

# Connected Workers: Broadband Expansion and Labor Mobilization in China

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## Abstract

Can modern digital communication technologies facilitate worker mobilization and collective action? This paper examines whether the expansion of high-speed internet affect worker strikes and formal labor disputes in China. Exploiting the staggered rollout of the Broadband China Program across 117 pilot cities between 2014 and 2016, we use a difference-in-differences framework to estimate the impact of expanding fiber-optic broadband and 4G networks on city-level labor dynamics. We find that broadband expansion significantly increases both strikes and labor disputes, with persistent effects lasting for up to four years following implementation. This surge is primarily driven by small-scale actions involving under 100 participants, with no observable impact on large-scale strikes. We find that the treatment effects are heavily concentrated in cities with high pre-reform social media engagement. Individual microdata further suggests enhanced social connectedness among migrant workers following expansion. Overall, the results suggest that fast internet facilitates labor mobilization by reducing coordination frictions.

**Keywords** — Labor strikes, collective actions, fast internet, social networks, development

**JEL Codes** — J52, O33, D74, L96

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# 1 Introduction

Worker strikes have traditionally been seen as one of the few tools available for workers to improve their bargaining power related to wages and working conditions (Ashenfelter and Johnson, 1969; Card, 1990). However, strike frequency has been declining globally for more than half a century due to factors related to globalization and the decreasing powers of labor unions (Brandl and Traxler, 2010; Piazza, 2005). Over the same historical period, however, the global economy experienced a rapid expansion in digital communication technologies. While a substantial literature examines how digital infrastructure, such as high-speed internet, alters standard labor market outcomes such as employment, earnings, and firm productivity (Akerman et al., 2015; Bahia et al., 2024, 2023; Hjort and Poulsen, 2019; Rupasingha et al., 2024; Zuo, 2021), far less is known about how it influences collective action and labor resistance. The research closest to this topic focuses on the impact of social media usage. For example, (Enikolopov et al., 2020) find that an increase in user penetration of online social networks significantly increases political protests in Russia. Similarly, (Qin et al., 2024) find that social media had an impact on the geographical spread of both protests and strikes in China. This paper addresses this broader gap by examining how the underlying core digital infrastructure, specifically the expansion of broadband internet and 4G mobile networks, affects worker strikes and formal labor disputes in China.

China offers an important setting to investigate this question. Between 2014 and 2016, the national government implemented the Broadband China Program (BCP), a major policy reform that systematically expanded fiber-optic broadband networks and 4G mobile base stations across 117 designated pilot cities. We exploit the staggered rollout of the BCP across cities within a difference-in-differences empirical design. To measure labor dynamics, we assemble a novel dataset tracking city-level worker strikes and formal labor disputes. We supplement this macro analysis with individual-level microdata from the China Migrant Dynamics Survey (CMDS), a large-scale national survey of domestic migrant workers.

Our empirical findings demonstrate that the implementation of high-speed internet infrastructure significantly increases both worker strikes and formal labor disputes, with effects persisting for up to four years following the program implementation. This rise in collective action encompasses both protests and sit-ins. Examining the scale of mobilization reveals an important

heterogeneity: the surge in strikes is primarily driven by smaller actions involving fewer than 100 participants. In contrast, the policy has no detectable effect on large-scale strikes involving hundreds or thousands of workers.

To evaluate the underlying mechanism, we examine whether high-speed internet increases labor actions by lowering communication and coordination costs among workers. While expanding 4G and fiber-optic infrastructure provides the bandwidth for rapid data transmission, the capacity to organize collective action depends on how effectively workers utilize these networks. If fast internet operates primarily by reducing coordination frictions, its impact should be most pronounced in cities where digital social networks were already established prior to the infrastructure expansion. To test this hypothesis, we utilize city-level social media connectivity data from (Qin et al., 2024), constructed from 13.2 billion social media (Weibo) posts. Cities are categorized into terciles based on their pre-reform social media activity per capita in 2013. Estimation results show that the positive impact of the BCP on strikes and labor disputes is heavily concentrated in cities with high pre-treatment social media engagement, where strikes increased by 150 to 300 percent relative to the sample mean. Micro-level suggestive evidence from the CMDs further reveals that migrant workers report greater social connectedness following BCP implementation, which suggests that fast internet is allowing workers to socially connect with each other more easily.

Taken together, these findings suggest that fast internet facilitate worker mobilization by reducing frictions associated with information sharing and collective organization. Rather than driving large-scale structural strikes, expanded internet access enables decentralized labor groups to lower the costs of organizing localized collective actions around immediate workplace grievances.

This study contributes to two main strands of economic literature. First, it advances the literature on collective action and political economy by demonstrating how modern communication technology can lower coordination costs for decentralized labor movements, even in institutional settings where formal union representation remains constrained (Ashenfelter and Johnson, 1969; Card, 1990; Chen, 2026; Cramton et al., 1999; Cramton and Tracy, 1992). Second, it adds to the growing research on the real economic impacts of fast internet in developing countries (Akerman et al., 2015; Bahia et al., 2024; Hjort and Poulsen, 2019; Zuo, 2021) by demonstrating that high-

speed connectivity reshapes political economy outcomes and labor relations beyond traditional market outcomes.

## 2 Background

### 2.1 Broadband China Program

In August 2013, the Chinese State Council launched the *Broadband China Program* (BCP), establishing broadband development as a national policy priority.<sup>1</sup> To implement the program, the Ministry of Industry and Information Technology (MIIT) and the National Development and Reform Commission (NDRC) began designating “Broadband China Pilot Cities” in 2014.<sup>2</sup> The designations were announced in three waves between 2014 and 2016, with 39 cities or city clusters selected in each wave and 117 locations selected in total.<sup>3</sup> Because cities entered the program at different times, this staggered rollout generates variation across cities and years that we use to identify the effects of broadband expansion.

The BCP sought to modernize China’s telecommunications infrastructure by promoting large-scale investment in fixed broadband and mobile internet networks. The policy emphasized the construction of fiber-optic networks, improvements in broadband speed and coverage, and the development of high-speed mobile networks.<sup>4</sup> Pilot cities received financial and technical support from the central government to accelerate the construction of fiber-optic networks. Complementary measures encouraged telecommunications providers to expand network capacity and extend 4G mobile coverage. Together, these initiatives increased the availability of high-speed internet and contributed to the rapid growth of household fiber-optic connections in participating cities.

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<sup>1</sup>State Council of the People’s Republic of China, *Notice of the State Council on Issuing the Broadband China Strategy and Implementation Plan*, State Council Document No. 31 of 2013.

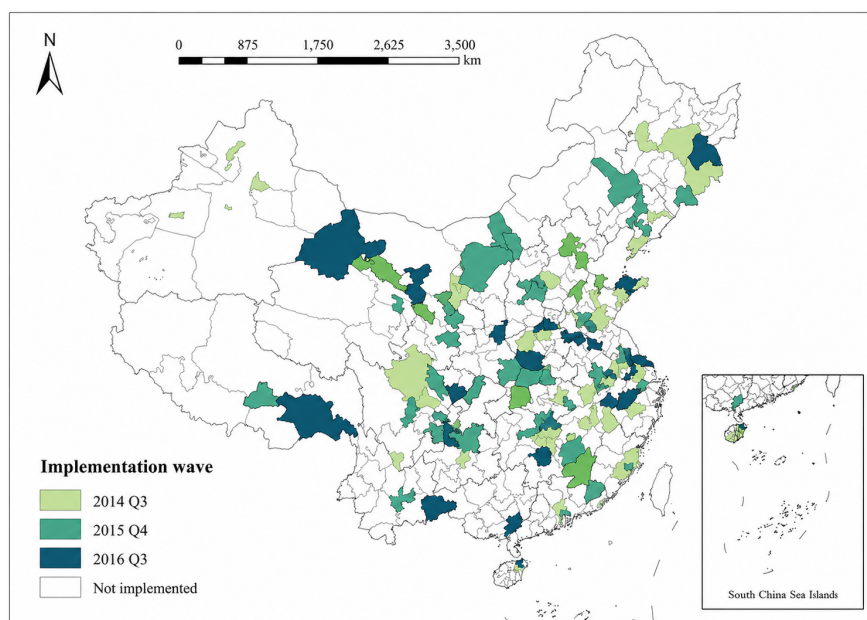
<sup>2</sup>General Office of the Ministry of Industry and Information Technology and General Office of the National Development and Reform Commission, *Notice on Launching the Development of Broadband China Demonstration Cities and City Clusters*, Document No. 5 of 2014.

<sup>3</sup>Ministry of Industry and Information Technology and National Development and Reform Commission, *Announcement of the 2014 Broadband China Demonstration Cities and City Clusters*, Announcement No. 61 of 2014, September 26, 2014; *Announcement of the 2015 Broadband China Demonstration Cities and City Clusters*, Announcement No. 65 of 2015, October 14, 2015; and *Announcement of the 2016 Broadband China Demonstration Cities*, Announcement No. 40 of 2016, July 22, 2016.

<sup>4</sup>State Council of the People’s Republic of China, *Notice of the State Council on Issuing the Broadband China Strategy and Implementation Plan*, State Council Document No. 31 of 2013.

Figure 1 displays the geographic distribution of the pilot cities. The selected cities are spread across different regions of China rather than being concentrated in a single part of the country. This broad geographic coverage allows the empirical analysis to draw on policy variation across cities with diverse geographic and economic characteristics.

Figure 1: Geographic Distribution of Broadband China Pilot Cities



*Notes:* The figure shows the geographic distribution of the 117 locations designated as Broadband China pilot cities or city clusters between 2014 and 2016. The designation lists were published by the Ministry of Industry and Information Technology and the National Development and Reform Commission.

The BCP differed from earlier initiatives that primarily sought to expand basic internet access. Before the program, many Chinese cities already had access to relatively slow fixed broadband and 2G or 3G mobile networks. The BCP therefore represented an improvement not only in network coverage but, importantly, in network quality. Figure A1 illustrates the rapid expansion of China's fixed broadband infrastructure. The number of optical-fiber access ports increased from 115 million in 2013 to 858 million in the first half of 2020, while the share of optical-fiber ports rose from 32.0% to 92.1%. Fixed broadband subscriptions and penetration also increased sharply after 2014.

