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Decades of slow wage growth for telecommunication workers

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What this report finds: The telecommunications workforce is under enormous pressure. Despite four decades of rising skills, wage growth has been slow for the large majority of the workforce, consistently lagging well behind average productivity growth in the economy as a whole. Today, roughly 45% of telecommunications workers have a four-year college degree or more education, up from 8.3% in the 1970s. Yet the lowest-wage telecommunications worker (at the 10th percentile in the wage distribution) has seen wages fall 0.3% annually since the 1970s, while the median telecommunications worker wage increased just 0.4% annually, compared with 1.8% annual productivity growth in that period.

The downward pressure on wages stems from a variety of sources, but two are central. The first is corporate "fissuring," where firms shed workers and contract out work to what are sometimes multiple layers of subcontractors, allowing large firms in the sector to squeeze smaller firms and especially their workers. The second is a long-term decline in unionization in the telecom sector. In the 1970s, the majority (roughly 60%) of telecommunications workers were represented by a union; that share has fallen to about 16% today.

SECTIONS

Introduction

Over the last four decades, the telecommunications sector has undergone a series of major organizational and technological transformations. The breakup of the Bell System in the early 1980s ended a long-standing monopoly on the country's telephone equipment and services, creating seven independent local telephone service providers and introducing competition into long-distance service. At about the same time, the first-generation cellular telephone system was deployed. This "1G" network used analog (not digital) technology and offered limited coverage, at a high cost, in a large physical format that limited widespread adoption. By the mid-1990s, a second generation ("2G") of cellular phones appeared, based on digital technology that provided cheaper, faster, more secure service and wider geographical coverage, greatly expanding the market for cell phones and beginning a process that has transformed both wireless and wired

telecommunications. The introduction more recently of 3G, 4G, and now 5G cellular networks has continued these trends. In parallel with these developments, the cable television industry expanded rapidly, from only a small fraction of households in the 1960s to 65 million households in the 1990s. As the number of cable customers grew, the industry also expanded the services offered to include high-speed internet access and voice of the internet (VoIP), which required building high-capacity hybrid networks of fiber and coaxial cable (California Cable & Telecommunications Association 2020).

This report examines how workers in the telecom sector have fared through these and many other developments since the 1970s. Documenting the experience of telecommunications workers is not a straightforward exercise. In order to follow trends over time in employment and wages, economists rely on carefully constructed classification systems that assign individual firms to industry categories and individual workers to occupational categories, where the definitions of categories strive to be consistent over time. The combination of organizational and technological changes seen in telecommunications in recent decades, however, makes it challenging to track firms and workers consistently. With the emergence of the "wireless" subsector of telecommunications, new industries (such as cellular phone service) and occupations (such as cellular tower installers) have emerged. Older industries (telegraph services) and occupations (switchboard operators) have all but disappeared. These changes in industries and occupations create significant challenges for statistical agencies, leading them to revise classification systems in ways that better reflect current reality, but that often also make it harder to track changes over time.

One important limitation of our analysis is that we focus on the experience of network technicians. The telecommunications workforce, however, contains a wide range of occupations, including large numbers of call center and retail workers. The experience of these and other workers is captured in the aggregate data for the telecommunications sector as a whole, but we leave for other research a closer look at these other telecom occupations.

Some of these changes in industry and occupational categories reflect technological developments. Others, however, reflect changes in business practices, including especially the rise of "fissuring." "Fissuring" is a term coined by economist David Weil to describe a process where "large businesses…operating at the top of their industries…no longer directly employ…workers to make products or deliver services." Instead, firms shed workers and contract out work to a "complicated network of smaller business units," putting "downward pressure on wages and benefits" and generating "murkiness about who bears responsibility for work conditions" (Weil 2014, p. 8).

As Weil has observed, in telecommunications specifically, "major carriers like AT&T and Verizon, rather than directly employing workers to build and maintain cell towers, have spun off that work to other parties, who in turn subcontract it to others, who may subcontract out even further" (p. 107). Work that at the end of the 1970s, say, would have been performed by direct employees of major telecom companies is now often performed by an array of smaller subcontracting firms that may or may not appear in the official data as part of the telecom sector, making it difficult to track employment and wage trends on a

consistent basis over time.

In order to produce the most complete and consistent picture possible, we draw on data from two government sources: the Current Population Survey (CPS, a large, nationally representative survey of households) and the Occupational Employment Statistics (OES, which surveys employers and covers almost all employees in the United States). The CPS data are pooled across multiple years to provide adequate sample sizes, allowing us to compare four periods: the 1970s (1973–1979), the 1980s (1983–1986), the 2000s (2003–2006), and the 2010s (2016–2019). The OES data generally refer to the period since 2003, when they are most consistent. The data appendix provides further details on the data presented here.

