling new forms of entrepreneurship and gig economy participation, facilitating remote work arrangements, and creating new categories of digital employment. However, these positive effects must be weighed against potential negative consequences, including job displacement in traditional sectors, increased labor market and political polarization, and precarious employment relationships mediated by digital platforms.

This study makes three primary contributions to the existing literature on digitalization and labor markets in developing economies. First, we provide an updated and comprehensive literature review that synthesizes recent empirical evidence on the relationship between mobile internet access and labor market outcomes, expanding the conceptual framework that can guide future research and policy analysis in the LAC region. This review is particularly timely given the rapid evolution of both mobile technologies and labor market structures in the post-pandemic era.

Second, we present a detailed analysis of mobile internet access trends across LAC countries, documenting patterns of expansion, persistent gaps across socioeconomic groups, and comparative performance relative to other regions, particularly OECD countries. This descriptive analysis provides essential context for understanding the scope and limitations of digital connectivity across the region and identifies key areas where policy interventions may be most needed. We will examine trends across different measures of internet mobile access and in many cases compare the recent evolution using OECD countries as a benchmark. By using nationally representative surveys, we will also examine trends across specific groups in a selected set of countries: Chile, Colombia, and Ecuador.

Finally, we assess the specific link between internet mobile access and labor market responses using Chile as a case study. We conduct an empirical analysis of the relationship between mobile internet access and labor market outcomes, with particular attention to the adoption of flexible work arrangements such as remote work. By combining reduced-form evidence from multiple data sources, we aim to identify and understand how mobile internet access influences employment patterns.

Chile represents a particularly compelling case study within this regional context, having undergone one of the most rapid expansions of mobile internet infrastructure in LAC. The country's experience offers valuable insights into the potential labor market effects of widespread mobile internet adoption. Chile's relatively advanced digital infrastructure offers an interesting setting for examining how mobile internet access influences employment patterns, work arrangements, and economic opportunities across different population segments.

2 Related literature: The diverse effects of ICT technologies

The literature examining the labor market effects of mobile and internet technologies has undergone a notable evolution in perspective over the past two decades. Early studies of mobile phone adoption in developing economies were characterized by what we can call *techno-optimism*, documenting productivity gains and improved market efficiency that appeared to validate theories of technology as an unambiguous driver of economic development. This optimistic view extended to initial research on broadband internet expansion, which similarly emphasized efficiency gains and new employment opportunities. However, as mobile internet technologies matured and became ubiquitous—progressing from 3G through 4G to 5G networks—empirical evidence has revealed a more nuanced and sometimes contradictory picture. Recent scholarship reflects growing skepticism and highlights concerns about technology's universal benefits, especially regarding broader dimensions of human well-being. This shift from techno-optimism to critical examination mirrors broader debates in the economics profession about whether digital technologies represent a fundamentally transformative force for labor markets or merely another chapter in the long history of technological change with mixed distributional consequences.

2.1 Mobile phones and the internet

We begin by examining the individual impacts of two key information and communication technologies (ICTs): mobile phones and the internet. While each represents a crucial component of mobile internet—the central focus of this project—existing research has largely treated them as separate technologies. After reviewing selected studies from the extensive literature on mobile phones and internet connectivity, we demonstrate how mobile internet emerges as a distinct ICT with unique characteristics and effects that differ from its individual components.

2.1.1 Mobile phones

The introduction of mobile phones as a communication technology generated well-founded optimism about their potential to transform markets in developing economies. Mobile phones have proven highly effective at increasing market efficiency, with their widespread adoption in developing countries during the late 1990s and early 2000s demonstrating measurable improvements in market functioning. A salient study showed that mobile phone penetration shifts prices toward the law of one price, reducing price disparities across markets and improving overall market outcomes in terms of efficiency. Jensen (2007) exploits the staggered adoption of mobile phones service across regions in Kerala, India, between 1997 and 2001 to measure its effects on fish price dispersion. He finds that the introduction of mobile phones reduced price dispersion[2] by approximately 62.5% and also reduced waste by 4.8 percentage points. Aker (2010) applies a similar strategy to that of Jensen (2007) in measuring the impact of mobile phone introduction on grain price dispersion in Niger between 2001 and 2006. She finds that grain price dispersion was reduced by 10.9% in the first three months after a pair of markets gained mobile phone coverage, with no decline in the effect over time. These effects are larger when markets are geographically distant and/or poorly connected by road.

Mobile phones have also proven to be a cost-effective way to encourage farmers in developing countries to adopt more effective crop management practices by providing information via SMS. Fabregas et al. (2025) present the results of six experiments conducted in Kenya and Rwanda between 2014 and 2017, implemented by three different organizations,[3] in which farmers received recommendations on agricultural inputs. The authors combine the results of the six programs in a meta-analysis and argue that due to the low cost of text messages, these types of programs are cost-effective even when exhibiting small overall effect sizes.

There is also evidence of mobile phone expansion impacting labor markets in developing countries and, more specifically, increasing employment. Klonner and Nolen (2010) study the effects of mobile phones in rural South Africa between 1995 and 2000. They take advantage of the rollout of mobile phone antennas using panel data from household surveys and instrument actual network coverage with predicted local coverage based on topographical terrain data. Their results suggest that each 10 percentage point increase in coverage within a municipality leads to a 4.5 percentage point increase in female employment. They provide evidence that this effect is driven by wage employment rather than self-employment and that mobile coverage shifts employment out of agriculture. These effects on overall employment are consistent with the conceptual argument of Aker and Mbiti (2010), who suggests that mobile phones reduce search costs.

In terms of poverty and consumption, mobile phone technology may serve as a mechanism for mitigating risk by increasing remittances, as shown through the adoption of Mobile Money[4] in developing countries. Jack and Suri (2014) study the impact of M-PESA[5] on risk mitigation capabilities in Kenya between 2008 and 2010. They use a panel difference-in-differences specification with household fixed effects to measure changes in the response of consumption to shocks, comparing M-PESA users and non-users. They find that M-PESA users experience no decline in household per capita consumption, while non-users experience an average reduction of 7 to 10%. Lee et al. (2021) study the effects of mobile banking in Bangladesh between 2014 and 2016 using an experiment in which they randomized which migrant–household pairs[6] received treatment consisting of training in mobile financial services and facilitation of account setup. They report two main results: (i) urban-to-rural remittances increased by 26% and (ii) rural consumption increased by 7.5% for treated households relative to the controls. Suri (2017) provide a review of the Mobile Money literature and suggest that although Mobile Money is an effective tool for mitigating risk and increasing consumption, it is far from revolutionizing the role of financial markets or cash in the economies that have adopted this technology.

Even in the absence of Mobile Money, there is evidence that mobile phones increase remit-

[2]Defined as the difference between the maximum and minimum price measured over a given period.

[3]A public agency, a social enterprise, and a research-oriented non-profit.

[4]Mobile Money is a "financial innovation that has allowed individuals to transfer purchasing power by simple short messaging service (SMS) technology" (Jack and Suri, 2014).

[5]M-PESA is a Kenyan mobile payment system, launched in 2007.

[6]The experiment analyzes how migrants living in urban areas increase the remittances sent to their families (the households) in rural areas after receiving treatment.

tances: Blumenstock et al. (2020) provides experimental evidence for the Philippines between 2016 and 2019 in which villages were randomly assigned access to a cellular tower. Treated households reported 16.7% higher income, of which 25% was attributable to increased remittances. In Peru, mobile phone coverage also increased household consumption: Beuermann et al. (2012) exploit staggered coverage at the village level between 2004 and 2009 and find that mobile phone expansion increased real household consumption by 11% and reduced poverty incidence by 8%.

Finally, the effects of mobile phones on a variety of political outcomes have been studied. For instance, mobile phones can trigger political collective action: Manacorda and Tesei (2020) study how mobile phone coverage influenced individual participation in protests across the African continent between 1998 and 2012. The main mechanism driving this relationship is that mobile phones increase access to information about economic conditions and about others' willingness to engage in political mobilization, with strategic complementarities in the provision of protests. To identify a causal effect, they use mobile phone coverage maps and individual-level protest data from two independent newswire-based sources and instrument mobile phone coverage using the incidence of lightning strikes. Their estimates suggest that mobile phones play a key role in enabling mass mobilization during economic downturns: "a fall in GDP growth of 4 percentage points leads to a differential increase in protests per capita between an area with full mobile phone coverage and an area with no coverage of around 10 percent."

Mobile phones have also been shown to increase voter turnout. Aker et al. (2017) conducted a three-arm experiment in Mozambique during the 2009 election. The first arm was a civic education campaign via SMS, the second provided an SMS hotline for citizens to report electoral misconduct, and the third involved door-to-door distribution of a free newspaper focused on voter education. The first two interventions increased voter turnout by 4–9 percentage points, while the newspaper intervention did not produce statistically significant effects. However, only the newspaper treatment increased demand for political accountability.