The BCP coincided with a similarly rapid transition in mobile broadband technology. As shown in Figure A2, the number of 4G base stations increased from 733,000 in 2014 to 2.63 million in 2016. Over the same period, the share of mobile broadband users relying on 4G increased from

7% to 47%, while the share relying on 2G fell from 55% to 36%. Together, these patterns show that the BCP period was characterized by both greater broadband availability and a substantial shift toward higher-quality fiber-optic and 4G networks. These improvements increased connection speeds, reliability, and data-transmission capacity, making it easier for users to access online information and use social media, instant-messaging platforms, and other digital communication technologies through which information can spread quickly.

A potential concern is that pilot status and implementation timing may have been correlated with cities' preexisting economic conditions or trends. For example, cities experiencing faster economic growth might have been more likely to enter the program early. Existing evidence, however, indicates that cities selected in earlier waves did not experience systematically faster pre-policy growth than cities selected later. In the empirical analysis, we account for time-invariant differences across cities and common nationwide shocks by including city and year fixed effects. We further assess the identifying assumption by examining pre-policy trends in the event-study analyses presented below.

## 2.2 Labor Strikes in China

Labor strikes in China generally arise from workplace grievances, including wage arrears, inadequate compensation, excessive working hours, and poor or unsafe working conditions (Leung, 2015; Li et al., 2016). Among these grievances, wage arrears are by far the most common: approximately 80% of the collective worker protests recorded annually by the China Labour Bulletin (CLB) are related, at least in part, to unpaid wages.<sup>5</sup> The problem is particularly severe in construction and manufacturing. In the first half of 2024, protests by construction workers demanding unpaid wages accounted for 47.8% of all incidents recorded by CLB. An additional 32.4% occurred in manufacturing and heavy industry and involved wage arrears, factory closures, relocations, and compensation disputes.<sup>6</sup>

Rural migrant workers are especially exposed to these grievances. China had approximately 297.5 million migrant workers in 2023, of whom 27.5% worked in manufacturing and 15.4% in

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<sup>5</sup>China Labour Bulletin, "Employment and Wages," <https://clb.org.hk/en/content/employment-and-wages>.

<sup>6</sup>China Labour Bulletin, "Bullet Points: July 2024," <https://clb.org.hk/en/content/bullet-points-july-2024>.

construction.<sup>7</sup> Migrant workers are particularly important in construction, where they accounted for an estimated 80% of the workforce in 2018.<sup>8</sup> Multilayered subcontracting arrangements and informal employment relationships make these workers vulnerable to delayed or withheld wages, a problem that the International Labour Organization describes as longstanding and widespread in China's construction sector.<sup>9</sup> Their limited access to formal employment contracts, local household registration, and social protection further weakens their ability to recover unpaid wages through formal channels (Leung, 2015; Li et al., 2016).

Workers may respond to labor violations by negotiating with employers, petitioning local authorities, or filing lawsuits, but these channels can be slow or ineffective. Independent unions are prohibited, and the All-China Federation of Trade Unions (ACFTU), the country's only legally recognized national union organization, often does not independently organize or represent workers during labor disputes. Workers therefore frequently organize collective action outside the official union system after other channels have failed (Leung, 2015; Li et al., 2016). These actions are generally small, short-lived, and localized: more than 95% of the labor actions recorded by CLB in 2024 involved fewer than 100 participants.<sup>10</sup> They commonly take the form of work stoppages, sit-ins, demonstrations, or public displays of banners and slogans intended to attract attention and pressure employers or local governments to address workers' grievances.

Broadband expansion may affect labor activism by changing how workers acquire and exchange information. Improved internet access allows workers to learn more quickly about labor rights, disputes elsewhere, and the responses of employers and local governments. Consistent with this mechanism, Qin et al. (2024) show that communication on Sina Weibo contributed substantially to the geographic spread of protests and strikes across Chinese cities and increased the likelihood that isolated incidents developed into broader waves of collective action. These effects

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<sup>7</sup>National Bureau of Statistics of China, 2023 *Migrant Workers Monitoring Survey Report*, April 30, 2024, [https://www.stats.gov.cn/sj/zxfb/202404/t20240430\\_1948783.html](https://www.stats.gov.cn/sj/zxfb/202404/t20240430_1948783.html).

<sup>8</sup>China Employment Network, "From Leading in Manufacturing to Seeking Opportunities in Services: The Changing Employment Choices of the New Generation of Migrant Workers," Ministry of Human Resources and Social Security of China, October 29, 2019, <https://chinajob.mohrss.gov.cn/h5/c/2019-10-29/134610.shtml>.

<sup>9</sup>International Labour Organization, *Technological Solutions to Guaranteed Wage Payments of Construction Workers in China*, ILO Working Paper No. 48, 2021, <https://www.ilo.org/publications/technological-solutions-guaranteed-wage-payments-construction-workers-china-1>.

<sup>10</sup>China Labour Bulletin, "China Labour Bulletin Strike Map Data Analysis: 2024 Year in Review for Workers' Rights," <https://clb.org.hk/en/content/china-labour-bulletin-strike-map-data-analysis-2024-year-review-workers%E2%80%99-rights>.

emerged even though social media rarely circulated explicit organizing instructions, suggesting that digital communication facilitates collective action primarily by spreading information about grievances, government responses, and other workers' actions.

The BCP could strengthen these processes by making it easier for workers to access social media, exchange information, and coordinate across workplaces and cities. Its overall effect on strikes, however, is theoretically ambiguous. Better digital infrastructure may also strengthen government surveillance, facilitate the detection of organizing efforts, or allow online expression to substitute for offline action. Broadband expansion may further affect employment, wages, firm productivity, and industrial composition, thereby either alleviating existing grievances or creating new ones. We therefore estimate the reduced-form effect of the BCP on labor strikes and examine whether the results are consistent with informational, coordination, and economic channels.

### **3 Data**

Our analysis covers 362 geographic units in China from 2011 to 2020. The sample consists of 333 prefecture-level cities; four direct-administered municipalities, including Beijing, Shanghai, Chongqing, and Tianjin; 24 province-administered county-level regions; and Laiwu in Shandong Province. The province-administered county-level regions are administratively parallel to prefecture-level divisions and are included because the strike and labor-dispute data report events in these jurisdictions that cannot be assigned to other prefecture-level cities. Laiwu is treated as a separate unit because it remained a prefecture-level city until its merger with Jinan in 2019.

The main analysis is conducted at the city-quarter level. Each geographic unit is observed for 40 quarters, yielding a balanced panel of 14,480 city-quarter observations. Of the 362 units, 112 were designated as BCP pilot cities during the staggered rollout and constitute the treatment group, while the remaining 250 form the control group. Our two primary outcomes—labor strikes and labor disputes—are measured at the city-quarter level. City-level economic covariates and migrant-worker characteristics are observed annually at the city level and are matched to the corresponding city-quarter observations. The following subsections describe each data source and the construction of the main variables.

### 3.1 Labor Strikes

Our primary measure of labor unrest comes from the China Labour Bulletin (CLB) Strike Map, which records strike incidents across China beginning in January 2011. The dataset is compiled from reports appearing on social media platforms, particularly *Weibo*, as well as news articles and other publicly available sources. We use the universe of strike incidents recorded between 2011 and 2020. To ensure data quality, we manually reviewed and verified each strike record by reading the event descriptions and cross-checking the information with original online sources when available.

The CLB Strike Map contains detailed information on the characteristics of each strike, including its location, industry, causes, scale, firm type, and reported outcomes. Causes include wage arrears, compensation disputes, working conditions, and other workplace grievances. Industries include construction, manufacturing, transportation, services, education, mining, and others. The dataset also records whether the strike occurred in a private firm or a state-owned enterprise (SOE), as well as information on government intervention, police presence, negotiations, and other outcomes when such information is available.

The CLB data have several limitations. First, not all strike incidents contain complete information on outcomes or other strike characteristics. Second, the dataset does not identify the firms involved in each dispute, preventing firm-level analysis. Third, because the CLB Strike Map relies on media reports and social media posts, it does not capture all labor actions in China. According to CLB, the dataset records approximately 5–10 percent of all strikes nationwide. Nevertheless, previous research has shown that the CLB data capture aggregate patterns of labor unrest reasonably well and constitute the most comprehensive publicly available source of strike activity in China (Campante et al., 2023; Chen, 2026). Since our analysis exploits variation in strike activity across cities over time, the data remain well suited for studying how broadband expansion affected collective labor actions.

Table 1 presents summary statistics for the CLB Strike Map and compares treated and control city-quarter observations. Treated cities exhibit significantly higher levels of strike activity across nearly all recorded dimensions. The average number of strikes is substantially higher in treated cities, and the same pattern holds for strikes categorized by sector, firm type, form of action,