Taken together, the data reviewed here tell the story of a telecommunications workforce that is under enormous pressure. Despite four decades of rising skills, wage growth has been slow for the large majority of the workforce, consistently lagging well behind average productivity growth in the economy as a whole. The downward pressure on wages stems from a variety of sources, but fissuring and the long-term decline in unionization are central.

Four decades of changes in employment and workforce demographics

Given the changes in the way statistical agencies track the telecommunications industry, it is difficult to paint a precise picture of employment changes in the sector over the last four decades. Using the broadest reasonably consistent measure of the industry available in the Census Bureau's household-based Current Population Survey data, telecommunications employment has been declining as a share of total U.S. employment since at least the mid-1980s (**Table 1**). In the 1970s and 1980s, average annual employment in telecommunications exceeded one million workers and amounted to about 1.4% of the total workforce. By the middle of the decade of the 2000s, the telecommunications workforce remained above one million, but its share of total employment had fallen to 1.0%. In the most recent period (2016–2019), telecommunications employment has dropped below one million workers to 893,929 and represents only about 0.6% of national employment.

Data from the Bureau of Labor Statistics' employer-based Occupational Employment Statistics also show a fairly steady decline in total industry employment between 2003 and 2019 (**Figure A**), broadly consistent with the CPS data. (Figure A also shows telecommunications employment by two occupations within the industry discussed later in the report; see the "Four decades of slow wage growth" section.)

These declines in employment depicted in Figure A took place even as output in the sector grew rapidly, resulting in productivity growth in the sector that far exceeded the

Table 1

Telecommunications employment as share of total U.S. employment, select periods, 1973 to 2019

	Total U.S. employment (annual average)	Total employment in telecommunications (annual average)	Telecommunications employment as share of total employment (%)
1973–1979	81,042,946	1,124,936	1.4%
1983–1986	96,424,733	1,391,137	1.4%
2003–2006	130,306,014	1,347,941	1.0%
2016–2019	144,927,775	893,929	0.6%

Source: EPI analysis of Current Population Survey data (EPI 2020).

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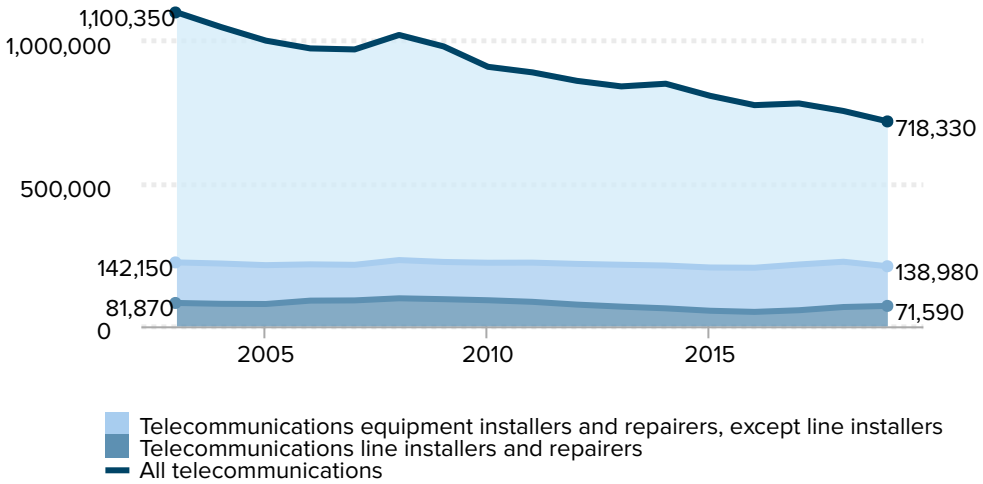
Figure A

Employment in telecommunications, all and by two sub-occupations of interest, 2003–2019



Source: EPI analysis of Occupational Employment Statistics data (BLS 2020b) for telecommunications (NAICS code 517). Telecommunications line installers and repairers category is OES code 499052, and telecommunications equipment installers and repairers, except line installers category is OES code 492022.

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pace in the rest of the economy (not shown). In the wireless telecom subsector, for example, between 1987 and 2018, labor productivity grew at an 11.9% annual average rate, compared with a 1.9% annual average rate for the economy as a whole over the same period. Even in the more traditional wired subsector, labor productivity growth averaged 3.5% per year over the same period, almost double the rate in the economy as a whole (Modica and Chansky 2019).