2.1.2 The internet

In its early stages, the internet was predicted to affect firm productivity through three main channels: (i) reducing transaction costs, (ii) improving management efficiency, and (iii) enhancing competition. However, an early review of the available evidence at the time also suggested that "much of the benefit from the internet is likely to show up in improved consumer convenience and expanded choices, rather than in higher productivity and lower prices" (Litan and Rivlin, 2001). Subsequent evidence on firm productivity in European countries confirmed that the internet's impact was not necessarily as initially predicted. De Stefano et al. (2014) estimate the effect of broadband internet in the North East of England between 2000 and 2004 using a fuzzy regression discontinuity design. They exploit a spatial discontinuity caused by the boundaries of local telephone exchanges to measure (i) the probability of broadband internet access on either side of the boundary and (ii) the effect of broadband access on firm performance using firm-level data from the UK Census Bureau that includes firm location and other characteristics. They find large differences in broadband adoption around the discontinuity, but no significant effects on firm performance—including employment levels, employment growth, or the closure probability. Similarly, Haller and Lyons (2015) study the effect of broadband on the productivity of manufacturing firms in the Republic of Ireland between 2002 and 2009. Using firm-level panel data with firm and time fixed effects and instrumenting broadband adoption with the share of addresses connected to exchanges enabled for broadband, they find no significant effect of broadband internet on firms' total factor productivity, either in levels or growth. Nonetheless, there is evidence of increased innovation activity even in the absence of gains in labor productivity. Bertschek et al. (2013) examine the effects of broadband internet expansion in Germany between 2001 and 2003 for a sample of manufacturing and service firms. Using data collected by the Centre of European Economic Research—including firm performance and broadband usage—they apply an instrumental variable approach in which broadband availability at the postal code level is used to instrument firm-level broadband use. Their estimates show no significant effect on labor productivity but a significant and robust effect on innovation activity.[7]

For the US, the evidence points in a different direction: Gillett et al. (2006) measure changes in the number of businesses overall, the level of employment, and the number of businesses in IT-intensive sectors between 1998 and 2002, driven by the mass adoption of broadband in December 1999. They rely on a pooled cross-sectional analysis at the zip-code level, controlling for time-lagged dependent variables, time-lagged industry composition, demographic and geographic characteristics, and state fixed effects. Their estimates suggest that broadband internet access increased employment growth rates by approximately 1–1.4%, business establishment growth rates by 0.5–1.2%, and the share of establishments in IT-intensive sectors by about 0.3–0.6%. More broadly, much research in the US attributes the resurgence in labor productivity in the late 1990s and early 2000s to the rapid expansion of ICT, including the internet and other advances such as intranets; improved computer hardware; and software. However, this body of research generally treats ICT in a broad sense and does not directly study the causal effects of the internet on labor and firm productivity (Autor et al., 2003; Jorgenson, 2001; Oliner and Sichel, 2000; Bresnahan et al., 2002; Stiroh, 2002).

In developing countries, evidence of broadband internet increasing firm productivity is more limited and does not necessarily include a well-equipped research design to claim causality. Basant et al. (2006) study manufacturing firms in Brazil and India that were surveyed in 2005 about ICT adoption (including internet use) and about management and organizational changes in 2001, 2002, and 2003. They first document large differences in ICT adoption between the two countries, with Brazil having a higher proportion of firms adopting these technologies. Then, they present correlations and first-differences estimations of ICT usage on firm revenues, highlighting a highly significant correlation between ICT capital and revenues. While they do not show direct correlations for internet use, their ICT capital indices include internet adoption. Paunov and Rollo (2015) take a broader approach and focus on 49,610 firms across 117 developing countries[8] between 2006 and 2011. Their identification strategy uses sector-level adoption of email as a communication channel[9] as the main regressor for firm-level labor productivity, controlling for firm-level characteristics as well as sector-year and country-year fixed effects. Their estimates indicate that the productivity benefits of internet use were present in almost all regions.[10] Notably, they interact their main internet usage measure with several "obstacles",[11] and find that even in the presence of any of these adverse business conditions, internet usage still has positive effects on labor productivity.

Labor markets experience significant transformations following broadband internet investments. However, unlike the broadly beneficial effects of mobile phones, the empirical evidence from both developed and developing economies reveals that internet adoption functions as a

[7] They measure innovation activity as a dummy variable equal to 1 if the firm has "internally introduced new or significantly improved processes between the years 2001 and 2003" (Bertschek et al., 2013).

[8] Forty percent are from LAC, 27% from Africa, 22% from Eastern Europe, Central Asia, or the Middle East, and 11% are from East Asia Pacific and South Asia regions.

[9] To avoid endogeneity, they omit the firm's own email adoption.

[10] The only exceptions are East Asia Pacific and South Asia, where the null hypothesis of no effect cannot be rejected.

[11] Power outages, corruption incidence, financial constraints, skills shortages, and difficult labor regulations.

skill-biased technology. Rather than providing universal benefits, internet connectivity primarily improves labor market outcomes for workers who already possess higher skills or educational attainment, potentially exacerbating existing inequalities in the labor market.

Akerman et al. (2015) study the Norwegian case from 2001 to 2007, during which a publicly funded program progressively expanded broadband access. They exploit this rollout as an instrument for broadband internet access to identify its causal effects on labor productivity and wages. Using firm-level data on value added, capital, and labor by skill level, as well as broadband adoption, they complement their dataset with an employer–employee registry containing workers' education and annual labor income. Additionally, they use individual-level socioeconomic data and hourly wage information from Statistics Norway's Wage Statistics Survey. Their results suggest that broadband internet increases skilled labor productivity while acting as a substitute for unskilled labor: "for every \$1 spent on skilled labor, production increases by \$1.34 in the absence of broadband internet. Broadband adoption in firms increases the productivity of skilled labor by \$0.27. For unskilled labor, however, this technological change lowers the marginal productivity by \$0.06." Bhuller et al. (2023) rely on the same Norwegian broadband rollout policy as Akerman et al. (2015) to measure the internet's effect on the search and recruitment process. Using a large-scale survey and administrative data with detailed information on vacancies, job search, and employment, they find three main effects: (i) the internet improved recruitment by reducing the average vacancy duration by 9% and lowering unsuccessful hiring attempts by more than 10%, (ii) unemployed job seekers increased their re-employment rates by 2.4%, and (iii) broadband access did not affect labor market outcomes for the already employed.

Forman et al. (2012) examine the relationship between internet investment and wage growth in the US between 1995 and 2000 using county-level data. They find that internet investment correlates with wage growth in only about 6% of counties—those in the right tail of the income distribution, with large populations, high skill levels, and concentrated IT use. These counties averaged 28% wage growth, compared to 20% elsewhere. Over half of this difference is explained by greater internet investments. Their correlations are robust to numerous firm-level controls. Atasoy (2013) studies broadband expansion in the US between 1999 and 2007, exploiting timing variation in county broadband access and relating it to labor market outcomes. Using county-year data with controls for demographics and fixed effects, she estimates that counties with at least one broadband provider see an increase in employment rates by 1.8 percentage points, driven both by unemployed individuals finding jobs and new entrants to the labor force. Employment growth primarily arises from increases in firm size rather than new firms. These effects are stronger in counties with a higher share of college-educated residents. The internet also boosted female employment, especially among highly educated women in both developed and developing countries. Dettling (2017) studies the US between 2000 and 2009 using the Current Population Surveys, which collect internet access data. Exploiting supply-side constraints as an instrument—particularly that multi-family properties are more profitable for providers due to economies of scale—she finds that high-speed internet access raises married women's labor force participation by 4.1 percentage points, with the largest effects among college-educated women with children.

Hjort and Poulsen (2019) study the effect of the arrival of fast broadband internet across 12 African countries between the late 2000s and early 2010s. They exploit the staggered rollout of the internet network to identify its causal effects on employment. The identification strategy relies on the differential timing of submarine cable landings from Europe, which substantially increased speed and capacity of the terrestrial internet network in coastal locations. They use georeferenced data from household, firm, or labor force surveys in each of the 12 countries, all of which include observations before and after the submarine cables' arrival. The authors implement difference-in-differences regressions at the individual, firm, or location level, exploiting variation in both time (pre- vs. post-arrival) and space (connected vs. unconnected areas). They report three main findings: (i) the probability that an individual is employed increases by between 3.1% and 13.2%, depending on the dataset used, and this increase is driven by higher employment in connected areas rather than job displacement from unconnected ones; (ii) the probability of being employed in a skilled occupation increases significantly, while the probability of employment in unskilled occupations remains unchanged; and (iii) employment inequality falls, as the increase in employment probability is of similar magnitude for individuals who completed only primary education and for those with secondary or tertiary education.

A more recent interesting feature in labor markets, derived from better internet access, are working from home (WFH) arrangements. Barrero et al. (2023) show that the percent of paid workdays worked at home in the US had a slightly positive slope between the 1960s until 2019, growing from 0.4% in 1965 to 7.2% in 2019. With the onset of the COVID-19 pandemic, this level rose to 61.5% because of social-distancing mandates. Then, it reduced to a stable 28% until recent days. ICTs play an important role in people's possibility to work from home; the authors argue: "In the 1970s, work from home often meant briefcases stuffed with paperwork. By the 1990s, it meant phone calls and floppy disks. In the twenty-first century, the rise of the internet facilitated collaboration at a distance." And they add that "The pandemic catalyzed the big shift to work from home, but earlier developments made it possible. Critical tools for remote work include web-based video-conferencing platforms like Teams, Webex, and Zoom; cloud-based filesharing services like Box, Drive, and Dropbox; and collaboration software like Asana and Slack. None of them existed in 2000." The authors characterize WFH using demographic variables from the Survey of Working Arrangements and Attitudes, and they find that WFH is concentrated in large cities, among people with higher education degrees, in people in their mid 30s and 40s, and in industries with computer-intensive tasks. They do highlight the concerns on the productivity issue: while workers may perceive an increase in productivity because of less commuting, managers may not perceive any change, at least in hybrid arrangements.