Table 1: Summary Statistics by Treatment Status

|                                                     | Treatment<br>N | Treatment<br>Mean | Control<br>N | Control<br>Mean | Difference |
|-----------------------------------------------------|----------------|-------------------|--------------|-----------------|------------|
| <i>Panel A. Total Strikes and Strikes by Sector</i> |                |                   |              |                 |            |
| Number of strikes                                   | 4,480          | 1.594             | 10,000       | 0.603           | 0.991***   |
| Construction                                        | 4,480          | 0.534             | 10,000       | 0.232           | 0.302***   |
| Education                                           | 4,480          | 0.053             | 10,000       | 0.028           | 0.025***   |
| Manufacturing                                       | 4,480          | 0.487             | 10,000       | 0.131           | 0.357***   |
| Mining                                              | 4,480          | 0.035             | 10,000       | 0.024           | 0.011***   |
| Services                                            | 4,480          | 0.275             | 10,000       | 0.076           | 0.199***   |
| Transportation                                      | 4,480          | 0.205             | 10,000       | 0.100           | 0.105***   |
| Other sectors                                       | 4,480          | 0.035             | 10,000       | 0.016           | 0.019***   |
| <i>Panel B. Strikes by Firm Type</i>                |                |                   |              |                 |            |
| Private firms                                       | 4,480          | 0.923             | 10,000       | 0.346           | 0.577***   |
| SOEs                                                | 4,480          | 0.190             | 10,000       | 0.077           | 0.113***   |
| Foreign-funded & JV firms                           | 4,480          | 0.176             | 10,000       | 0.023           | 0.153***   |
| Unknown firms                                       | 4,480          | 0.333             | 10,000       | 0.160           | 0.173***   |
| <i>Panel C. Strikes by Form of Action</i>           |                |                   |              |                 |            |
| Protests                                            | 4,480          | 0.940             | 10,000       | 0.346           | 0.594***   |
| Sit-ins                                             | 4,480          | 0.429             | 10,000       | 0.156           | 0.273***   |
| <i>Panel D. Strikes by Scale of Action</i>          |                |                   |              |                 |            |
| Small (< 100 people)                                | 4,480          | 1.273             | 10,000       | 0.495           | 0.778***   |
| Medium (100–1,000 people)                           | 4,480          | 0.294             | 10,000       | 0.099           | 0.196***   |
| Large (> 1,000 people)                              | 4,480          | 0.058             | 10,000       | 0.013           | 0.045***   |
| <i>Panel E. Strikes by Primary Cause</i>            |                |                   |              |                 |            |
| Wage arrears                                        | 4,480          | 1.156             | 10,000       | 0.434           | 0.722***   |
| Compensation disputes                               | 4,480          | 0.138             | 10,000       | 0.024           | 0.115***   |
| Pay increases                                       | 4,480          | 0.118             | 10,000       | 0.042           | 0.076***   |
| <i>Panel F. Strikes by Resolution Outcome</i>       |                |                   |              |                 |            |
| Suppressed                                          | 4,480          | 0.118             | 10,000       | 0.032           | 0.086***   |
| Police standby                                      | 4,480          | 0.387             | 10,000       | 0.116           | 0.271***   |
| Peaceful ending                                     | 4,480          | 0.193             | 10,000       | 0.068           | 0.125***   |

Notes: (1) This table reports the mean values of the variables by treatment status. (2) The underlying data are drawn from the 2011–2020 China Labour Bulletin (CLB) Strike Map, which records daily strike incidents in prefecture-level cities across China. (3) The final column reports the difference in means between treated and control observations. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

scale, cause, and resolution outcome. These differences suggest that treated cities experienced systematically greater labor unrest during the sample period.

The magnitude of these differences largely reflects the composition of strike activity in the CLB data. Most recorded strikes occurred in the construction and manufacturing sectors, were

concentrated in private firms, involved relatively small-scale actions, and were primarily driven by wage arrears. Consequently, the largest treatment-control differences are observed in these categories, which account for the majority of strike incidents in the sample.

While these differences indicate that treated cities were generally more strike-prone than control cities even before considering the effects of broadband expansion, such differences do not threaten our identification strategy, provided that pre-existing strike activity and related factors did not influence the timing of broadband expansion. Our empirical analysis relies on a difference-in-differences framework that compares changes in strike activity over time between treated and control cities while controlling for city and time fixed effects. As a result, the estimation is driven by within-city changes in strike outcomes following treatment rather than by pre-existing differences in strike levels across cities. We discuss this identifying assumption and the empirical strategy in greater detail in Section 4.

### 3.2 Labor Disputes

The China Judgments Online (CJO) database is a public repository of court decisions in China. Launched in July 2013, it mandated the publication of court decisions beginning in November 2013 and became largely comprehensive by June 2015. The database contains more than 330,000 labor dispute cases between 2013 and 2020, including information on the date of the court decision, the names of the plaintiff and defendant, the court location, and the content of the ruling. Although the CJO records the date of the court decision rather than the date on which a case was filed, the interval between filing and resolution is typically on the order of one to two quarters.<sup>11</sup>

We use the CJO data to complement the strike data from the CLB. While the CLB Strike Map is compiled primarily from media reports and social media sources, the CJO is based on official court records and therefore provides an alternative measure of labor conflict derived from the formal legal system. Table B1 shows that treated cities have significantly more labor dispute cases than control cities, consistent with the pattern observed for strikes. Moreover, at the city-quarter level, the number of labor disputes is substantially greater than the number of strikes. This difference

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<sup>11</sup>Qian Zhou, “Dispute Resolution in China: Litigation, Arbitration, and Mediation,” *China Briefing*, September 7, 2022, <https://www.china-briefing.com/news/dispute-resolution-in-china-litigation-arbitration-and-mediation/>.

may arise because strikes, as unofficial forms of collective action, are more susceptible to censorship and underreporting, whereas labor disputes that reach the courts are formally documented. Comparing patterns across these two data sources therefore helps assess the representativeness of the CLB data and alleviates concerns that our findings are driven solely by changes in media reporting or online information flows.

### **3.3 City-Level Covariates**

We obtain city-level covariates from the China City Statistical Yearbook (CCSY) for 2011–2019. The CCSY provides annual information on prefecture-level cities, including population, GDP, employment, average wages, industrial structure, public finance, and infrastructure. We use these variables to account for differences in local economic and labor-market conditions that may be correlated with both BCP designation and labor strikes.

The resulting city-year panel is unbalanced because the CCSY does not report every variable consistently for every city and year, particularly for smaller cities and recently established administrative units. For example, Sansha, a small prefecture-level city in Hainan Province, has population data for only three of its seven observed years and no reported GDP, average-wage, or employment data during those years. Coverage of sectoral GDP is also less complete than that of basic measures such as population and total GDP. Despite these limitations, the CCSY remains by far the most comprehensive source of comparable annual information on economic and demographic conditions across Chinese cities.

### **3.4 China Migrants Dynamic Survey**

We use data from the 2011–2018 China Migrants Dynamic Survey (CMDS), an annual, nationally representative survey of China’s internal migrant population. The CMDS uses a stratified, multistage sampling design with probability proportional to size and covers migrants living outside their place of household registration. The survey collects detailed individual-level information on demographic characteristics, migration history, employment, earnings, labor contracts, social insurance, living conditions, and social integration.

We use the CMDS only for supplementary mechanism analysis rather than for measuring strikes or identifying the main treatment effect. In particular, the survey allows us to examine whether the BCP affected migrant workers' participation in local social organizations and networks, including workplace and hometown-based associations. These analyses help assess whether changes in social engagement or migrant-worker networks may explain the relationship between broadband expansion and labor activism.

## 4 Empirical Strategy

### 4.1 Main Specifications

To estimate the causal effect of broadband expansion on labor activism, we exploit the staggered rollout of the BCP across Chinese cities between 2014 and 2016. Our baseline specification employs a staggered difference-in-differences (DID) framework:

$$Y_{ct} = \beta_0 + \beta_1 D_{ct} + \mathbf{X}_{cy}\gamma + \theta_c + \delta_t + \varepsilon_{ct}, \quad (1)$$

where  $Y_{ct}$  denotes the outcome variable for city  $c$  in year-quarter  $t$ . The treatment indicator  $D_{ct}$  equals one if city  $c$  has implemented the BCP by quarter  $t$ , and zero otherwise. The vector  $\mathbf{X}_{cy}$  contains time-varying city-level covariates, including economic, demographic, labor market, and environmental characteristics. The covariates are measured at the year level because of data availability and applied uniformly across quarters within each year. The terms  $\theta_c$  and  $\delta_t$  represent city fixed effects and year-quarter fixed effects, respectively. City fixed effects account for time-invariant differences across cities, while year-quarter fixed effects absorb shocks common to all cities in a given period. Standard errors are clustered at the city level.

The coefficient of interest is  $\beta_1$ , which captures the average effect of broadband expansion on the outcome of interest. Under the identifying assumption that treated and untreated cities would have followed parallel trends in the absence of the policy,  $\beta_1$  can be interpreted as the causal effect of broadband expansion. Section 5 presents evidence supporting the validity of the parallel trends assumption.

It is important to note that our identification strategy does not require the rollout of the BCP to be completely random across cities. As discussed in Section 2, the selection of pilot cities was determined by China’s MIIT and NDRC, and we do not directly observe the criteria or deliberations underlying these decisions. Instead, the DID framework requires that the timing of BCP adoption is not systematically related to unobserved factors that would otherwise affect trends in labor unrest, which is our main outcome of interest. To assess the plausibility of this assumption, we first examine pre-treatment trends using the event-study specification. In addition, we control for a rich set of time-varying city characteristics that may be correlated with both the timing of broadband expansion and labor disputes in Equation (1). These approaches help mitigate concerns that our estimates are driven by differential pre-existing trends or by policy targeting based on factors that also influence labor activism. We discuss these identification issues in greater detail in Section 4.2.

To assess the validity of the parallel trends assumption and examine the dynamic effects of broadband expansion, we also estimate the following event-study specification:

$$Y_{ct} = \alpha_0 + \sum_{k \neq -1} \alpha_k \mathbf{1}(k = t - T_c) + \mathbf{X}_{cy} \lambda + \mu_c + \tau_t + \varepsilon_{ct}. \quad (2)$$

where  $T_c$  denotes the quarter in which city  $c$  first receives BCP treatment. The indicator  $\mathbf{1}(k = t - T_c)$  equals one if an observation is  $k$  quarters away from the treatment quarter. We omit the period immediately preceding treatment ( $k = -1$ ) as the reference period. The coefficient  $\alpha_k$  captures the average difference in the outcome relative to one quarter before treatment.

The event-study coefficients provide two important pieces of evidence. First, statistically insignificant pre-treatment coefficients support the parallel trends assumption underlying the DID design. Second, the post-treatment coefficients reveal the timing and persistence of the policy’s effects on the outcomes.

In light of the recent DID literature on staggered treatment adoption, we also implement the estimator proposed by Sun and Abraham (2021). This estimator compares treated cities to not-yet-treated and never-treated cities, thereby addressing potential biases that can arise under staggered treatment adoption. The results are presented in Section 5 and qualitatively similar to our baseline findings.

We estimate Equation (1) for two sets of outcomes. First, we examine a set of first-stage outcomes as a sanity check to assess whether broadband expansion had an immediate effect on internet access and telecommunications development within a city. Specifically, we consider three annual measures. *Broadband intensity* is defined as the ratio of broadband subscribers to the city's year-end registered (hukou) population. *Cellphone intensity* is measured as the ratio of cellphone users to the city's year-end registered (hukou) population. *Telecommunications service revenue per capita* is calculated as total telecommunications service revenue divided by the city's year-end registered (hukou) population. These outcomes are available only at the annual level and are therefore measured using yearly city-level data. If broadband expansion leads to positive effects on one or more of these outcomes, it would provide evidence that the policy successfully improved local telecommunications infrastructure and internet access.