As shown in **Table 2**, the share of telecommunications employment that is in the traditional

Table 2

Wired telecommunications employment as share of total telecommunications employment, select periods, 1973 to 2019

	Total employment in telecommunications (annual average)	Total employment in wired telecommunications (annual average)	Wired as share of total telecommunications employment (%)
1973–1979	1,124,936	n.a.	n.a.
1983–1986	1,391,137	n.a.	n.a.
2003–2006	1,347,941	992,840	73.7%
2016–2019	893,929	477,429	53.4%

Note: Separate data for wired telecommunications are not available for 1973–1986.

Source: EPI analysis of Current Population Survey data (EPI 2020).

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wired subsector has been declining over time, reflecting, in part, a rise in the wireless subsector. The CPS does not report data separately for wired telecommunications in the 1970s and 1980s, but the available data do show that in the 2003–2006 period, the wired sector still accounted for almost three-fourths (73.7%) of total employment in telecommunications, likely down from even higher levels in the 1970s and 1980s. By 2016–2019, wired telecommunications had fallen to just over half (53.4%) of employment in the sector. To some degree, the distinction between the wired and wireless sectors can be overstated because wireless cell tower networks also depend on fiber optic cables to function. But, as we shall see, the shift in the composition of employment out of wired and into other sectors in telecommunications, especially wireless, has had important implications for wage patterns in telecommunications, primarily because the wired sector historically has had much higher rates of unionization than the wireless sector.

Over the last four decades, the telecommunications workforce as a whole has become substantially more skilled. **Table 3** shows the shares of telecommunications workers with given demographic characteristics for select periods from 1973 to 2019. The workforce is much older today and, therefore, generally has significantly more work experience than the workforce had in the 1970s. The share of younger, less experienced workers (ages 16–24), for example, has fallen from 18.6% in the 1970s to 6.9% in the most recent years. Over the same period, the share of older, more experienced workers (ages 55–64) increased from 7.2% to 16.7%.

The educational attainment of the telecommunications workforce has also increased dramatically. In the 1970s, almost two-thirds (63.4%) of telecommunications workers had a high school diploma or less education; by 2016–2019, only about one-fifth (21.9%) had a high school degree or less. Meanwhile, the share with a four-year college degree or more increased from 8.3% to 44.7%.

Since the 1970s, the workforce has also become substantially more diverse by race, ethnicity, and national origin. In the 1970s, almost nine of every ten workers (86.2%) in

Table 3

Demographic characteristics of telecommunications workers

Share of workers by age, education, gender, race/ethnicity, and nativity, select periods, 1973 to 2019

	1973–1979	1983–1986	2003–2006	2016–2019
Age				
16–24	18.6%	10.0%	8.7%	6.9%
25–54	73.4%	81.0%	80.8%	73.1%
55–64	7.2%	8.3%	9.1%	16.7%
65+	0.8%	0.8%	1.4%	3.2%
Average age	36	38	40	43
Educational attainment				
Less than high school	7.1%	4.6%	2.1%	1.5%
High school	56.3%	46.2%	24.7%	20.4%
Some college	28.3%	32.1%	37.8%	33.4%
College degree	7.3%	13.7%	25.8%	31.1%
Advanced degree	1.0%	3.5%	9.5%	13.6%
Gender				
Women	48.4%	45.4%	41.6%	30.8%
Men	51.6%	54.6%	58.5%	69.3%
Race/ethnicity				
White	86.2%	80.1%	68.1%	62.0%
Black	10.0%	12.6%	15.9%	14.3%
Latino	2.8%	5.1%	9.3%	13.3%
Other	1.1%	2.1%	6.8%	10.5%
Asian American/Pacific Islander (AAPI)	n.a.	n.a.	6.0%	9.6%
Nativity				
Foreign born	n.a.	n.a.	10.4%	15.5%
U.S. born	n.a.	n.a.	89.6%	84.5%

Notes: Race/ethnicity categories are mutually exclusive. Separate data for the AAPI category are not available for 1973–1986. Data on nativity are not available for 1973–1986.

Source: EPI analysis of Current Population Survey data (EPI 2020).

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telecommunications were white. By 2016–2019, the share had fallen to just over six in ten (62.0%). Over the same period, the share of Black workers increased from 10.0% to 14.3%, and the share of Latino workers increased from 2.8% to 13.3%. In the 1970s and most of the 1980s, the CPS did not separately report ethnicity for Asian American/Pacific Islander (AAPI) respondents (instead including them in the "other" racial category with other racial groups). But by 2016–2019, almost one in 10 (9.6%) of workers in the sector were AAPI. The CPS only began, in 1996, to ask respondents whether they were born in the United States, so while we can't make comparisons to earlier periods, the most recent data show that immigrants currently make up 15.5% of the total telecommunications workforce.