More broadly, there is evidence of a positive contribution to economic growth in developed countries. Koutroumpis (2009) provides evidence from 22 OECD countries over six years (2002–2007). He uses a structural econometric model based on a production function that endogenizes broadband infrastructure. The magnitude of the coefficients suggest that a 1% increase in broadband penetration raises GDP growth by an average of 0.025%, and this coefficient is robust across different specifications controlling for country and year fixed effects. Czernich et al. (2011) also studies this relationship for 25 OECD countries using a panel dataset covering 1996 to 2007. They rely on an instrumental variable strategy with a non-linear first stage: a logistic diffusion model where pre-existing voice telephony and cable TV infrastructure predict broadband penetration, measured as the number of broadband subscribers per 100 inhabitants. Their estimates indicate that a 10 percentage point increase in broadband penetration raises annual per capita GDP growth by 0.9 to 1.5 percentage points, with results robust to the inclusion of country and year fixed effects.

Internet expansion has also been shown to improve mental and physical health. Johnson and Persico (2024) study a period of rapid broadband rollout in the US between 2000 and 2008. The authors combine mortality data from the National Center for Health Statistics at the county level with broadband supply data from the Federal Communications Commission. They also use census data to control for county-level demographics. Their identification strategy relies on a two-way fixed effects model with time and county fixed effects, as well as county-level demographic controls varying at the county-year level. They find that a 10% increase in the population's access to broadband internet is associated with a 1% reduction in suicide mortality. The authors suggest that the main mechanism behind these effects is an improvement in material well-being, evidenced by a decline in poverty and unemployment rates and an increase in total annual payroll at the county-year level.

Internet access has also been shown to affect health-related outcomes on different dimensions. For instance, there is evidence that internet access influences health decisions. Amaral-Garcia et al. (2022) exploit a plausibly exogenous geographic discontinuity in the UK between 2000 and 2001 and find that broadband internet increased the probability of having a Cesarean section by 2.5%, an effect mainly driven by first-time mothers, with no significant changes in maternal or neonatal health outcomes. On the other hand, McDool et al. (2020) estimate the effect of neighborhood broadband speed on children's well-being in England between 2012 and 2017. Their identification strategy relies on panel data regressions with individual, temporal, and geographical fixed effects and a rich set of covariates. Their results suggest negative effects of internet use on children's self-reported well-being, particularly among girls and in relation to body image. These effects appear to be driven by a "crowding out" of other beneficial activities as internet use increases. Finally, Chen and Liu (2022) measure the effect of internet access on body weight in China between 2000 and 2001. Using a difference-in-differences strategy in which treatment intensity depends on pre-existing internet infrastructure across cities, they find that a 10% improvement in internet infrastructure reduces the probability of being overweight by 1.62 percentage points (a 5.28% decrease). The authors attribute this effect to increased exposure to health information and improved economic well-being.

On social capital accumulation there is mixed evidence. Bauernschuster et al. (2014) provide evidence for Germany between 2001 and 2008. Their instrumental variable approach shows no significant effects of the broadband internet rollout on social capital measures. Geraci et al. (2022) study a similar question in the UK context between 1997 and 2017. They exploit a technological feature of the telecommunications infrastructure that generated substantial variation in the quality of internet access across households. Their results suggest that fast internet access reduced civic and political engagement, which contrasts with Bauernschuster et al. (2014). They argue that these differences can reflect differences in internet use between English and German users: the former tend to engage more in commercial activities, while the latter are more inclined to use the internet to stay in touch with others.

Internet access has also affected crime and conflict. Following a similar identification strategy as Akerman et al. (2015) and Bhuller et al. (2023) in the Norwegian context, Bhuller et al. (2013) find that broadband internet is associated with an increase in reported incidences of rape and other sex crimes. They identify three mechanisms: (i) an increase in reporting itself, (ii) a matching effect between potential offenders and victims, and (iii) a direct effect on crime propensity. There is also evidence of the internet facilitating recruitment into terrorist organizations: Do et al. (2023) show that this was the case for Tunisians who joined Daesh in Syria and Iraq between 2013 and 2014. Using individual-level data, including area of residence, and combining it with census data on internet access, they find that areas with larger increases in internet access are positively correlated with a higher number of Daesh recruits, conditional on area, age, and education. The largest estimated effects are observed among individuals aged 20–29. As with mobile phones, the internet has reshaped many aspects of economies beyond production.

2.2 Mobile internet

Now we turn to the literature on the societal impact of mobile internet across its different generation technologies. This literature is large for African countries and typically exploits the staggered rollout of mobile internet coverage to identify its effects using reduced-form estimates.

2.2.1 Consumption and poverty

Bahia et al. (2024) combine household surveys and maps of mobile internet coverage for Nigeria between 2010 and 2016, exploiting the staggered 3G coverage rollout to measure its effects on poverty and consumption. They find a 15 percentage point reduction in the share of the population living under the US$1.90 per day per person extreme poverty line, mirrored by a 10.8% increase in aggregate household consumption, with larger effects for men and initially poorer households. With a similar strategy, Bahia et al. (2021) estimate the effects of 3G coverage on household consumption in Tanzania between 2008 and 2013. They find that 3G coverage increased per capita household consumption by 7 to 11 percentage points and that the share of households below the poverty line was reduced by approximately 5 percentage points, with statistically significant results appearing after more than one year of exposure. As in Bahia et al. (2024), younger and more educated men benefited the most. Masaki et al. (2020) measure the effects of 3G coverage in Tanzania between 2011 and 2017 using a similar strategy combined with an instrumental variables approach.[12] They estimate a 14% increase in total household consumption in covered areas and a 10% reduction in extreme poverty (US$1.90/day). Also in Tanzania, Roessler et al. (2021) assigned smartphones to women in an experiment to measure the causal effects. They find that over thirteen months, smartphones increased households' annual per capita consumption by 20% compared to the control group, with 18% of that effect mediated by internet access.[13] There is also evidence of improved household incomes in Southeast Asian countries. Hübler and Hartje (2016) estimated a cross-sectional probit selection model of household smartphone ownership with two instruments to estimate its effect on household incomes in Thailand, Vietnam, Laos, and Cambodia between 2012 and 2013.[14] They find an economically significant positive effect of smartphone ownership on household per capita income (approximately 11%), although the statistical significance is weak. There is also evidence on how the misuse of mobile internet may negatively affect health and other life-improving outcomes. Ramdas and Sungu (2024) conducted a randomized controlled trial in 2019 in India, randomizing the maximum usage of mobile internet data as a commitment device. They find that the treated group used mobile internet more productively[15] and that their data lasted longer on average within a month compared to the control group. In addition, the authors invited both treatment and control groups to an in-person health camp, sending invitations via WhatsApp. Due to mobile data shortages, the control group had significantly lower attendance at the camp.

2.2.2 Effects on employment

The existing literature suggests that the mechanisms driving the positive effects on poverty and consumption are closely linked to labor market dynamics. For instance, Bahia et al. (2021) estimate that mobile internet coverage increased labor force participation by approximately 3 to 8 percentage points and raised both wage employment and non-agricultural self-employment by 4 percentage points, displacing agricultural self-employment. In contrast, Masaki et al. (2020) find only weak correlations between 3G connectivity and salaried employment, and no significant effect on overall employment. They suggest instead that 3G may shift employment by improving wages or increasing the share of high-skilled jobs. Abreha et al. (2021) provide evidence that mobile internet access can improve labor market outcomes by enhancing competition among firms and thereby boosting labor productivity. During Ethiopia's transition to 3G in

[12] They instrument 3G coverage with a 3G connectivity index, built using a next-to-vicinity weighted average distance to 3G-covered areas.

[13] They argue that this share is quite large, considering the low levels of mobile internet use in their study.

[14] Their instruments are (i) the unweighted mean of smartphone ownership in each household district and (ii) the share of households with internet access in the district.

[15] They define better use as allocating less mobile internet data to entertainment and more to information.