Second, we estimate the baseline effects of broadband expansion on labor unrest. The outcomes in this analysis consist of a range of quarterly city-level measures of strikes and labor disputes. These include the total number of strikes and labor disputes, as well as disaggregated measures by sector, firm ownership type, form and scale of collective action, and the underlying causes and outcomes of strikes. We focus on the absolute number of strikes and labor disputes in the baseline analysis because these measures provide a more informative way to examine the dynamics of labor activism over short periods of time. An alternative approach is to normalize these outcomes by city population, which varies across years. Because population data are not available consistently for all cities and years, resulting in a less complete sample and potentially less precise estimates, we explore this specification as a robustness check to complement the baseline analysis.

## 4.2 Identification

The main identification concern for our baseline specification is that the selection and timing of BCP pilot cities may not have been random. Cities with stronger economic growth, larger populations, more developed labor markets, or greater infrastructure needs may have been selected earlier, and these characteristics may also affect trends in strikes and labor disputes. Although city fixed effects absorb time-invariant differences and year-quarter fixed effects account for common shocks, the baseline estimates could still be biased by differential time-varying factors correlated

with both BCP adoption and labor unrest. A related concern is that improved internet access may increase the reporting and detection of strikes rather than their underlying incidence, which motivates our use of official labor-dispute records from the CJO as an alternative outcome.

To examine whether observable pre-treatment conditions predict BCP cohort assignment, Table B2 relates assignment to the 2014, 2015, and 2016 cohorts to a broad set of pre-treatment city characteristics. Most coefficients are statistically insignificant and do not exhibit a systematic pattern across cohorts, providing some reassurance that treatment timing was not strongly determined by observable city characteristics. Nevertheless, several characteristics significantly predict assignment to particular cohorts. These correlations motivate our preferred specifications, which control for GDP, population, highway traffic flow, registered unemployment, primary-sector GDP share, the number of large-scale firms, average wages, medical-insurance enrollment, and other time-varying city characteristics, together with city and year-quarter fixed effects. In separate robustness checks, we additionally include city-specific linear time trends and consider alternative specifications of the city-level characteristics.

Because this exercise cannot entirely rule out selection based on unobserved factors, the causal interpretation ultimately rests on the parallel-trends assumption, which requires that treated and untreated cities would have followed similar trends in labor activism in the absence of the BCP. We assess this assumption using the event-study specification in Equation (2). As shown in Section 5.2, the pre-treatment estimates are generally statistically insignificant, providing support for the parallel-trends assumption.

## 5 Main Results

### 5.1 First Stage

Table 2 reports the first-stage effects of the BCP policy on telecommunications outcomes. Across specifications, the results provide evidence that the policy successfully expanded local telecommunications infrastructure and internet access. In Panel A, which includes province fixed effects and clusters standard errors at the province level, BCP adoption is associated with statistically significant increases in broadband intensity, cellphone intensity, and telecommunications service

Table 2: First-Stage Effects of Broadband Expansion on Telecommunications Outcomes

|                                                     | (1)<br>Cutoff Year: Year of Treatment | (2)<br>Cutoff Year: Year of Treatment | (3)<br>Cutoff Year: Year of Treatment | (4)<br>Cutoff Year: One Year After Treatment | (5)<br>Cutoff Year: One Year After Treatment | (6)<br>Cutoff Year: One Year After Treatment |
|-----------------------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|
|                                                     | Broadband<br>Intensity                | Cellphone<br>Intensity                | Telecom Rev.<br>per Capita            | Broadband<br>Intensity                       | Cellphone<br>Intensity                       | Telecom Rev.<br>per Capita                   |
| <i>Panel A. Province FE, Province-Clustered SEs</i> |                                       |                                       |                                       |                                              |                                              |                                              |
| $D_{ct}$                                            | 0.112***<br>(0.027)                   | 0.526**<br>(0.226)                    | 766.822***<br>(236.676)               | 0.112***<br>(0.028)                          | 0.564**<br>(0.217)                           | 783.952***<br>(0.247)                        |
| N                                                   | 2,564                                 | 2,582                                 | 2,566                                 | 2,564                                        | 2,582                                        | 2,566                                        |
| $R^2$                                               | 0.415                                 | 0.088                                 | 0.252                                 | 0.406                                        | 0.087                                        | 0.247                                        |
| <i>Panel B. City FE, City-Clustered SEs</i>         |                                       |                                       |                                       |                                              |                                              |                                              |
| $D_{ct}$                                            | 0.032***<br>(0.011)                   | 0.013<br>(0.046)                      | 155.688<br>(101.540)                  | 0.024**<br>(0.012)                           | 0.058<br>(0.074)                             | 160.660<br>(116.785)                         |
| N                                                   | 2,563                                 | 2,582                                 | 2,566                                 | 2,563                                        | 2,582                                        | 2,566                                        |
| $R^2$                                               | 0.803                                 | 0.382                                 | 0.671                                 | 0.802                                        | 0.382                                        | 0.671                                        |

Notes: (1) Each coefficient is estimated using Equation (1). The unit of observation is city-year because the outcome variables—broadband intensity, cellphone intensity, and telecommunications service revenue per capita—are available only at the annual level and are collected from the China City Statistical Yearbook (CCSY). (2) Broadband intensity is measured as the ratio of the number of broadband subscribers to the city's year-end registered (hukou) population; cellphone intensity is measured as the ratio of the number of cellphone users to the city's year-end registered (hukou) population; and telecommunications service revenue per capita is calculated as total telecommunications service revenue divided by the city's year-end registered (hukou) population. (3) All specifications include regional linear time trends and year fixed effects. Standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

revenue per capita. The estimated effects are similar when the treatment is defined using either the contemporaneous adoption year or allowing for a one-year implementation lag.

Panel B presents the preferred specification with city fixed effects and city-clustered standard errors. The results indicate that BCP adoption increased broadband intensity by approximately 2.4–3.2 broadband subscriptions per 100 registered residents in treated cities. While the estimated effects on cellphone intensity and telecommunications service revenue per capita are positive, they are not statistically significant in the city fixed-effects specification. The weaker results for these outcomes likely reflect data limitations in the CCSY, which contains incomplete coverage for many cities. Combined with the inclusion of city fixed effects, this substantially reduces the variation available for identification. Nevertheless, broadband intensity is the most direct measure

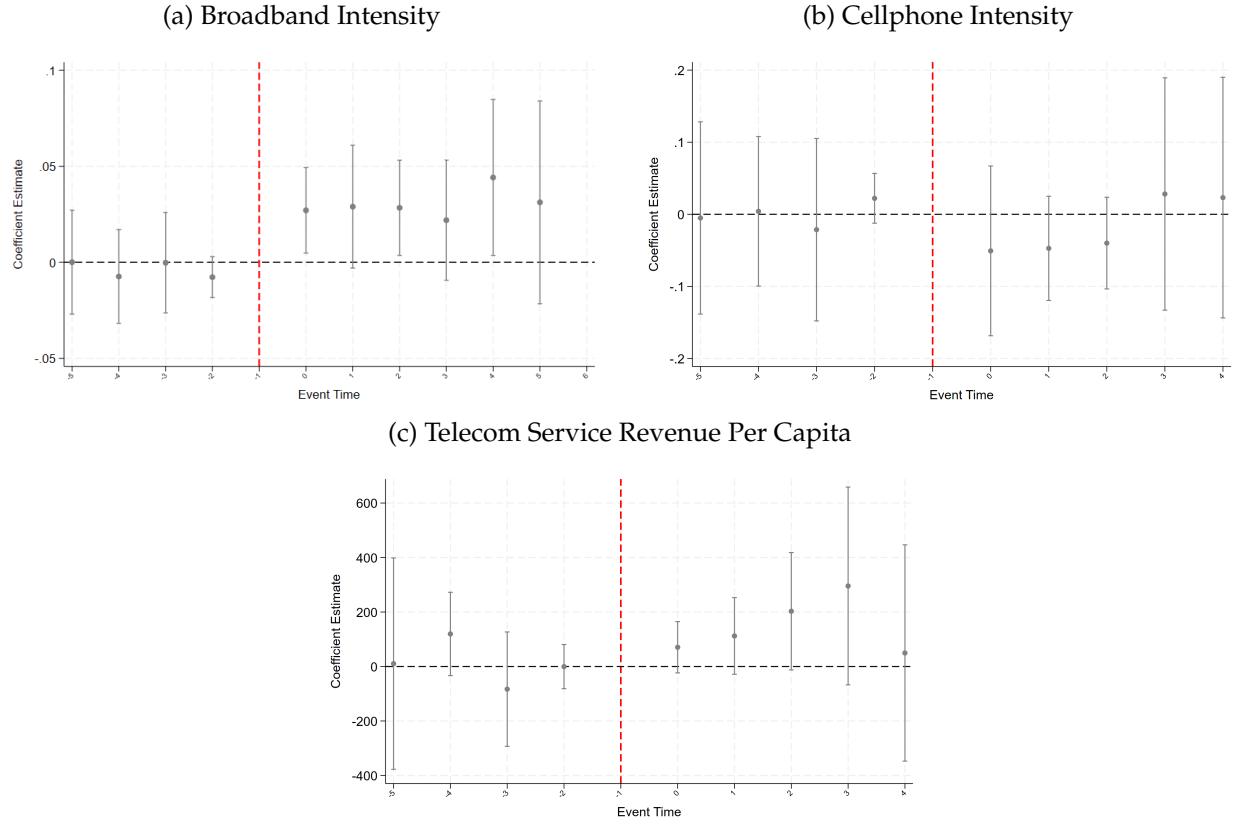
of internet access and broadband penetration, which is the primary mechanism through which the BCP is expected to operate. The positive and statistically significant effects on broadband intensity therefore provide strong evidence that the policy successfully expanded local internet infrastructure in treated cities.