Another notable change in the composition of the telecommunications workforce is the steep decline of the share of women working in the sector. Women were almost half (48.4%) of the workforce during the 1973–1979 period but were less than one-third (30.8%) by the 2016–2019 period. This substantial change in the gender composition of the industry likely reflects two factors. The first is an enormous decline over several decades in switchboard operators, which was from the 1940s on a large and overwhelmingly female occupation (Price 2019; Taylor 2020; Communication Workers of America 2020). The second factor is the rise in the share within the telecommunications sector of what are predominantly male occupations in the installation and repair of wired and wireless telecom infrastructure.

In general, economists would predict that, all else constant, the substantial upgrading of the skill level of telecom workers—reflected in greater work experience and much higher rates of formal education—would contribute to substantially higher wage rates in telecommunications. These increases in the general skill level in the sector certainly contributed to the large rise in labor productivity, but, as we will see later, they did not have the same impact on wages.

Four decades of declining rates of unionization

Since the 1940s, telecommunications has been one of the most heavily unionized industries in the country. Over the last four decades, however, the share of the telecommunications workforce that is a member of, or represented by, a union at work has fallen substantially. This pattern follows a broader trend in the economy, but the decline in union representation in telecommunications has been much steeper than in the economy as a whole.

Table 4 shows the change over time in the share of workers represented by a union—for all U.S. workers and for the telecommunications sector as a whole as well as wired and nonwired subsectors. In the 1973–1979 period, on average, almost 60% (59.8%) of the telecommunications workforce was unionized, compared with 26.0% of the total workforce in those same years. By the mid-1980s, the unionization rate in telecommunications had dipped to just half (50.4%) but was still almost two and a half times as large as the national average in the same period (21.3%). Two decades later, in the 2003–2006 period, the

Table 4

Share of workers represented by a union in telecommunications and in U.S. workforce overall, select periods, 1973 to 2019

	1973–1979	1983–1986	2003–2006	2016–2019
Telecommunications				
Total	59.8%	50.4%	22.8%	16.1%
Wired	n.a.	n.a.	24.6%	17.7%
Other	n.a.	n.a.	18.7%	13.0%
Total U.S. workforce	26.0%	21.3%	13.7%	11.8%

Source: EPI analysis of Current Population Survey data (EPI 2020).

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unionization rate in telecommunications had dropped by more than half, to 22.8%, compared with 13.7% in the economy as a whole. Union representation in telecommunications continued its steep decline through to the 2016–2019 period, when the rate hit 16.1%, about five percentage points higher than the national average of 11.8%.

The forces driving the decline in unionization in telecommunications mirror—but have generally been more intense than—those in the rest of the economy. These forces include deregulation of telecommunication services, well-organized legal and illegal campaigns by employers to thwart union organizing, an increasingly hostile legal environment, and the strategic use of fissuring to avoid collective bargaining (Lafer and Loustaunau 2020; McNicholas et al. 2019, 2020; Schmitt and Zipperer 2009; Weil 2014).

Another factor lowering the share of union workers in the telecom industry as a whole has been the declining share of workers in the historically more unionized (and more regulated) wired sector of the industry and the simultaneous rise in the employment share of the wireless sector—a sector that has had a lower unionization rate from its inception (Table 4). That said, it is important to keep in mind that the same factors that have been driving down unionization rates in the wired sector—employer opposition, a legal environment hostile to unions, and the strategic use of fissuring—also explain why the newer wireless sector began with lower union density and has seen steady declines from that already low rate.

Economists have documented extensively that, all else constant, union workers earn significantly higher wages than comparable nonunion workers (Bivens et al. 2017; Card 1996; Farber et al. 2020; McNicholas et al. 2020; Mishel et al. 2012). The most recent direct analysis of the union wage premium concludes that "unionized workers (workers covered by a union contract) earn on average 11.2% more in wages than nonunionized peers (workers in the same industry and occupation with similar education and experience)" (McNicholas et al. 2020). The large size of the union wage premium combined with the steep decline in the telecommunications unionization rate from about 60% in the 1970s to only about one-fourth that rate in the late 2010s makes the falling union share in telecommunications a major factor in the slow wage growth in the sector

that we document in the next section.

Four decades of slow wage growth

The long-term decline in unionization combined with more recent restructuring of the industry as a result of fissuring has led to slow wage growth in telecommunications over the last four decades. The substantial increases in the work experience and educational attainment of the telecommunications workforce, all else equal, should have led to strong growth in inflation-adjusted wages in the sector. Instead, wages have grown, at best, only slowly. Typical wage growth in the industry, for example, has consistently lagged behind productivity growth in the economy as a whole, and as Bivens and Mishel (2015) and Gould (2020) show, productivity growth is a standard benchmark for healthy wage growth.