2008, the staggered rollout of the broadband network allowed them to estimate a difference-in-differences model with firm fixed effects, finding a 23.3% increase in labor productivity. To evaluate broader effects across developing countries, Chiplunkar and Goldberg (2022) use an instrumental variable strategy, exploiting lightning frequency as an instrument for 3G coverage. They find that a 10 percentage point increase in 3G coverage raises female labor force participation by 4.9 percentage points, and that, conditional on participation, 3G expansion increases employment for both men and women. According to their findings, 3G access leads men to transition out of unpaid agricultural and service work into self-employment via small, owner-operated enterprises. Women, in turn, fill the unpaid positions vacated by men, run small enterprises across sectors, or, like the men, become wage workers in the service sector. Viollaz and Winkler (2022) examine the case of Jordan between 2010 and 2016, using individual-level panel data on labor market outcomes. For identification, they exploit the rapid expansion of mobile internet during this period, interacting the distance to the nearest 3G antenna with a proxy for pre-rollout internet access cost. They find that each percentage point increase in mobile internet access raises women's labor force participation by 0.7 percentage points, with employment gains concentrated among skilled and older women. Despite this overall positive evidence, Roessler et al. (2021) show that smartphones are not necessarily more effective than basic phones in shifting informal workers to formal employment, even when internet use rose by 0.4 standard deviations relative to the control group.

2.2.3 A novel feature: the "gig economy"

An interesting characteristic of how mobile internet affects labor markets is the so-called "online platform economy" (OPE henceforth), also called the "gig economy". These "gig" jobs are typically time-flexible, on-demand, and offered via platforms in the internet (Tapia and Azuara, 2024). Mobile internet access may increase this type of job because lower communications and transactions costs associated with access to the internet are likely to have enabled individuals to become self-employed (Chiplunkar and Goldberg, 2022). OPE jobs have been studied fundamentally in the US, and the number of OPE workers in the US have grown steadily in the last decade (Collins et al., 2019). OPE workers are predominantly younger males compared to traditional self-employed workers Collins et al. (2019). These workers typically engage with multiple platforms simultaneously and often use these opportunities to supplement income from their primary employment (Gruber, 2024). The appeal of OPE work largely stems from its flexibility, though this comes with high turnover rates—Farrell and Greig (2017) report that "one in six participants in any given month is new and more than half exit within 12 months." Recent studies highlight the economic mobility potential of OPE work. Garin et al. (2020) find that new OPE workers experience stronger wage growth compared to other freelancers and demonstrate greater resilience to unemployment shocks. This finding aligns with Koustas (2019), who shows that while US households typically enter the gig economy following income declines, they subsequently reverse this downward trend. Despite concerns about market saturation, Stanton and Thomas (2021) estimate that the supply surplus in the US OPE labor market still generated about 40% of the total market surplus in the late 2000s. While OPE work shares characteristics with informal employment, Gruber (2024) highlights a crucial distinction: the digital nature of these platforms creates unique opportunities for policymakers to design and implement worker benefits more effectively than in traditional informal sectors. Much of the existing research has focused narrowly on Uber as a case study (Gruber, 2024; Cook et al., 2019; Angrist et al., 2021; Chen et al., 2019, 2020; Abraham et al., 2024). Also, while numerous studies have focused on the US, evidence from the LAC region remains scarce. There is evidence for Peru of nudging on-demand platform drivers to save more (Azuara et al., 2021) and on how social protection systems in Uruguay can be strengthened taking advantage of the labor OPE (Behrendt et al., 2019).

2.2.4 Social media

One widely documented aspect of smartphones and mobile internet is the role of social media in shaping various outcomes—particularly political polarization and subjective well-being. While the literature on social media is not strictly confined to mobile internet or smartphone use, its rapid growth over the past two decades is closely tied to the expansion of mobile internet. A key point to note is that there is substantial evidence suggesting that social media and smartphone use can be addictive. Allcott et al. (2022) estimate an economic model of digital addiction using a randomized experiment and find that social media use on smartphones is habit-forming[16] and that individuals are generally unaware of their own self-control problems. The study randomized two treatments: (i) a bonus treatment offering a $2.50/hour subsidy for reducing social media use over three weeks and (ii) a treatment providing access to a screen-time-limit feature via a custom-developed application. The bonus treatment led to a 56-minute daily reduction in use (a 39% decrease relative to the control group). Even three weeks after the subsidy ended, users still consumed 19 minutes less per day, and 12 minutes less three weeks later. The second treatment reduced usage by 22 minutes per day (16%) over 12 weeks. Notably, the control group consistently underestimated their future social media use. Given these self-control problems, it is not surprising that social media may influence beliefs and subjective well-being, as discussed below. It is also nontrivial that individuals engaging in social media consumption may exhibit addictive behavior, especially considering that approximately 62% of adults in the US read news directly from social media (Gottfried and Shearer, 2016) and that these platforms can serve as powerful vectors for spreading "fake news" (Allcott and Gentzkow, 2017). Another concern is the potential disutility associated with abstaining from social media: Bursztyn et al. (2023) suggest that social media acts as a "collective trap," where individuals experience negative utility from not consuming it, and when such externalities are internalized, net welfare declines. To estimate this effect, the authors conducted an experiment with US college students, focusing on TikTok and Instagram usage. Using an incentivized Becker-DeGroot-Marschak mechanism implemented through an iterative multiple price list, they find that 60% of TikTok users and 46% of Instagram users display a positive willingness to pay to have both themselves and others deactivate these platforms.

The literature on social media's influence on political beliefs and behavior is extensive, with evidence from both Western and Eastern countries. For instance, Enikolopov et al. (2020) examine the case of Russia in 2011, when an unexpected wave of political protests erupted following allegations of electoral fraud. The authors argue that the social network "VKontakte"[17] (henceforth VK) played a key role in triggering these protests by facilitating information dissemination and coordination for collective action. To identify VK's causal effect on political protests, they exploit geographic and temporal variation in both protest activity and VK penetration. In particular, they take advantage of VK's early expansion, which began in the hometowns of its first users—students from Saint Petersburg State University, where VK's founder studied. Their identification strategy rests on the assumption that the number of students from different cities attending this university was not systematically related to local political characteristics. Their results suggest that a 10% increase in VK users in a city led to (i) a 4.6 percentage point increase in the probability that the city participated in a protest and (ii) a 19% increase in the number of protests during the first weekend after the election. Enikolopov et al. (2018) also study how social media can promote political accountability in non-democratic contexts, focusing on Russia between 2008 and 2011. They analyze the role of Alexey Navalny,[18] whose blog—shared across multiple social media platforms[19]—exposed corruption in state-controlled

[16] Habit-forming in this context means that today's consumption increases future demand.
[17] According to the authors, this is the most popular social network in Russia.
[18] A lawyer and former member of the Russian opposition party Yabloko.
[19] These include Facebook, VKontakte, and Twitter, among others.

companies. Using high-frequency data on stock returns of these companies and conditioning on firm characteristics, the authors assess the market response to Navalny's posts. They find that cumulative abnormal returns fell by 0.78 percentage points within six hours of a post, and that these posts increased the likelihood of subsequent changes in company management.

In the US, Fujiwara et al. (2024) provide evidence that Twitter use altered voter behavior in the 2016 and 2020 presidential elections. They exploit an event that occurred in 2007, which played a key role in boosting Twitter's popularity and induced geographic variation in user adoption. This variation serves as an instrument for the number of Twitter users at the county level. Their 2SLS estimates suggest that (i) Twitter's influence was concentrated among independent and moderate voters, who shifted their support toward Democratic candidates; (ii) Twitter reduced Trump's vote share during the 2016 primaries; and (iii) overall, Twitter exhibited a pro-Democratic slant. Beknazar-Yuzbashev and Stalinski (2022) also provide evidence for the US in June 2020, during the presidential campaign, by examining the impact of Facebook ads on political behavior. In their experiment, they randomly assigned users to a treatment group, where political ads were hidden, and a control group, where alcohol ads were hidden instead. While the overall treatment had no statistically significant effect on voter turnout, they find meaningful heterogeneous effects by political ideology: the treatment significantly increased Republican turnout, while for Democrats the estimated effect was negative but not statistically significant. The authors suggest that this is due to a predominance of Democratic-leaning ads in the sample. Levy (2021) studies how social media exposure affects polarization by increasing encounters with pro- or counter-attitudinal content. In an experiment conducted in the US between February and March 2018, Facebook users were randomly assigned to one of three groups: a liberal treatment, a conservative treatment, or a control group. Those in the treatment groups were asked to subscribe to up to four news outlets aligned with their assigned ideology. The study estimates intention-to-treat effects and finds that exposure to counter-attitudinal content reduces affective polarization.[20] However, the author argues that Facebook's algorithm appears to filter counter-attitudinal content, suggesting the platform may contribute to increased polarization. Evidence from developing countries also highlights the role of social media in shaping political beliefs and social cohesion. Ajzenman et al. (2023) explore whether political identity overshadows other forms of identity by running a Twitter experiment around the 2022 Brazilian elections. They created fictional accounts signaling either political preferences (a political dimension), support for a Brazilian football club (an "affective" dimension), or neutrality in one of the two. These accounts randomly followed real Twitter users with either similar or dissimilar traits across the two identity dimensions. Their results show that (i) when signaling a single identity, congruence in either dimension increases follow-backs, though political identity congruence yields a larger effect (20 percentage points vs. 13.4 percentage points for the affective dimension), and (ii) when signaling both identities simultaneously, political disagreement overshadows affective identity, leading to a follow-back rate increase of only 4.3 percentage points, rather than the 13.4 percentage points observed when affective identity is signaled alone.