Figure 2 complements the first-stage results reported in Panel B of Table 2 by examining the dynamic effects of the BCP policy using the preferred specification with city fixed effects. Consistent with the table estimates, Panel (a) shows a positive increase in broadband intensity following policy adoption, while the pre-treatment coefficients remain close to zero and statistically insignificant. This pattern provides support for the parallel trends assumption and suggests that treated and control cities exhibited similar trends in broadband penetration prior to the policy. By contrast, Panels (b) and (c) show no clear evidence of changes in cellphone intensity or telecommunications service revenue per capita following treatment. Taken together, the event-study results reinforce the conclusion that the primary effect of the BCP was to expand broadband access rather than to generate broad changes across all telecommunications outcomes, supporting the interpretation that broadband penetration is the main channel through which the policy operated.

## 5.2 Baseline

Figure 3 presents event-study estimates of the effect of the BCP on labor activism. Panels (a) and (b) report the dynamic effects on the number of strikes and labor disputes, respectively, relative to the quarter of the year immediately preceding policy implementation. Several patterns emerge. First, the pre-treatment coefficients are generally small and statistically indistinguishable from zero in the years leading up to BCP adoption, providing support for the parallel trends assumption underlying the difference-in-differences design. While the coefficients exhibit a gradual upward trend in the years preceding treatment, this trend is driven primarily by observations further from the treatment date. In contrast, the coefficients are relatively flat and close to zero during the two years immediately prior to treatment, suggesting little evidence of differential pre-treatment trends. Moreover, the magnitudes of the pre-treatment coefficients remain economically small relative to the post-treatment effects.

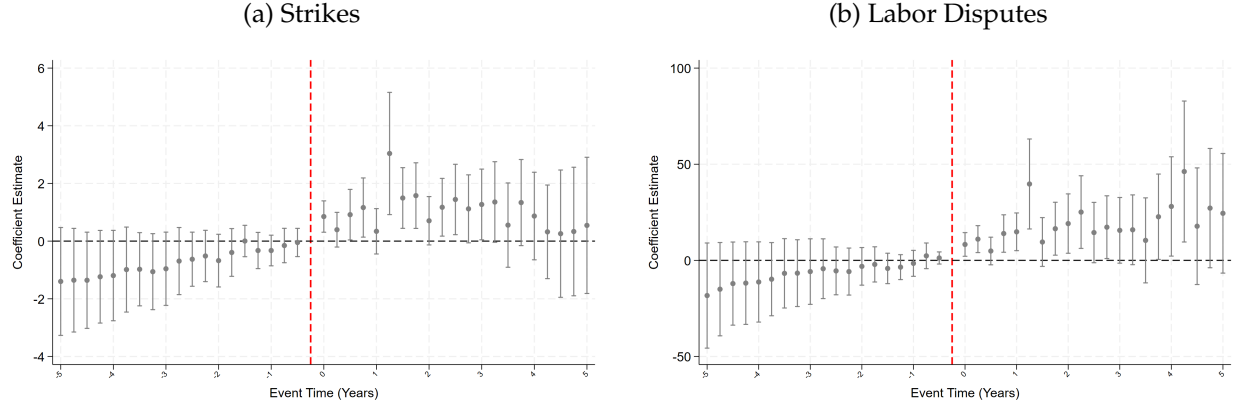
Figure 2: Event-Study Plot of the Effect of BCP on Network Coverage



Notes: (1) The estimates are obtained from Equation (2). The outcomes are broadband intensity, cellphone intensity, and telecommunications service revenue per capita. (2) Broadband intensity is measured as the ratio of the number of broadband subscribers to the city's year-end registered (hukou) population. Cellphone intensity is measured as the ratio of the number of cellphone users to the city's year-end registered (hukou) population. Telecommunications service revenue per capita is calculated as total telecommunications service revenue divided by the city's year-end registered (hukou) population. (3) Covariates include the logarithm of GDP (measured in current-year prices, 10,000 yuan) and the logarithm of average wages (yuan). (4) Regressions also include city fixed effects, year fixed effects, and region-specific linear time trends. (5) The black solid circles represent the estimated coefficients for each year relative to the policy year. (6) The black vertical bars represent robust 95% confidence intervals that allow for arbitrary within-city error correlation. (7) The red dashed line at event time -1 denotes the omitted baseline period.

Second, both panels from Figure 3 show a clear increase in labor activism following BCP implementation. In the case of strikes, the estimated effects become positive immediately after treatment and remain positive for several years, with coefficients generally ranging from approximately 1 to 2 additional strikes per city-quarter. Given that the average city-quarter experiences only 0.603 strikes, these estimates imply an increase of roughly 150–300% relative to the sample mean. A similar pattern is observed for labor disputes, where the estimated effects increase by roughly 10 to 30 additional disputes per city-quarter and remain substantially above their pre-treatment levels. Although the confidence intervals widen at longer event horizons due to a smaller num-

Figure 3: Event-Study Plot of the Effect of BCP on Labor Activism



Notes: (1) The estimates are obtained from Equation (2), with the outcomes defined as the number of strikes and the number of labor disputes at the city-quarter level in panels (a) and (b), respectively. Covariates in  $X_{cy}$  include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway passenger traffic (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares employed in the secondary and tertiary sectors (percent), log registered unemployment (persons), log employment in the sales sector (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons). (2) All regressions include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. (3) The black solid circles represent the estimated event-study coefficients for each year relative to the policy year in regressions of the number of strikes. (4) The black vertical bars denote robust 95% confidence intervals that allow for arbitrary within-city error correlation. The red dashed line at event time  $-1$  indicates the omitted reference period.

ber of observations, the overall pattern indicates that broadband expansion was associated with sustained increases in both strikes and labor disputes.

Table 3 complements the event-study evidence presented in Figure 3 by reporting DID estimates of the average effect of BCP adoption on labor activism. The table presents estimates from the full sample with and without covariates, as well as estimates from restricted post-treatment windows that limit the sample to observations within two, three, and four years of policy adoption. These specifications allow us to examine whether the effects differ between the shorter and longer post-treatment periods. Across specifications, the estimated effects are consistently positive and statistically significant for both strikes and labor disputes, indicating that broadband expansion increased labor unrest in treated cities.

Panel A reports the results for the number of strikes. In the baseline specification without covariates, BCP adoption is associated with an increase of 0.664 strikes per city-quarter. Relative to the sample mean of 0.603 strikes per city-quarter, this estimate implies an increase of approximately 110%. The estimated effect remains positive and statistically significant after controlling

Table 3: Effects of Broadband Expansion on Strikes and Labor Activism

|                                                              | (1)<br>Full Sample   | (2)<br>Full Sample  | (3)<br>Two-year     | (4)<br>Three-year  | (5)<br>Four-year   |
|--------------------------------------------------------------|----------------------|---------------------|---------------------|--------------------|--------------------|
| <i>Panel A. Dependent Variable: Number of Strikes</i>        |                      |                     |                     |                    |                    |
| $D_{ct}$                                                     | 0.664***<br>(0.178)  | 0.797***<br>(0.278) | 0.443**<br>(0.195)  | 0.438**<br>(0.193) | 0.617**<br>(0.249) |
| Covariates                                                   | No                   | Yes                 | Yes                 | Yes                | Yes                |
| N                                                            | 14,480               | 7,680               | 6,852               | 7,412              | 7,588              |
| $R^2$                                                        | 0.558                | 0.690               | 0.721               | 0.709              | 0.696              |
| <i>Panel B. Dependent Variable: Number of Labor Disputes</i> |                      |                     |                     |                    |                    |
| $D_{ct}$                                                     | 31.574***<br>(7.237) | 6.328*<br>(3.584)   | 6.279***<br>(2.259) | 4.609<br>(2.908)   | 6.073*<br>(3.465)  |
| Covariates                                                   | No                   | Yes                 | Yes                 | Yes                | Yes                |
| N                                                            | 14,480               | 7,680               | 6,852               | 7,412              | 7,588              |
| $R^2$                                                        | 0.682                | 0.912               | 0.909               | 0.902              | 0.909              |

Notes: (1) Each coefficient is estimated from a separate OLS regression based on Equation (1). The outcome variables in Panels A and B are the number of labor strikes and the number of labor disputes at city-quarter level, respectively, obtained from the CLB and CJO datasets. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares in the secondary and tertiary sectors (percent), log registered unemployment (persons), log employment in the sales sector (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons), all obtained from the CCSY. (3) All regressions also include year-quarter fixed effects and city fixed effects. The regression in Columns (2) to (5) additionally includes city-specific linear time trends. Standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

for a rich set of city-level covariates and across both shorter- and longer-term post-treatment windows. Across specifications, the estimated coefficients range from 0.438 to 0.797 strikes per city-quarter, corresponding to increases of roughly 73% to 132% relative to the sample mean. These magnitudes suggest that the effects are economically large and robust to alternative sample restrictions.

Panel B presents analogous results for labor disputes. The baseline specification indicates that BCP adoption increased the number of labor disputes by approximately 31.6 disputes per city-quarter. Although the magnitude declines substantially once covariates are included, the

estimated effects remain positive and are statistically significant in most specifications. Taken together, the results in Table 3 reinforce the dynamic patterns shown in Figure 3 and provide consistent evidence that broadband expansion contributed to higher levels of labor activism.

### 5.3 Strike Characteristics and Heterogeneous Effects

Tables B3–B5 explore how the effects of broadband expansion vary across different types of labor disputes. Table B3 shows that the increase in strike activity is concentrated in the construction, manufacturing, and service sectors, while there is little evidence of significant effects in education, mining, transportation, or other sectors. The largest estimated effect occurs in construction, a sector characterized by dispersed workplaces, subcontracting arrangements, and frequent disputes over labor conditions.

Table B4 further indicates that the rise in labor unrest is driven primarily by strikes occurring in private firms, with smaller positive effects for state-owned enterprises and no significant effect for foreign-funded or joint-venture firms. Broadband expansion is also associated with increases in both protests and sit-ins, the two most common forms of labor action in China.

Finally, Table B5 examines heterogeneity by strike scale, primary cause, and resolution outcome. Panel A shows that the estimated effects are concentrated among small-scale actions involving fewer than 100 participants, with no significant changes in medium- or large-scale strikes. Panel B indicates that the increase in labor unrest is driven almost entirely by disputes over wage arrears, while strikes related to compensation or pay increases do not respond significantly to broadband expansion. Panel C shows that broadband expansion is associated with a higher incidence of strikes that are met with police standby, but not with suppression or peaceful resolution.