To summarize wage trends, we look first at data collected from workers captured by the Current Population Survey. The CPS data allow us to look separately at low-, middle-, and high-wage workers, defined as those at the 10th, 50th, and 90th percentiles of wage earners in the wage distribution in the telecom sector. (A worker at the 10th percentile is a relatively low-paid worker who makes more than 10% of all workers and less than 90% of all workers. A worker at the 50th percentile—also known as the median or "typical" worker—makes more than half of all workers and less than half of all workers. A worker at the 90th percentile is a relatively high-paid worker who earns more than 90% of workers, but less than 10% of workers.)

A comparison of hourly wages between telecommunications and the rest of the economy over the last four decades displays two important features of the wage structure in telecommunications (**Table 5**). (All wages presented here are in inflation-adjusted 2019 dollars.) First, telecommunications has long been a relatively high-wage sector. In the most recent period, a typical worker in telecommunications earned almost $28 per hour, 45% more than the $19 per hour earned by the typical worker in the rest of the economy in the same period. For high-wage workers—those at the 90th percentile—the premium for telecommunications workers was 28% (about $61 in telecommunications versus $48 in the rest of the economy). Even for low-wage workers—those in the 10th percentile—telecommunications workers earned 25% more than their counterparts in the rest of the workforce (just over $12.50 versus just over $10.00).

The second feature of earnings in the telecom industry is that wage growth has been consistently slow since the 1980s. This pattern is easier to see in **Figure B**, which converts the cumulative wage changes for telecommunications workers and the U.S. workforce as a whole between the earliest and most recent periods in Table 5 into average annualized growth rates and adds the annual productivity growth rate between those two periods. In the more than four decades between 1973–1979 and 2016–2019, the inflation-adjusted wage paid to the 10th percentile telecommunications worker fell on average 0.3% per year, a cumulative decline of about 12% in real terms. For the median worker over the same period, the inflation-adjusted wage increased at an average rate of only 0.4% per year, implying that after more than four decades of upskilling and technological advancement, the typical telecommunications worker made just about 20% more than this worker's

Table 5

Wage trends for telecommunications workers and nontelecommunications workers, by wage percentile, select periods, 1973 to 2019

	1973–1979	1983–1986	2003–2006	2016–2019
Telecommunications workers				
Percentile	**Per hour (constant 2019$)**			
10th	$14.29	$13.99	$12.82	$12.55
50th	$23.13	$26.51	$27.77	$27.59
90th	$38.08	$44.54	$53.61	$61.32
	Wage relative to early (1973–1979) period			
10th	100.0	97.9	89.7	87.8
50th	100.0	114.6	120.1	119.3
90th	100.0	117.0	140.8	161.0
All other workers (excluding telecommunications)				
Percentile	**Per hour (constant 2019$)**			
10th	$9.20	$8.23	$9.39	$10.07
50th	$16.84	$16.60	$18.30	$18.99
90th	$33.35	$34.32	$42.31	$47.91
	Wage relative to early (1973–1979) period			
10th	100.0	89.5	102.1	109.5
50th	100.0	98.6	108.7	112.8
90th	100.0	102.9	126.8	143.6

Source: EPI analysis of Current Population Survey data (EPI 2020). Wages are adjusted for inflation using the CPI-U-RS (BLS 2020a).

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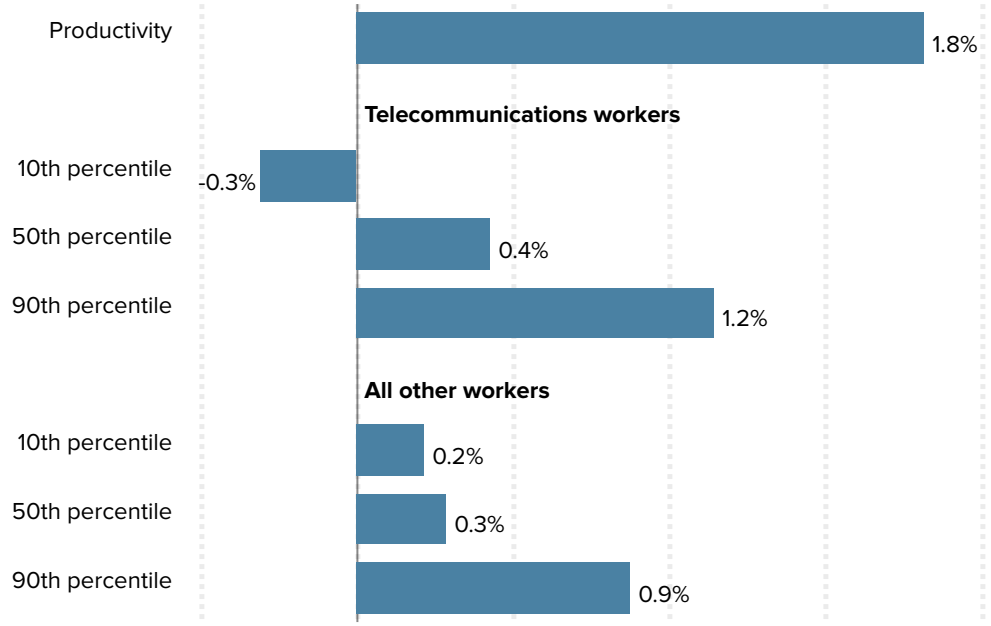
counterpart in the 1970s. Even highly paid telecommunications workers (those in the 90th percentile of the wage distribution) saw their inflation-adjusted wages rise on average by only 1.2% per year, only two-thirds the rate of annual average productivity growth in the total economy.