Within the context of elections, so-called fake news also plays an important role. If news consumers (voters) derive utility not only from learning the true state of the world (e.g., regarding a candidate's future performance) but also from consuming news that aligns with their existing beliefs—even when such news is false—and if they are unable or unwilling to distinguish between fake and real news, then political beliefs can become distorted and misaligned with reality. This presents a serious problem in the context of social media, where the fixed costs of news production are particularly low and many news suppliers can easily enter the market (Allcott and Gentzkow, 2017). However, fake news sharing can be curbed by imposing small frictions:

[20] Affective polarization is measured through an index averaging responses to 20 survey questions about domestic political issues and political figures featured in the news during the study period.

Henry et al. (2022) provide experimental evidence from the 2019 European elections campaign in France, where they randomly exposed voting-age Facebook users to false statements. Among these users, some were also exposed to fact-checking, and a further subgroup was simply offered the option to view the fact-checking. They find that both fact-checking treatments reduced fake news sharing by approximately 45%, and that each additional click required to share a fake news item significantly decreased the likelihood of sharing.

The wide massification of social media has also had effects on hate incidents targeting certain groups, not only in the West but also in the East. For instance, Cao et al. (2023) show that Donald Trump's tweets referring to COVID-19 as the "Chinese virus" led to a spike in anti-Asian incidents in the US at the onset of the pandemic. They find that this spike was concentrated in counties that supported Donald Trump in the 2016 election, where anti-Asian incidents increased by approximately 4200%. Müller and Schwarz (2023) leverage the same geographical variation in Twitter usage as Fujiwara et al. (2024) to examine how Twitter usage affects anti-Muslim hate crimes. They find that a one standard deviation increase in Twitter usage is associated with a 32% increase in anti-Muslim hate crimes around the time of Donald Trump's political rise in 2016. To explore potential mechanisms, they examine patterns in Trump's Twitter activity and use the days when he played golf as a source of exogenous variation. On golfing days, Trump's tweets were more focused on Islam-related issues compared to non-golfing days. Their 2SLS estimations show that Trump's tweets about Muslims triggered waves of anti-Muslim sentiment, increasing hate crimes against this group. Müller and Schwarz (2021) provide further evidence on this topic by studying anti-refugee sentiment on Facebook and hate crimes against refugees in Germany between 2015 and 2017. They exploit municipal-level variation in Facebook usage and weekly variation in anti-refugee sentiment. Specifically, they analyze how periods of high salience of refugee-related topics on the Facebook page of "Alternative für Deutschland" (AfD) relate to hate crimes in municipalities with higher Facebook penetration. To address endogeneity concerns, they use exogenous variation from Facebook outages. They find that Facebook acts as a channel for spreading anti-refugee sentiment and that outages reduce local hate crimes, particularly in areas with many AfD followers. Bursztyn et al. (2019) study the relationship between social media and xenophobic attitudes in Russia, exploiting the same exogenous city-level variation in VK usage as Enikolopov et al. (2020). They measure how higher VK penetration correlates with attitudes and hate crimes toward ethnic minorities, using both survey data and data on hate crimes collected by an independent Russian NGO. They find a positive effect of VK penetration on elicited ethnic hostility, with an elasticity close to 1. Furthermore, they show that increased VK penetration not only correlates with more hostile beliefs about ethnic groups but also increases hate crimes—though only in cities with a high baseline level of nationalist sentiment. In such cities, a 10% increase in VK penetration raised hate crimes by 21.7%.

Mental health and subjective well-being constitute another area affected by social media. Braghieri et al. (2022) examine how Facebook influenced college students' mental health in the US between 2004 and 2006. They exploit the staggered rollout of Facebook across colleges and combine this with data on students' mental health. Their generalized difference-in-differences strategy shows that an index of poor mental health increased by 0.085 standard deviations after Facebook's introduction. The authors argue that these effects are primarily driven by increased unfavorable social comparisons among students. Allcott et al. (2020) provide experimental evidence on the effects of Facebook deactivation via smartphones on several outcomes, including subjective well-being. Their study, conducted in the US four weeks before the 2018 midterm elections, yields four main findings. First, Facebook use was found to crowd out offline activities by approximately 60 minutes per day. Second, the treatment group showed reduced political knowledge and attention, as well as reduced polarization. Third, Facebook deactivation slightly but significantly improved well-being, measured through self-reported happiness, life satisfaction, depression, and anxiety. Overall, their subjective well-being index increased by 0.09 standard deviations—equivalent to about 25–40% of the typical effect of psychological interventions. Finally, the authors find that Facebook demand remained lower even after the experiment ended. In a more recent and large-scale study involving Meta (the parent company of Facebook and Instagram), Allcott et al. (2024) examine the effects of deactivating either Facebook or Instagram for five weeks in a sample of 35,442 individuals in the US. They find that deactivation of Facebook increased an index of mental health by 0.06 standard deviations, while Instagram deactivation led to a 0.041 standard deviation improvement. This study also reports heterogeneous effects—which previous studies could not due to limited statistical power, finding that Facebook's effect is concentrated among individuals over 35, while Instagram's effect is concentrated among women under 25. Importantly, the improvements in well-being are not driven by reduced overall smartphone use but rather by a shift from social media to other types of smartphone applications.

2.2.5 Other outcomes

Beyond consumption, labor markets, and the role of social media, there is also a growing literature documenting that smartphones may increase the incidence of various types of accidents. For example, Palsson (2017) shows that the rollout of 3G between 2005 and 2012, along with the release of the iPhone in 2008, increased emergency room visits in US hospitals by 9% for children under the age of five. The author employs a difference-in-differences strategy at the hospital–age group–year level, leveraging variation in 3G exposure at the hospital-year level. The main argument is that smartphones with 3G access distract caregivers more intensively than other forms of distraction due to the wide array of engaging features available on such devices. Hersh et al. (2022) uses a similar identification strategy to estimate the relationship between smartphone use and traffic accidents in California between 2001 and 2013. Their difference-in-differences estimation exploits the interaction between smartphone adoption and 3G coverage at the quarter-mile road-segment level. They find that smartphone use is associated with a 2.9% increase in traffic accidents. Similarly, Brands et al. (2022) study the Netherlands and assess the effect of increased mobile internet use due to changes in EU roaming regulations implemented in 2017, which substantially boosted mobile data usage while traveling. Using a difference-in-differences approach based on the exogenous variation induced by the regulation, they find that the policy increased the number of traffic accidents by 10%. In a different domain, mobile internet has also been shown to negatively impact human capital accumulation. Jain and Stemper (2024) combine georeferenced global data on the rollout of 3G technology between 2000 and 2018 with standardized test scores from two million students across 82 countries. They find that the introduction of 3G is associated with declines in academic performance across all subjects equivalent to a loss of approximately one-quarter of a year of learning.

3 Internet mobile coverage in LAC

In this section, we describe the current state of mobile internet access in the LAC region. To do so, we combine various data sources to compare trends in mobile internet connectivity across LAC countries with those observed in OECD countries, which serve as a benchmark for mobile internet access. We present indicators from the OECD's broadband statistics, which compile a wide range of metrics related to internet access in general, and mobile internet in particular. Additionally, we include data from Our World in Data and the World Bank. To provide a more comprehensive view of mobile internet connectivity, we examine population coverage as reported by firms, the number of mobile internet subscriptions reported by telecommunications providers, and the average number of mobile phone antennas per municipality or locality, disaggregated by technology (2G, 3G, 4G, and 5G), using administrative data from the respective Ministries or Departments of Telecommunications of three Latin American countries (Chile, Colombia, and Ecuador).

We also examine socioeconomic gaps in internet access within the same three LAC countries as above, from which we have information from household surveys. By comparing mobile internet access as reported by individuals, we document internet access gaps across socioeconomic dimensions in Chile, Colombia, and Ecuador. We proxy socioeconomic status by classifying individuals in one of the following three (exclusive) education levels: (i) less than high school, (ii) high school and some college, and (iii) completed college.

3.1 Mobile subscription

The number of mobile internet subscriptions captures the overall demand for mobile internet in each country. Figure 1 displays bi-quarterly time series of mobile internet subscriptions per 100 inhabitants for four LAC countries (Chile, Colombia, Costa Rica, and Mexico), as well as the OECD average excluding those four LAC countries, from 2009 to 2023.