Taken together, the results in Tables B3–B5 suggest that broadband expansion primarily facilitated the emergence of smaller, localized labor actions centered on unpaid wages rather than large-scale mobilizations seeking broader improvements in compensation. Although a more detailed discussion of the mechanisms behind the increase in strikes is deferred to Section 6, these patterns provide some preliminary evidence that enhanced access to information and communication technologies facilitated labor organization and collective action, particularly in private, lower-skilled sectors where formal channels for worker representation are often more limited.

Tables B6 and B7 examine whether the effects of broadband expansion vary across cities with different levels of pre-existing strike activity and different city sizes. Table B6 shows that the increase in strikes following broadband expansion is concentrated in cities with a history of labor unrest prior to BCP adoption. Relative to cities with no pre-BCP strikes (Level 1), cities with the highest pre-BCP strike activity (Level 3), defined as having an average number of pre-BCP strikes above the 75th percentile across all cities, experience significantly larger increases in overall strikes, construction strikes, manufacturing strikes, and service-sector strikes. In contrast, cities with moderate levels of pre-BCP strike activity (Level 2), defined as those between the 25th and 75th percentiles, do not experience significantly larger increases in strikes relative to Level 1 cities.

Table B7 reveals a similar pattern across city scales. The positive effects of broadband expansion on overall strike activity are concentrated in medium and large cities, where medium and large cities are defined as those with registered (*hukou*) populations between the 25th and 75th percentiles and above the 75th percentile, respectively, while small cities fall below the 25th percentile. The estimated effects increase monotonically with city size. Large cities experience the strongest increases in overall strikes, construction strikes, manufacturing strikes, and service-sector strikes, while the corresponding effects are smaller in medium-sized cities, both relative to small cities. Taken together, these findings suggest that broadband expansion was most strongly associated with increased labor unrest in cities that were already more conducive to collective action, either because they had a prior history of strikes or because their larger population size provided a broader base for worker mobilization.

## 5.4 Robustness

As a robustness check, we re-estimate the baseline event-study specification using the estimator proposed by Sun and Abraham (2021), which accommodates heterogeneous treatment effects across cohorts and over time under staggered treatment adoption. Figure A3 shows that the pre-treatment coefficients are relatively small compared with the post-treatment estimates and generally converge toward zero as treatment approaches. Following BCP adoption, the estimated effects become positive for both strikes and labor disputes, with particularly large increases approximately one year after treatment. Table B8 reports positive and statistically significant aver-

age effects across alternative post-treatment horizons, consistent with the baseline results. Overall, these findings suggest that the main estimates are not driven by biases arising from heterogeneous treatment effects in the conventional two-way fixed-effects estimator.

Additionally, we conduct a robustness check comparing specifications with no city characteristics, contemporaneous city characteristics, 2011 city characteristics interacted with a linear time trend, and average pre-treatment city characteristics interacted with a linear time trend. Table B9 shows that the estimated effects on strikes remain positive and statistically significant across all specifications. The estimates for labor disputes are also consistently positive, although they become smaller and statistically insignificant when pre-treatment city characteristics are interacted with a linear time trend. Thus, the strike results remain robust, while the labor-dispute estimates are less precise under these alternative specifications.

## 6 Mechanisms

### 6.1 Internet-Enabled Mobilization

The first, and perhaps most intuitive, mechanism through which broadband expansion may increase strike activity is by improving workers' ability to communicate, exchange information, and coordinate collective action. Expanded broadband access can strengthen social connections, facilitate the diffusion of information, and make it easier for workers to mobilize around shared grievances.

Because we do not observe whether individual strike participants use the internet or social media, we cannot test this mechanism directly. Instead, we provide two pieces of indirect evidence. First, we examine whether broadband expansion increases migrants' social participation and social connectedness, outcomes that are likely to reflect greater opportunities for communication and network formation. Second, we investigate whether the effect of broadband expansion on strike activity is larger in cities that were already more socially connected prior to treatment. If broadband expansion operates through communication and social networks, then improved internet access should be particularly effective in places where stronger pre-existing social ties provide a foundation for information sharing and collective mobilization.

To examine whether broadband expansion affected workers' social connectedness, we use data from the CMDS, which contains detailed information on migrant workers' social participation and local social networks, and estimate the following specification:

$$Y_{ict} = \beta D_{ct} + X_{ict}\gamma + Z_{ct}\delta + \mu_c + \lambda_b + \theta_t + \varepsilon_{ict}, \quad (3)$$

where  $Y_{ict}$  denotes a measure of social connectedness for individual  $i$  residing in city  $c$  in survey year  $t$ .  $D_{ct}$  is an indicator equal to one if city  $c$  had implemented the BCP by year  $t$ .  $X_{ict}$  includes individual characteristics such as gender, age, ethnicity, education, marital status, employment status, self-employment status, and household size.  $Z_{ct}$  includes city-level controls including average wages, employment density, unemployment rate, broadband subscriptions, and the number of enterprises. The specification additionally control for birth-year fixed effects  $\lambda_b$ , city fixed effects  $\mu_c$ , and year fixed effects  $\theta_t$ . Standard errors are clustered at the city level and all regressions are estimated using survey weights.

Table 4 provides evidence that broadband expansion strengthened migrants' social connectedness and local integration. Broadband expansion increased the probability of participating in any social organization by 3.1 percentage points, volunteering by 5.6 percentage points, and joining a hometown association by 2.6 percentage points. In addition, migrants in treated cities were 6.0 percentage points more likely to report connecting with local people. At the same time, broadband expansion reduced the probability of primarily connecting with people from their hometowns by 6.4 percentage points. Taken together, these results suggest that broadband expansion facilitated the formation of broader social networks and increased migrants' engagement with local communities.

We next examine whether the effects of broadband expansion are larger in cities that were already more socially connected prior to treatment. Table 5 investigates this question using a measure of pre-treatment social connectedness constructed from *Weibo* activity. Specifically, we use a self-connectedness index defined as the total number of *Weibo* posts in a city in 2013 divided by its population in the same year. Cities are then classified into low, medium, and high self-connectedness groups corresponding to the bottom, middle, and top terciles of the city-level distribution, respectively. The *Weibo* data are obtained from Qin et al. (2024). If broadband ex-

Table 4: Effects of Broadband Expansion on Social Connectedness

|          | (1)                         | (2)                 | (3)                      | (4)                              | (5)                          |
|----------|-----------------------------|---------------------|--------------------------|----------------------------------|------------------------------|
|          | Pr(Any Social Organization) | Pr(Volunteer)       | Pr(Hometown Association) | Pr(Connecting with Local People) | Pr(Connecting with Hometown) |
| $D_{ct}$ | 0.031***<br>(0.003)         | 0.056***<br>(0.002) | 0.026***<br>(0.003)      | 0.060**<br>(0.023)               | -0.064***<br>(0.018)         |
| N        | 114,755                     | 114,755             | 114,755                  | 327,742                          | 327,742                      |
| $R^2$    | 0.109                       | 0.041               | 0.094                    | 0.173                            | 0.112                        |

Notes: (1) All specifications are based on Equation (3), with the dependent variables listed in the top row. The dependent variables in columns (1) through (5) are binary indicators for migrants' participation in any social organization, volunteering, hometown associations, connecting with local people, and connecting with people from their hometowns, respectively. (2) Due to data availability, the estimations in columns (1) through (3) are based on the 2017 CMDS survey, while the estimations in columns (4) and (5) are based on the 2011, 2012, and 2017 CMDS surveys. (3) The model specifications are the same as those in Table 2. (4) Clustered standard errors at the city level are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

pansion increases strike activity by facilitating communication, information sharing, and worker coordination, then its effects should be stronger in cities where denser social networks already existed before the rollout of the BCP.

The results are consistent with this hypothesis. In Panel A, broadband expansion has no statistically significant effect on the number of strikes in cities with low levels of pre-treatment self-connectedness. By contrast, the interaction between broadband expansion and high self-connectedness is positive and statistically significant across all specifications. The coefficients for cities with medium levels of self-connectedness are generally smaller and statistically insignificant. Similar patterns emerge when restricting the sample to cities observed for at least two, three, or four years after treatment.

Panel B shows analogous results for labor disputes. While broadband expansion alone has little effect or even reduces disputes in cities with low self-connectedness, the interaction terms for highly connected cities are consistently positive and highly significant. Taken together, these findings suggest that broadband expansion had substantially larger effects in cities with stronger pre-existing social networks, supporting the view that communication and social connectedness played an important role in facilitating collective labor action following the expansion of broadband infrastructure.

Table 5: Heterogeneous Effects of Broadband Expansion by Pre-Treatment Social Connectedness

|                                                              | (1)                   | (2)                  | (3)                  | (4)                  | (5)                  |
|--------------------------------------------------------------|-----------------------|----------------------|----------------------|----------------------|----------------------|
|                                                              | Full Sample           |                      | Two-year             | Three-year           | Four-year            |
| <i>Panel A. Dependent Variable: Number of Strikes</i>        |                       |                      |                      |                      |                      |
| $D_{ct}$                                                     | 0.133<br>(0.144)      | -0.108<br>(0.338)    | -0.335<br>(0.283)    | -0.282<br>(0.281)    | -0.258<br>(0.282)    |
| $D_{ct} \times \text{Medium}$                                | -0.057<br>(0.152)     | 0.368<br>(0.395)     | 0.551<br>(0.348)     | 0.487<br>(0.342)     | 0.506<br>(0.352)     |
| $D_{ct} \times \text{High}$                                  | 1.063***<br>(0.364)   | 1.669***<br>(0.542)  | 1.311***<br>(0.412)  | 1.237***<br>(0.407)  | 1.529***<br>(0.467)  |
| Covariates                                                   | No                    | Yes                  | Yes                  | Yes                  | Yes                  |
| N                                                            | 11,240                | 7,512                | 6,692                | 7,244                | 7,420                |
| $R^2$                                                        | 0.566                 | 0.693                | 0.723                | 0.711                | 0.698                |
| <i>Panel B. Dependent Variable: Number of Labor Disputes</i> |                       |                      |                      |                      |                      |
| $D_{ct}$                                                     | -8.665**<br>(3.544)   | -3.023**<br>(1.439)  | -4.995*<br>(2.703)   | -2.581<br>(2.602)    | -2.480<br>(2.674)    |
| $D_{ct} \times \text{Medium}$                                | 8.553***<br>(3.286)   | 2.954*<br>(1.706)    | 4.942*<br>(2.618)    | 2.252<br>(2.589)     | 3.275<br>(2.802)     |
| $D_{ct} \times \text{High}$                                  | 71.310***<br>(14.882) | 17.947***<br>(6.935) | 37.353***<br>(8.261) | 32.524***<br>(7.972) | 33.105***<br>(8.202) |
| Covariates                                                   | No                    | Yes                  | Yes                  | Yes                  | Yes                  |
| N                                                            | 11,240                | 7,512                | 6,692                | 7,244                | 7,420                |
| $R^2$                                                        | 0.704                 | 0.913                | 0.756                | 0.743                | 0.777                |