As mentioned earlier, technological and organizational changes in the telecom sector have made it difficult to track with precision developments over time in employment and wages. A particular limitation of the CPS data is that the relatively small sample size and the fairly coarse industry and occupation categories available in the survey do not allow us to study trends *within* telecommunications. To take a closer look, we turn to data from the Bureau of Labor Statistics' Occupational Employment Statistics database, which takes data directly from a large sample of employers.

The OES data let us focus on recent wage trends for three important occupations within

Figure B

Average annual wage growth, telecommunications and all workers, by wage percentile, from 1973–1979 to 2016–2019



Source: EPI analysis of Current Population Survey data (EPI 2020) and Bureau of Labor Statistics Labor Costs and Productivity data (BLS 2020c). Wages are adjusted for inflations using the CPI-U-RS (BLS 2020a).

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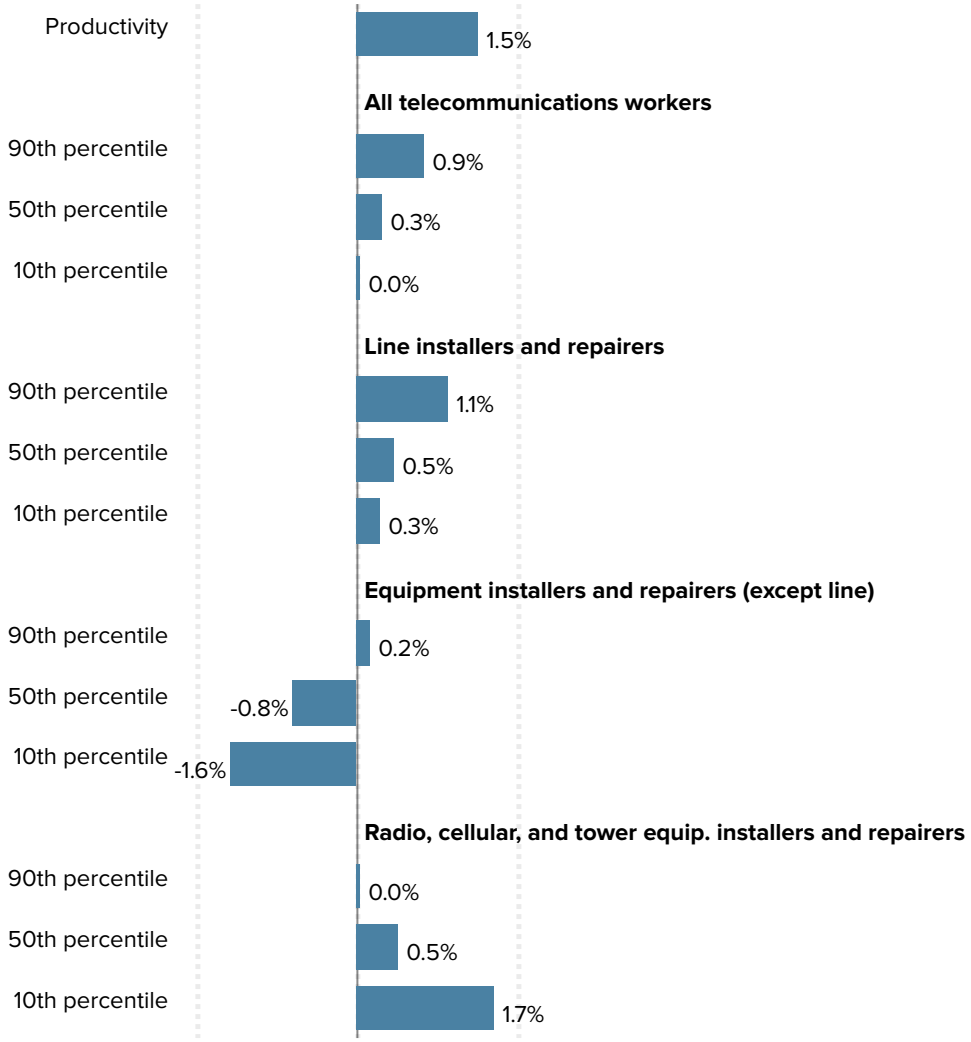
telecommunications: telecommunications line installers and repairers; telecommunications equipment installers and repairers, except line installers; and radio, cellular, and tower installers and repairers. A large portion of the telecom sector employees work in the first two of these occupations (jointly, more than 200,000 workers in every year since 2003) (see Figure A earlier). The third category is much smaller (not shown in Figure A, but between about 500 and 6,500 workers in each year) and is included in the following figure and discussion both for completeness and to illustrate the challenges in working with data in the sector. While the much larger OES database allows us to look with confidence at occupational wage trends within telecommunications, changes in industry and occupational codes limit our analysis to only the period since 2003.