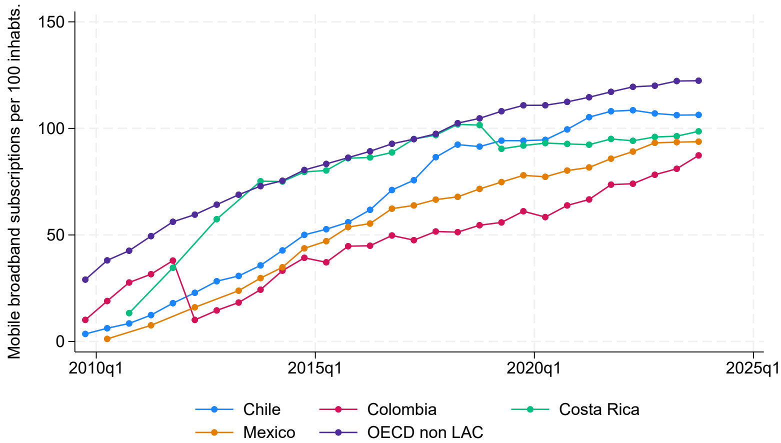


Figure 1: Mobile broadband subscriptions per 100 inhabitants

As can be seen from Figure 1, there is a persistent gap between OECD and LAC countries. Costa Rica shows an early convergent trend, reaching OECD subscription levels early in the period analyzed: In the fourth quarter of 2014, Costa Rica had 79.58 subscriptions per 100 inhabitants, while the OECD (without the LAC countries shown) had 80.47 subscriptions on average, but in the last quarter of the series, OECD countries had 122.38 subscriptions[21] and Costa Rica 98.62. The Mexican case shows an almost steady gap relative to OECD. During the whole period, on average, OECD subscriptions are 34.45 larger than Mexico's, with the minimum reached in the fourth quarter of 2022 and the maximum in the second quarter of 2013. The last three quarters measured show a somewhat closing gap, being the only three of the series with a difference smaller than 30 subscriptions per inhabitant, but the last two measures (both in 2023) show a larger difference than the fourth quarter of 2022. For Colombia, between 2011 and 2012 their rate of mobile subscriptions by 100 inhabitants largely decreased according to OECD data, falling from 37.97 to 10.12, which increased its gap from 18.19 to 49.41. From

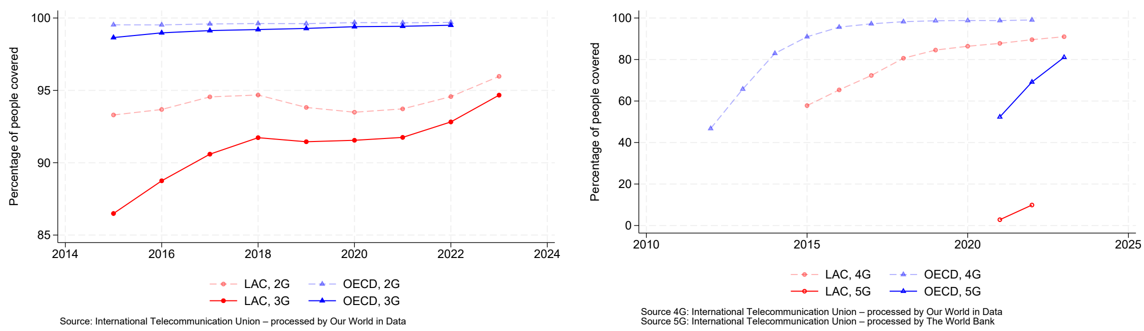
[21] Non-weighted country average, taken of 35 countries.

the second quarter of 2020, the Colombian gap has decreased slowly, from 52.48 to 35.05. Chile shows a large gap decrease between 2013 and 2018, from 38.11 to 10.07 subscriptions, but from that date the gap has been oscillating between 9.1 and 16.04. These four different trajectories show that LAC is still lagging relative to OECD countries in terms of mobile internet subscriptions, with no clear sign that the gap is near to be closed.

3.2 Population coverage

Another way to examine LAC's performance on mobile internet access is comparing the population proportion covered by cutting-edge mobile internet technology: the rate of people in a country living in an area covered by a mobile internet antenna of a certain technology. This indicator has the advantage that it distinguishes between technologies and also adjusts for population. But, like the subscription indicator, it is a much aggregated variable. Again, we include the evolution of the average of OECD countries for the same period as a benchmark. For this section we show data collected from Our World in Data and the World Bank. Figures 2a and 2b show trends on the average rates of population covered by different mobile internet technologies, for OECD and LAC. Figure 2a shows the trend of 2G and 3G technologies, and Figure 2b shows the trend of 4G and 5G technologies.

Figure 2: Mobile internet coverage by technology



(a) 2G and 3G

(b) 4G and 5G

Figure 2a shows that, for older generation technologies, at least 90% of the population has been covered with both technologies since 2017, and for the last date available, 2G and 3G technologies cover around 95% population of LAC countries, on average. The gap between OECD and LAC countries is relatively small for these technologies, with less than 10 percentage points for both 2G and 3G at least from 2017. The 3G gap has been reduced from 2015 by half, falling from 12.15 pp to 6.68. 4G trends, displayed in Figure 2b, show a clear pattern of a decreasing rate of increase in coverage, with a concave curve for both LAC and OECD countries, which can be expected if it is easier and faster to cover people in dense areas compared to those disaggregated in less dense areas, such as rural ones. For LAC, 4G shows a large increase of coverage since 2015: from 57.79% of the population in 2015 to 91% in 2023. Nonetheless, compared to OECD, the rate of increase in coverage is still very lagged, reaching in 2023 what OECD countries reached in 2015.

Perhaps the most interesting of the technologies presented, and also with less information available, is 5G, as it is the latest technology deployed so far. 5G technology has been available since 2019,[22] and in LAC it was first deployed in Brazil for mobile connections in 2020 (Castells

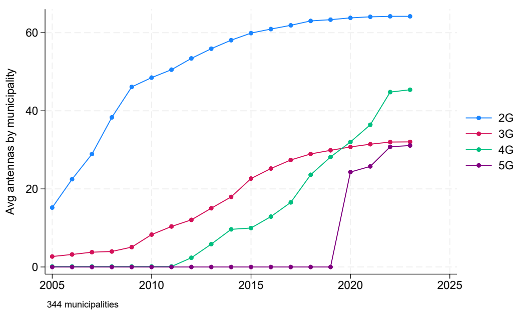
[22] As far as we know, South Korea was the first country to deploy 5G, in April 2019 (Massaro and Kim, 2022).

et al., 2023). Figure 2b shows that LAC countries had 9.88% of their population covered in 2022, while OECD countries had 69.15%. Also, the gap with OECD levels increased in the short period available, from 49.52% to 59.27%. The LAC average between countries is heterogeneous, with 75% of the 17 countries considered with 0% coverage in 2021 and 53.85% with 0% coverage in 2022, while in the other tail of the distribution, one country had 49% of coverage in 2021 and one had 79% of coverage in 2022.

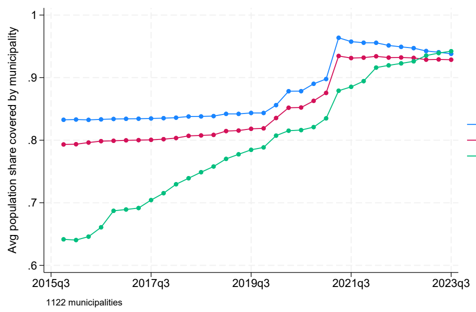
3.3 Antennas rollout

The third indicator we use to check how mobile internet has evolved in LAC countries is the expansion of mobile connectivity infrastructure: the antennas rollout. This indicator allows us to better understand the quality of mobile internet infrastructure on each country and how it has evolved in the last years (i.e., it is a proxy of how fast each country can adopt new technologies). We collected data of antennas rollout for three countries (Chile, Colombia, and Ecuador). We show the data aggregated at the smallest administrative level possible. For instance, we present data at the municipality level in Chile (the smallest administrative subdivision) and Colombia (the second largest administrative subdivision), while in the case of Ecuador the data is aggregated at the province level. In what follows, we show for each country the rollout of average antennas by the respective administrative level, or the population percentage covered (Colombia). Figure 3a shows the rollout of antennas at the municipality level for Chile, for each available technology, from 2005 until 2023; Figure 3b shows the average population percentage covered by municipalities for Colombia; and Figure 3c shows the average antennas by Ecuador's provinces, for each available technology.

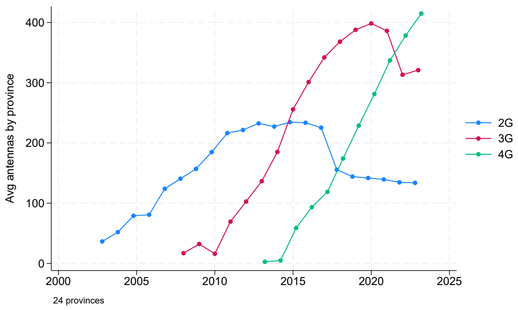
Figure 3: Antennas rollout, or population share covered



(a) Chile, antennas rollout by municipality



(b) Colombia, population share covered by municipality



(c) Ecuador antennas rollout by province

Given the available data, the only country with 5G technology deployed is Chile, with a rapid expansion of 5G technology in a matter of a year. Figure 3a shows that 4G antennas have overcome 3G antennas and also shows that 5G technology had a fast initial rollout. It took only a year to reach with 5G technology what it took seven years with 4G technology. After this initial rapid expansion, the 5G rollout seems to be relatively stable. Figure 3b shows that 4G technology has already reached and surpassed 2G and 3G in terms of coverage within municipalities, with an average of 94.2% of the population covered. Figure 3c shows the rollout of antennas by province for Ecuador. It can be noticed that both 3G and 4G antennas followed similar trends once they began being deployed, but 4G antennas surpassed 3G antennas, with 3G reaching its peak in 2020, while 4G was still increasing in the period measured. Summing up, these three countries have already deployed infrastructure of 4G, reaching their local-average 3G infrastructure, but only one of them deployed the latest technology available in this period. These countries serve as an example of heterogeneous deployment of mobile internet infrastructure and that it is lagged relative to OECD countries.