Notes: (1) Each coefficient estimate is based on Equation (1), with the treatment indicator further interacted with measures of city-level heterogeneity. Cities are classified according to their pre-BCP self-connectedness, measured as the log of the total number of social media posts divided by total population in 2013. Low, medium, and high self-connectedness correspond to the bottom, middle, and top terciles of the city distribution, respectively. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares employed in the secondary and tertiary sectors (percent), log registered unemployment (persons), log sales employment (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons). (3) All regressions include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. (4) Clustered standard errors at the city level are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 6.2 Alternative Mechanisms

### 6.2.1 Unequal Economic Gains and Distributional Conflict

An alternative mechanism is that broadband expansion generates unequal economic gains across worker groups and, in turn, heightens worker expectations and distributional tensions. If the benefits of improved digital infrastructure accrue disproportionately to more-educated workers, workers who benefit less may perceive widening economic inequality or greater unfairness, while improved access to information may make differences in wages and opportunities more visible. These changes can increase dissatisfaction and demands for a larger share of the economic gains, thereby contributing to labor unrest independently of broadband's effect on workers' ability to coordinate.

Table B10 provides suggestive evidence for this mechanism. Among lower-educated workers, BCP has no statistically significant effect on consumption or earnings, although working hours decrease by 1.6% and hourly wages increase by 3.1%. Relative to lower-educated workers, higher-educated workers experience additional increases of 7.7% in consumption, 7.2% in earnings, and 7.6% in hourly wages, together with an additional 1.5% reduction in working hours. These results indicate that the economic benefits of broadband expansion are substantially larger for higher-educated workers, consistent with skill-biased gains that may increase perceived inequality and distributional conflict. While this evidence does not directly establish that unequal gains cause strikes, it identifies a plausible complementary channel through which broadband expansion may increase labor unrest.

### 6.2.2 Labor Market Expansion

Another potential mechanism operates through labor-market expansion and increased economic scale. Existing evidence indicates that the BCP raises real GDP per capita growth (Cai and Wu, 2026), promotes skilled-service employment, firm creation, and innovation (Wang et al., 2022), and encourages entrepreneurship (Cheng et al., 2025). These changes may expand the number of worker-firm relationships and workplace interactions, creating more opportunities for wage arrears, contractual disagreements, and other labor conflicts. Consistent with this mechanism,

Table B7 shows that the estimated effects on strikes are concentrated in medium and large cities, where labor markets are larger and economic activity is more intensive.

Although these alternative mechanisms are plausible, the timing of the estimated effect suggests that they are unlikely to be the primary explanation. Figure 3 shows that strikes increase within the first treated quarter, with the estimated effect becoming positive and statistically significant immediately following BCP implementation. Unequal economic gains, changing worker expectations, and labor-market expansion generally require time for firms, workers, and local economies to adjust. By contrast, such a rapid response is more consistent with broadband access immediately reducing information and coordination costs among workers. Thus, while the alternative mechanisms may contribute to the longer-run effects, the timing of the increase in strikes more strongly supports the internet-mobilization mechanism.

## 7 Conclusion

Over the past half-century, worker strikes have experienced a global decline, even as the global economy has seen a simultaneous expansion of digital communication infrastructure. This paper examines whether and how the rollout of one such major communication infrastructure, fast internet, affects worker strikes and formal labor disputes. Exploiting the staggered rollout of the Broadband China Program across 117 pilot cities between 2014 and 2016 within a difference-in-differences design, we find that expanding fiber-optic broadband and 4G mobile networks significantly increases both worker strikes and formal labor disputes. These elevated levels of labor unrest persist for up to four years following policy adoption.

Detailed examination of dispute characteristics reveals important bounds on this mobilization. The rise in collective action is driven mostly by small-scale, localized actions involving fewer than 100 participants, primarily centered on wage arrears in private, lower-skilled industries such as construction, manufacturing, and services. In contrast, fast internet expansion has no observable effect on large-scale strikes or disputes seeking broader wage increases. Exploring underlying mechanisms, we find that treatment effects are heavily concentrated in cities with high pre-reform social media engagement, while microdata from domestic migrant workers indicates increased individual social connectedness and local organization participation following treatment.

Overall, these findings suggest that expanded broadband access lowers the information and coordination frictions associated with organizing worker strikes. In institutional environments where formal channels for labor representation are constrained, greater access provides lower-skilled workers with the necessary communication tools to share information and align incentives quickly. Consequently, the primary impact of expanded internet access is not to generate large-scale protests involving thousands of workers, but to facilitate small-scale, workplace-specific mobilizations centered on local grievances.

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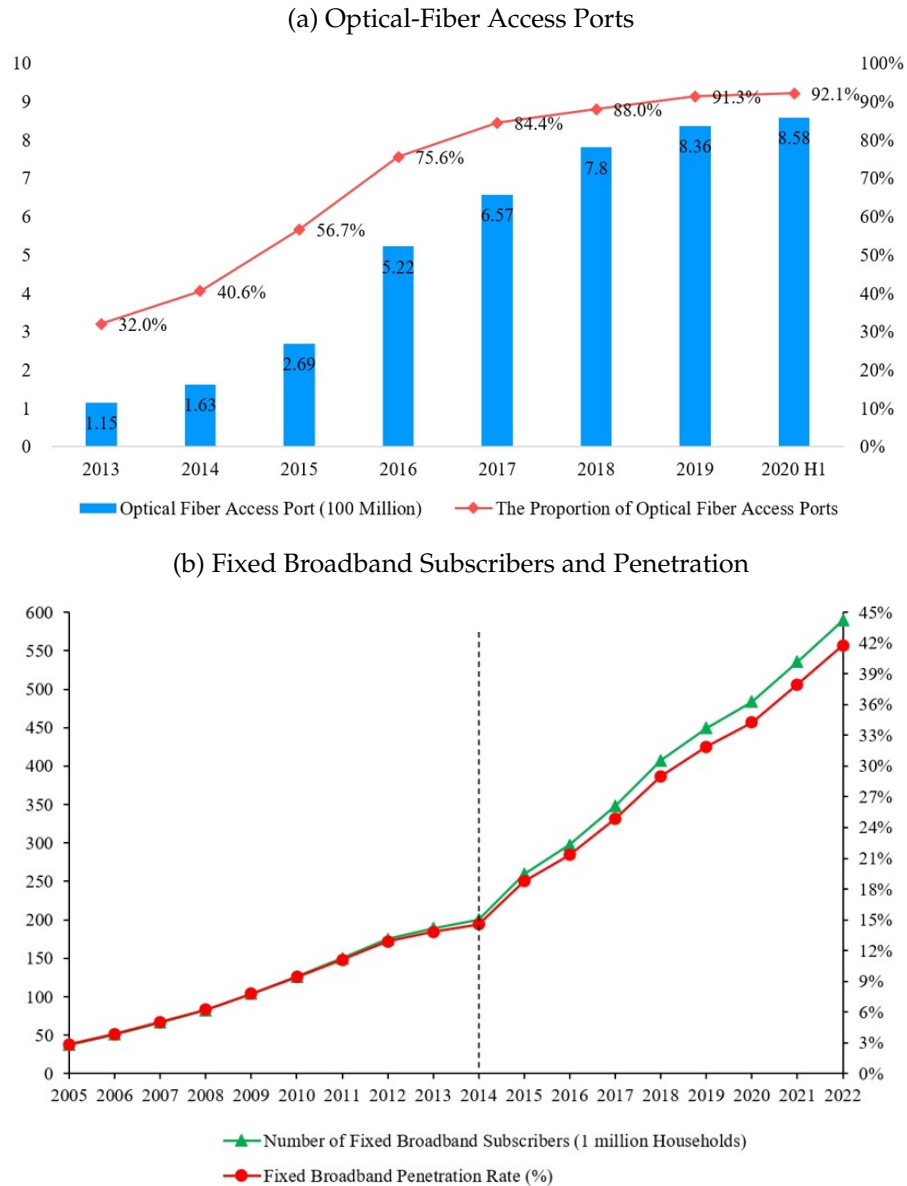
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# Appendix