The summary of the OES wage data in **Figure C** reinforces the conclusion from the CPS data. Inflation-adjusted wage growth in telecommunications has been disappointing. For the telecom sector as a whole, the 10th percentile worker saw no real wage growth at all between 2003 and 2019. For the median telecommunications worker, wages grew just 0.3% per year after adjusting for inflation. Even at the 90th percentile, real wage growth of only 0.9% per year lagged behind the 1.5% per year rate of average productivity growth in the total economy.

Wage growth was somewhat faster for telecommunications line installers and repairers (0.3% per year at the 10th percentile; 0.5% at the 50th; 1.1% at the 90th) but in all cases still

Figure C

Average annual wage growth, by telecommunications occupations and wage percentile, 2003–2019



Source: EPI analysis of Occupational Employment Statistics data (BLS 2020b) for OES codes 492022, 499052, and 492021, and Bureau of Labor Statistics Labor Costs and Productivity data (BLS 2020c). Wages are adjusted for inflation using the CPI-U-RS (BLS 2020a).

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fell well short of average productivity growth over the same period. Wage growth was far worse in the other large occupation examined in Figure C. Inflation-adjusted wages for telecommunications equipment installers and repairers, except line installers, fell 1.6% per year at the 10th percentile and 0.8% per year at the median and grew only 0.2% per year at the 90th percentile.

The group of workers that saw their inflation-adjusted wages grow as fast or faster than productivity was the 10th percentile of the small group of workers categorized as radio, cellular, and tower installers and repairers. But even for workers in that occupation, the

median wage grew only 0.5% per year and the 90th percentile wage was flat (0.0% annualized growth rate). This unusual wage pattern may reflect that this occupational category corresponds closely to "building and maintaining [cell] towers" occupations discussed in detail by Weil (2014, pp. 107–113) in his account of fissuring in the telecommunications sector between 2003 and 2011.

Weil writes that extensive subcontracting in the period contributed to breaches in safety that led to the death of nearly 100 workers—a fatality rate "three times that of coal mining and more than ten times that of construction overall" (Weil 2014, p. 108)—and put tremendous downward pressure on wages. Even the apparent rise in wages for workers at the 10th percentile is consistent with fissuring if some of the less-skilled, lowest-paying jobs within the occupation were outsourced to subcontractors where the work falls into other industry or occupation categories in the OES data.

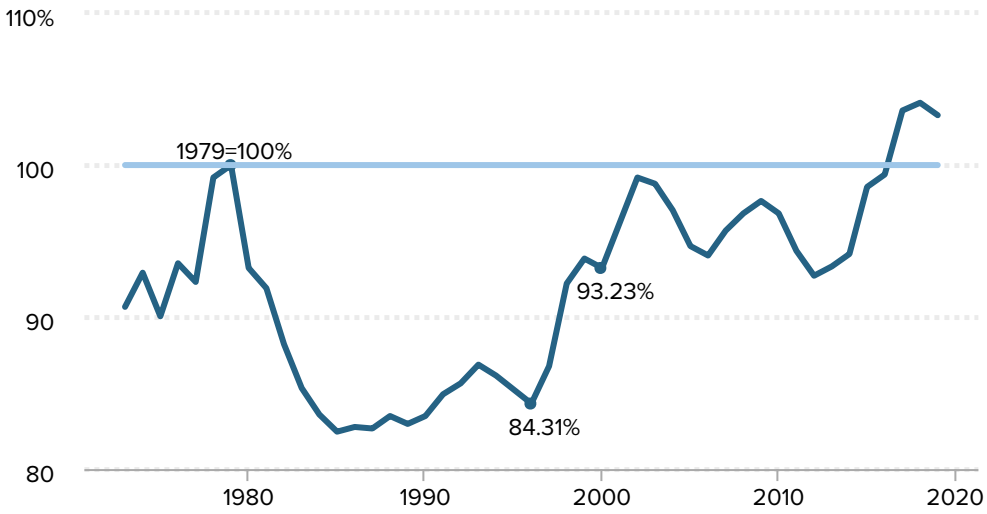
A final word on wages: wage patterns in telecommunications show none of the standard signs of a labor shortage