3.4 Socioeconomic gap from household surveys in Chile, Colombia, and Ecuador

Finally, we examine recent trends in internet mobile access in Chile, Colombia, and Ecuador. By using household surveys, we can analyze actual access of individuals and compare access across different population groups and its recent evolution. In particular, we are interested in socioeconomic gaps within each country. We define socioeconomic status by classifying individuals in one of three exclusive groups: those with low education (did not finish high school), middle school (with high school and some college), and higher education (finished college).

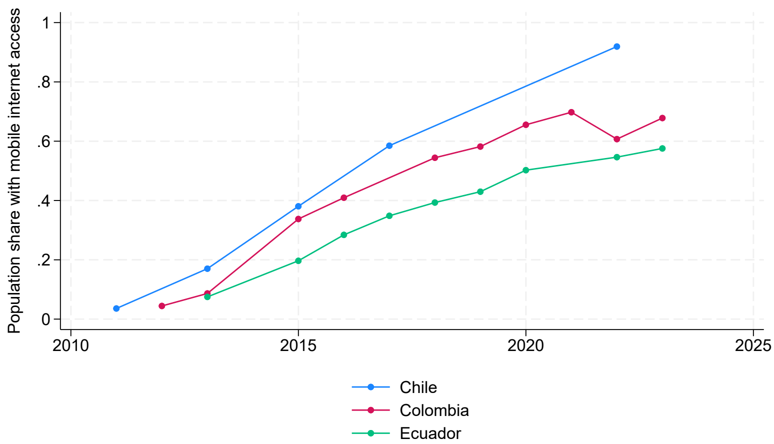
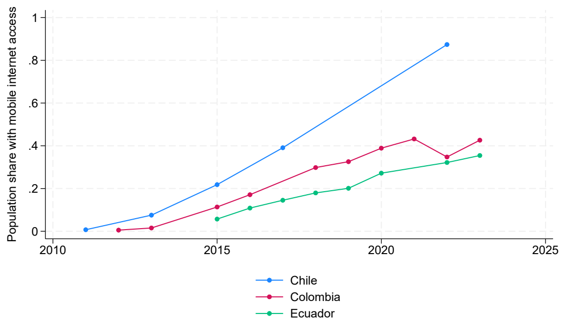


Figure 4: Mobile internet access, 3 countries

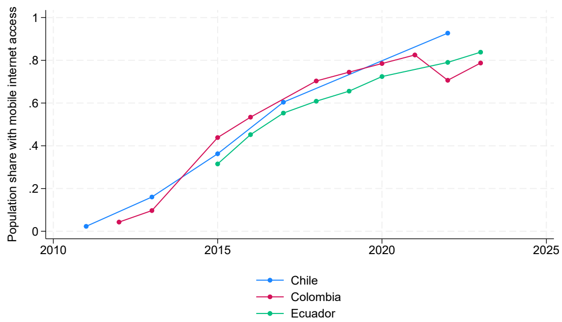
Figure 4 shows a stable ranking across countries. Chile exhibits the highest access, followed by Colombia and Ecuador. The gap between these countries has widened during this period. For instance, in 2018 Ecuador exhibits internet access levels that Chile had in 2015 (a three-year gap), but in 2023 Ecuador had internet access levels that Chile had in 2017, a six-year gap. With Colombia, the gap is smaller but also increased in this period, and apparently it has stagnated since 2021. The access level in Chile is considerable, with around 91.93% of the Chilean population with mobile internet access.

Figure 5 shows trends in mobile internet access separated by education groups within each country: (i) those who did not complete high school (shown in Figure 5a), (ii) those who completed high school and had some college but do not have a college degree (shown in Figure 5b), and (iii) those who completed college (show in Figure 5c).

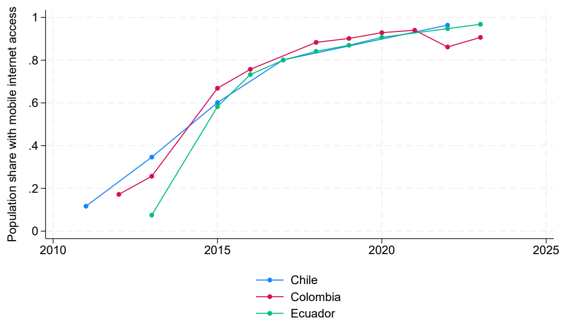
Figure 5: Mobile internet access, within 3 countries



(a) < High School



(b) High School and some College



(c) College+

When comparing mobile internet access within each group, it becomes clear that the gaps seen in Figure 4 are driven by differences in low socioeconomic groups. In Figure 5a, we observe that less than half of Colombia and Ecuador's lowest socioeconomic group has access to mobile internet, while for low socioeconomic groups in Chile, 87.4% declares having access. This contrasts with the situation of the middle and high educational groups. Figure 5b shows that trends in mobile internet access are similar between Colombia and Chile until 2020, while Ecuador exhibits similar mobile internet access rates in 2015, with an increasing gap relative to Chile from 2016 onwards. For higher educational groups, the three countries show similar trends and levels during the whole period, with access rates higher than 90% of this population group for the three countries analyzed. Consistent with the trends shown in Figure 3 with 5G antennas, Chile exhibits the overall highest mobile internet access.

4 Recent labor market trends and mobile internet access

In this section, we aim to provide novel evidence on the relationship between mobile internet access and labor market outcomes, using data from Chile as a case study. We combine information from the antennas rollout (shown in section 3.3) with data from the Chilean National Employment Survey (ENE from its acronym in Spanish). We exploit the fast rollout of 5G antennas in Chile between 2019 and 2022 at the municipal level. We created pooled cross section data at the individual level, where we leverage between and within municipality variation of mobile internet access to examine heterogeneous treatment-effects across different groups of individuals.

To empirically address the relationship of antennas and labor market outcomes, we estimate the following equation:

$$y_{i(m),t,k} = \beta_0 + \beta_1 \ln(\text{5G Antennas} + 1)_{m,t} + \beta_2 X_{i(m),t,k} + \omega_m + \omega_t + \omega_k + \epsilon_{i(m),t,k} \quad (1)$$

In equation 1, $y_{i(m),t,k}$ is the outcome: labor force participation (LFP) or working from home (WFH). Both outcomes, when measured at the municipality level m are continuous variables in $[0, 100]$. They are characterized by an individual i living in municipality m in year $t \in \{2019, 2022\}$ and month k. The main coefficient of interest is β_1, and it is interpreted as a change of $\beta_1/100$ percentage points in outcome $y_{i(m),t,k}$ when 5G antennas are increased by 1%. We clustered the standard errors at the municipality level and include survey weights in all regressions. We show the main estimates of equation 1 in Table 1.

Table 1: Effect of 5G antennas rollout on Labor Market Outcomes

	Full	By Gender		By Education Levels			By Age Group	
	Sample	Women	Men	< High School	High School	College+	< 40	≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Labor Force Participation								
Log(5G Antennas +1)	1.693***	0.459	2.848***	1.615**	0.745	0.888*	1.959***	0.288
	(.38)	(.41)	(.46)	(.64)	(.46)	(.53)	(.59)	(.31)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	638160	341109	297051	169347	282494	183986	255917	382243
Y Mean in 2019	58.98	49.12	70.13	44.72	59.36	71.39	59.65	58.52
Panel B: WFH | Employed								
Log(5G Antennas +1)	2.394***	1.801***	2.894***	0.218	0.0448	3.708***	2.269***	2.347***
	(.4)	(.3)	(.57)	(.26)	(.24)	(.5)	(.51)	(.39)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	428006	205214	222792	122341	173543	131119	132918	295088
Y Mean in 2019	3.79	5.85	1.94	2.98	4.09	4.16	4	3.7

Notes: Table displays the estimation of equation 1. Each column includes municipality and year fixed effects and the following individual controls: education level, gender, age, civil status (if married, widowed, divorced, or none). Column 1 uses the full sample of individuals at least 15 years old, from ENE 2019 and ENE 2022. Columns 2 and 3 separate the sample by gender, with Column 2 displaying results for women and Column 3 displaying results for men. Columns 4–6 display results separating the sample by three categories of education levels: Column 4 displays results for individuals with less than high school education level, Column 5 displays results for individuals who completed high school but did not complete college, and Column 6 displays results for individuals who completed college. Standard errors are clustered at the municipal level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

4.1 Labor force participation

Panel A of Table 1 shows the effect of 5G antennas on LFP. $\hat{\beta}_1$ shows a statistically and economically significant effect of high-technology mobile internet rollout on LFP. This estimator can be interpreted as an intention-to-treat effect, and it suggests that faster mobile internet access translates to a higher proportion of individuals incorporating to the labor market. This result goes in line with Bahia et al. (2021), with our strategy suggesting that more coverage (proxied by an expansion of mobile internet infrastructure) increases labor force participation. The effects seem to be concentrated in particular groups, such as men and younger individuals, and in the tails of the education distribution.

4.1.1 Labor force participation by gender

Columns (2) and (3) of Panel A in Table 1 reproduce the exercise displayed in Column (1) but restrict the sample to women or men, respectively. It is clear that the effects shown in Column (1) are concentrated among men, for which $\hat{\beta}_1 = 2.848$ (SE = 0.46), while for women $\hat{\beta}_1 = 0.459$ (SE = 0.41). This is important, given the gender gap in LFP (LFP is 70.13% for men and 49.12% for women). Hence, mobile internet infrastructure seems to be widening the gender gap in LFP. This result contrasts with Viollaz and Winkler (2022), which we speculate may be due to the different margins of treatments evaluated: our treatment does not necessarily suggest individuals gaining mobile internet access (an extensive margin), but probably improving internet quality (an intensive margin). Nonetheless, when we restrict the sample to women only and add interactions of education levels as shown in section 3.4, the coefficient associated to the interaction of high education levels and our main regressor is positive and statistically significative at conventional levels ($\hat{\beta}_1 \times \mathbf{1}\{\text{High Education}\} = 0.74$, SE = 0.225).

4.1.2 Labor force participation by education levels

When we separate the sample by education level, we observe that the effect seems to be concentrated in the tails, particularly in the lower one. Columns (4)–(6), Panel A shows the estimated coefficient $\hat{\beta}_1$ of the main regression separated by education levels. $\hat{\beta}_1 > 0$ for each of the three education levels, but the values differ in magnitude and statistical significance. For instance, at conventional levels of statistical significance, the regression for individuals with middle education level (shown in Column (5)) is the only one that is not statistically significant, with $\hat{\beta}_1 = 0.745$ (SE = 0.46), while for individuals with high education levels (in Column (6)) the coefficient is $\hat{\beta}_1 = 0.888$ (SE = 0.53), statistically significant at 10%, and for those with low education levels (in Column (4)) the estimated coefficient is the highest of the three, and the most statistically significant one: $\hat{\beta}_1 = 1.615$ (SE = 0.64).

It is important to notice the gap in LFP rates between these groups. Individuals who did not finish high school exhibit a LFP rate in 2019 of 44.72%, while LFP for those who finished high school but do not have a college degree is 59.36%, and LFP for those with the highest education levels is 71.39%. Considering these large gaps (26.67 percentage points between high and low education levels) and the magnitude of our estimations, it is hard to think we can make much progress by relying on this type of technological change. The underlying reasons explaining the larger effects on the tails and lower in the middle education group are probably different in nature and require more attention in future studies.

4.1.3 Labor force participation by age groups

Finally, we compare results by age groups. We classified individuals in two groups: < 40 years old, or ≥ 40 years old. Younger cohorts are represented in Column (7), with an estimated coefficient of $\hat{\beta}_1 = 1.959$ (SE = 0.59), while older cohorts are represented in Column (8), with an estimated coefficient of $\hat{\beta}_1 = 0.288$ (SE = 0.31). This large difference in the effect for younger and older individuals goes in line with could be expected if the job possibilities created by higher-quality mobile internet infrastructure are predominantly of OPE jobs, which are reasonably more likely to be taken by younger males, compared to traditional self-employed workers (Collins et al., 2019). If policymakers are inclined to facilitate and incentivize LFP of older cohorts, and if digital-related jobs (as OPE jobs) are to keep growing in the following years, it will be necessary to engage in higher efforts to include older cohorts in these kind of jobs; for example, training older cohorts may be required to facilitate their access to OPE jobs.

Of course, these results are a first approximation of the impact of this type of technology in labor markets, but a more comprehensive study should consider its implications in other dimensions such as formal vs informal jobs, job duration, and salary. Besides, this short analysis does not cover changes in the demand side of labor markets.

4.2 Working from home

In this section, we focus on the rates of employed individuals working from home. This is an interesting trend in the labor market that requires specific attention. Since 2020, multiple countries have seen an increase in people working from their homes, as put in Barrero et al. (2023): "The pandemic catalyzed the big shift to work from home, but earlier developments made it possible." These developments include the rise and rollout of fast internet connections. To put in perspective the shift to WFH, in the US before COVID-19 pandemic the percent of paid workdays worked from home was 7.2% in 2019, while after the pandemic it stabilized at 28% (Barrero et al., 2023). The Chilean market exhibits a similar trend shift, but smaller in magnitude: before the pandemic, on average, around 4% of employed individuals declared to work from their homes. This figure rose to 14.6% during 2020, and in 2022–2023 it averaged 9.02%. We explore whether the rapid expansion of mobile internet infrastructure could have helped the shift to WFH.

Panel B in Table 1 shows the results of the estimation of equation 1, replacing $y_{i(m),t,k} = WFH_{i(m),t,k}$. When we use the full sample of individuals, with the set of fixed effects and individual controls, we estimate a coefficient of $\hat{\beta}_1 = 2.394$ (SE = 0.4), which suggests a strong link between internet mobile access and working from home. Considering the low level of WFH in 2019 (3.79%), when the amount of 5G antennas doubled, the WFH level increased by 63.1%, implying that fast mobile internet connections are a driving force on this recent trend.

4.2.1 Working from home estimates by gender

In Columns (2) and (3) (Panel B), we explore potential heterogeneous effects of 5G infrastructure expansion by gender. Both Column (2) and Column (3) show a statistically significative estimation of the causal effect of mobile internet infrastructure expansion on WFH rates among employed individuals. The estimated coefficient for men is $\hat{\beta}_1 = 2.894$ (SE = 0.57) and for women $\hat{\beta}_1 = 1.801$ (SE = 0.30). In 2019, the WFH rate for men was 1.94% and for women 5.85%. This implies that the effect of doubling 5G antennas more than doubled the WFH rates for men, and for women it increased the WFH rates by approximately 30%.

4.2.2 Working from home by education levels

When conditioning on education levels, we notice that the effect is largely concentrated in those individuals with highest education levels. Columns (4) to (6) (Panel B) show the estimated coefficient when restricting the sample to each one of the three education levels. Column (4) shows the regression for those individuals without a high school degree, with an estimated coefficient of $\hat{\beta}_1 = 0.218$ (SE = 0.26). For individuals who completed high school but do not possess a college degree, the estimated coefficient is $\hat{\beta}_1 = 0.0448$ (SE = 0.24). Last, for individuals with a college degree, $\hat{\beta}_1 = 3.708$ (SE = 0.5), which is the largest of the three and the only one statistically significant at conventional levels.

It is worth noticing the differences in WFH rates in 2019: those with the lowest education level had a WFH rate of 2.98%, while the ones with middle and high education levels had a WFH rate of 4.09% and 4.16% respectively. Considering the differences in the treatment effect, we can speculate that the jobs of individuals with highest education levels allow them to arrange a WFH agreement, suggesting that in Chile WFH appears as a skill-biased force.

4.2.3 Working from home by age groups

We do not find large differences by age groups. Columns (7) and (8) in Table 1 (Panel B) show the respective coefficients. In this case, WFH does not appear to be concentrated in any specific group. We do recognize that there might be a more subtle heterogeneity by age that this broad classification is not capturing. Nonetheless, it is interesting to notice the different effects that mobile internet infrastructure has on LFP and on WFH for these age groups: Combining results from Panels A and B in Columns (7)–(8), it can be interpreted that even when employed individuals of older cohorts take advantage of the better and faster connectivity to get a WFH arrangement, and the job opportunities derived from faster and better mobile internet connectivity are weaker to move older cohorts to participate in the labor force, possibly due to the nature of the jobs derived from faster and better mobile internet connections. In other words, if mobile internet facilitates the creation of new jobs, these are more likely to be adopted by younger than older cohorts, while both of these cohorts benefit from more WFH arrangements once they are employed.

5 Conclusion

This study offers a preliminary overview of the relationship between mobile internet access and labor markets. We review the recent but abundant literature on the impact of ICT technologies and report important trends on mobile internet access in the LAC region. We then focus on a particular case study to examine the relationship between mobile internet access and labor markets in Chile.

Relative to OECD countries, the LAC region lags behind in terms of mobile internet access. However, with the rapid expansion of this technology, this gap is rapidly closing. Within our region, we also document important gaps across socioeconomic groups. Higher socioeconomic groups have higher mobile internet access rates, both at the cross-country level and within LAC countries. When we evaluate Chile's rapid expansion of mobile internet access, we find important effects in labor markets with different reactions across socioeconomic groups. Mobile internet access appears to be exacerbating gender gaps in labor force participation, and its impact is concentrated among younger cohorts, potentially leaving older ones behind.

It is not easy to summarize the impact of mobile internet access in a single statement. What is clear is that it affects human well-being across many dimensions. Despite the abundant and rich empirical literature available, we argue that the overall consequences are still difficult to anticipate. It is important to weigh correctly both the benefits and costs of expanding mobile internet access. For instance, mobile internet can make labor markets more dynamic, but not necessarily with high-quality or secure jobs. Mobile internet also affects mental health, polarizes societies, and can distract us in our daily tasks, which may have negative consequences for our health. Rather than simply assuming an optimistic perspective, we recommend caution when evaluating apparent gains from productivity and employment.

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