Employers have an obvious incentive to find the best workers at the lowest wage. This incentive sometimes leads employers and groups that represent employers to argue that they "cannot find qualified workers," even in circumstances when a market might not actually be experiencing a labor shortage. Economists, however, have a clear test for a shortage, which can allow us to distinguish between standard concerns employers have for containing labor costs and an actual shortage. That test is based on simple labor market dynamics. When employers have demand for the goods and services but can't easily hire, at workers' current wage levels, all the workers they need to fill that demand, employers in competitive markets offer workers higher wages. The higher wage will either lure workers away from nonwork activities (such as child care, retirement, school, and other reasons for nonemployment) or, as is often the case, from other employers. Even employers that aren't looking to expand their output may need to offer higher wages just to be able to hold on to their existing workers. These dynamics leave a telltale sign of a labor shortage: a substantial acceleration in wage growth. In general, economists are suspicious of claims of labor shortages that aren't matched by an observable spike in wages in the relevant market.

The experience of one fairly uncontroversial case of a labor shortage will help to illustrate. In 2006, North Dakota experienced a fracking boom, which sent industry employment skyrocketing. Based on OES data, employment of "Rotary Drill Operators" in the oil and gas industry in the state went from 310 in 2005 to 1,130 in 2010, before peaking at 1,710 by 2013—more than a fivefold increase in employment in the space of eight years. North Dakota's small population and relative geographic isolation meant hydraulic fracturing employers faced a genuine shortage of rotary drill operators. They responded as employers do when facing a genuine shortage: They raised wages for rotary drill operators—by a lot. According to OES data, the real wage paid to the typical rotary drill

Figure D

Low-wage worker's wage relative to low-wage worker wage in 1979, 1973–2019



Note: Data are for the 10th-percentile worker in each year.

Source: EPI analysis of Current Population Survey data (EPI 2020). Wages are adjusted for inflation using the CPI-U-RS (BLS 2020a).

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operator in North Dakota increased by over 25% between 2006 and 2008 and was up over 30% by 2011. (In subsequent years, wage growth slowed in response to a large inflow of workers into the state as well as a decline in fracking.)

What is true in a specific geographic location in a specific occupation, such as the labor market for rotary drill operators in North Dakota, is also true at the national level for workers across a broad range of occupations. The low national unemployment rate in the second half of the 1990s, for example, generated shortage-like conditions for many employers of workers in generally low-wage occupations. With strong demand for their goods and services in the late 1990s, employers responded to the increasing scarcity of workers by offering higher wages to their lowest paid employees. After falling by an inflation-adjusted 15% between 1979 and 1996, the tight labor market of the late 1990s boosted the real wages of workers at the 10th percentile by over 10% in the four years between 1996 and 2000 (**Figure D**).

The wage data from the CPS and the OES summarized in the preceding section show none of the signs of a labor shortage. Contrary to what economists expect after a substantial, long-term rise in the education and experience of the telecommunications workforce, wages in the sector have, at best, grown only slowly. And for some portions of the workforce, for significant stretches of time, wages have been stagnant and occasionally even declining in real terms, as workers in the sector suffer the effects of fissuring and the erosion of collective bargaining.

Data appendix

We use data from the Economic Policy Institute's extracts of the Current Population Survey Outgoing Rotation Group (CPS ORG) and May series (EPI 2020). Data and full documentation are available for download at https://microdata.epi.org/. To increase the sample size available for the telecommunications sector, we pool data across multiple years in four separate periods, 1973–1979, 1983–1986, 2003–2006, and 2016–2019. We pool 1973–1979 because that is the earliest period when we have access to both wage data and union membership and coverage in the CPS, using the May CPS. Before 1979, the monthly CPS did not collect data on workers' wages or union status. We pool seven years of data in the 1970s because each year's May data has a sample size that is only one-third as large as the CPS ORG, which we use in subsequent periods. The period 1983–1986 encompasses the four earliest years in which the CPS ORG includes information on union status. The period 2003–2006 encompasses the first four years when the CPS data use industry codes that allow us to examine wired telecommunications separately from other telecommunications industries. The final period, 2016–2019, encompasses the most recent four full calendar years of data available. The CPS did not ask about respondents' nativity before 1996, and before 1989 the CPS classified Asian American/Pacific Islander persons in its "other" racial category.

Occupational Employment Statistics draw from a semiannual survey by the Bureau of Labor Statistics of nonfarm establishments. The sample is drawn from the universe of establishments in the unemployment insurance system. Data are accessed through the BLS's website (BLS 2020b).

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