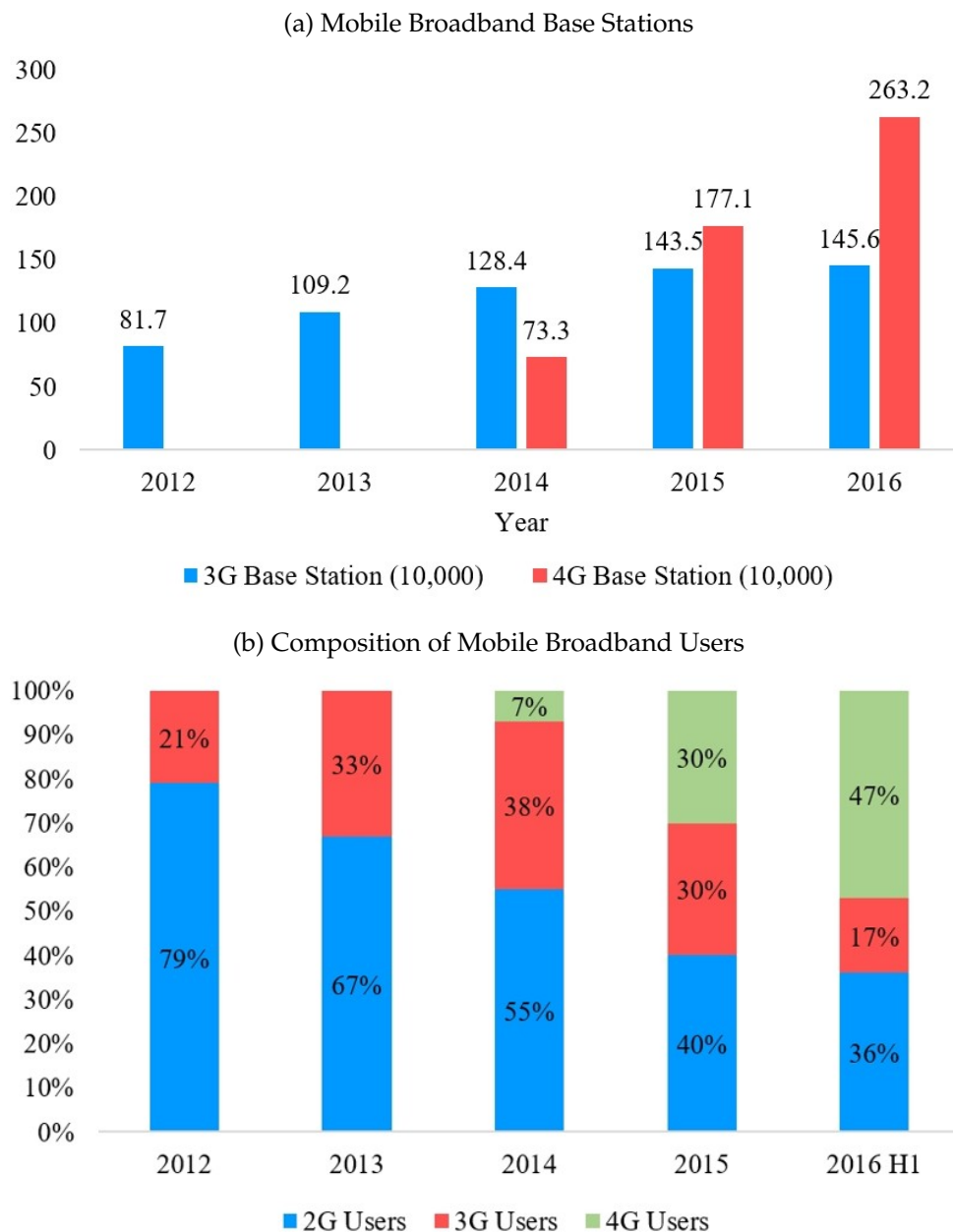
## A Additional Figures

Figure A1: Development of Fixed Broadband Infrastructure in China



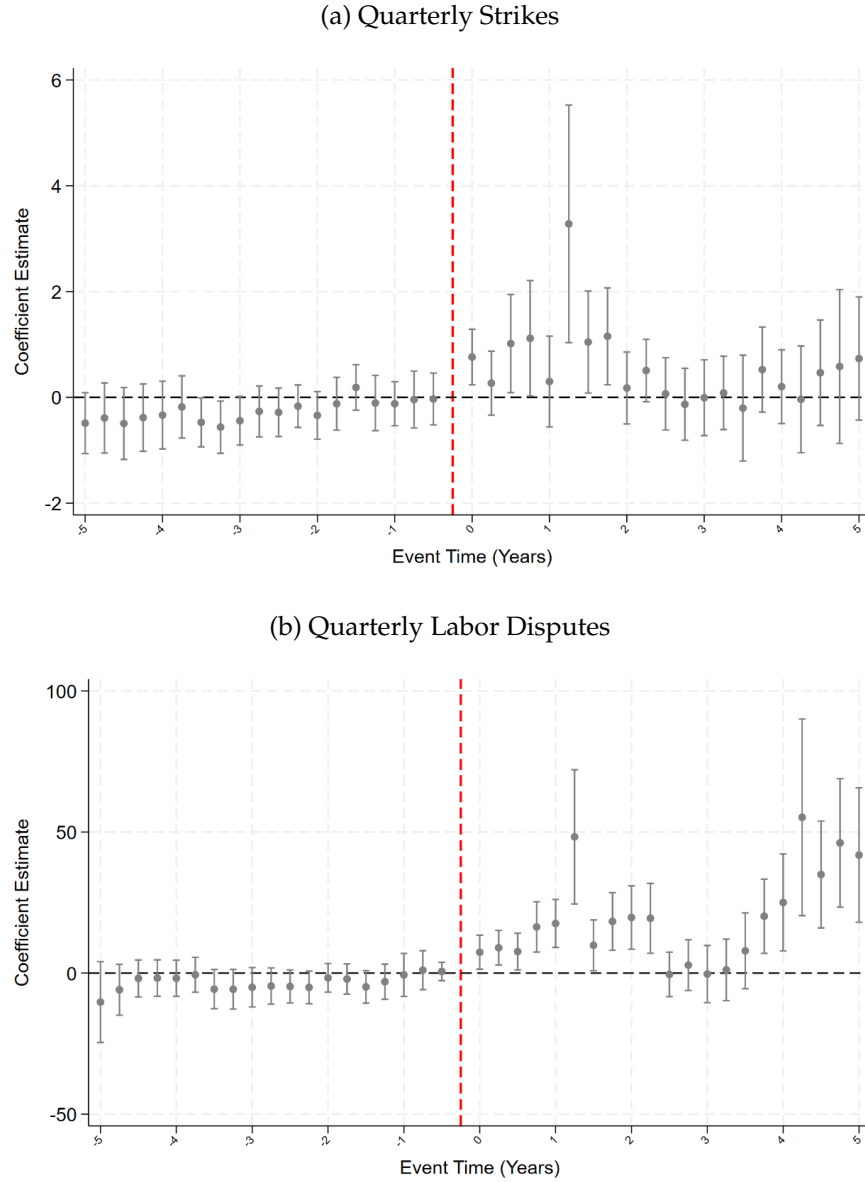
Notes: Panel (a) reports the total number of optical-fiber access ports and the proportion of broadband access ports using optical fiber from 2013 through the first half of 2020. The data are from the China Academy of Information and Communications Technology, <http://www.caict.ac.cn/english/>. Panel (b) reports the number of fixed broadband subscribers and the fixed broadband penetration rate from 2005 to 2022. The vertical dashed line indicates the first designation of Broadband China pilot cities in 2014. The data are from the *China Statistical Yearbook*, 2005–2022.

Figure A2: Development of Mobile Broadband Infrastructure and Use in China



Notes: Panel (a) reports the number of 3G and 4G mobile broadband base stations in China from 2012 to 2016, measured in units of 10,000 stations. Panel (b) reports the percentage of mobile broadband users relying on 2G, 3G, and 4G technologies from 2012 through the first half of 2016. The data in both panels are from the *China Statistical Yearbook*, 2005–2022.

Figure A3: Robustness Checks Using the Sun and Abraham (2021) Estimator



Notes: (1) Panels (a) and (b) present event-study estimates of the effect of the BCP on the quarterly numbers of strikes and labor disputes, respectively, using the estimator proposed by Sun and Abraham (2021). (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares employed in the secondary and tertiary sectors (percent), log registered unemployment (persons), log sales employment (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons). (3) Regressions also include year-quarter fixed effects, city fixed effects, and province-specific linear time trends. (4) The black solid circles represent the estimated coefficients for each year relative to the policy year ( $\tau = 0$ ). (5) The black vertical bars represent robust 95% confidence intervals that allow for arbitrary within-city error correlation. The red dashed line at event time  $-1$  marks the omitted baseline period.

## B Additional Tables

Table B1: Summary Statistics of Labor Disputes by Treatment Status

|                                                                | Treatment<br>N | Treatment<br>Mean | Control<br>N | Control<br>Mean | Difference |
|----------------------------------------------------------------|----------------|-------------------|--------------|-----------------|------------|
| <i>Panel A. Number of Labor Dispute Cases</i>                  |                |                   |              |                 |            |
| Number of labor dispute cases                                  | 4,480          | 12.718            | 10,000       | 4.030           | 8.688***   |
| Cases initiated by workers                                     | 4,480          | 7.777             | 10,000       | 2.516           | 5.262***   |
| Cases initiated by firms                                       | 4,480          | 4.941             | 10,000       | 1.514           | 3.427***   |
| <i>Panel B. Quarterly Number of Labor Dispute Cases</i>        |                |                   |              |                 |            |
| Quarterly number of labor dispute cases                        | 4,480          | 43.102            | 10,000       | 14.152          | 28.950***  |
| Quarterly number of cases initiated by workers                 | 4,480          | 26.170            | 10,000       | 8.841           | 17.329***  |
| Quarterly number of cases initiated by firms                   | 4,480          | 16.932            | 10,000       | 5.311           | 11.621***  |
| <i>Panel C. Proportion Associated with Labor Dispute Cases</i> |                |                   |              |                 |            |
| Proportion associated with labor dispute cases                 | 4,480          | 0.791             | 10,000       | 0.634           | 0.157***   |
| Proportion associated with worker-initiated cases              | 4,480          | 0.767             | 10,000       | 0.601           | 0.165***   |
| Proportion associated with firm-initiated cases                | 4,480          | 0.734             | 10,000       | 0.569           | 0.165***   |

Notes: (1) This table reports the mean values of the variables by treatment status. (2) The data are drawn from the China Judgments Online (CJO) database and cover court decisions involving labor disputes from 2013 to 2020. Cases are assigned to city-quarter observations according to the date and location of the court decision. (3) The final column reports the difference in means between treated and control observations. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B2: Pre-Treatment City Characteristics and BCP Cohort Timing

| Dependent variable                             | (1)<br>Pr(2014 cohort) | (2)<br>Pr(2015 cohort) | (3)<br>Pr(2016 cohort) |
|------------------------------------------------|------------------------|------------------------|------------------------|
| Log GDP                                        | −0.005<br>(0.083)      | 0.320**<br>(0.127)     | 0.096<br>(0.088)       |
| Real net income (RNI, ‰)                       | −0.002<br>(0.002)      | −0.001<br>(0.002)      | −0.001<br>(0.002)      |
| Log end-of-year population                     | −0.048*<br>(0.027)     | 0.014<br>(0.030)       | 0.022<br>(0.040)       |
| Log highway traffic flow                       | 0.056*<br>(0.031)      | −0.082*<br>(0.043)     | −0.037<br>(0.040)      |
| Log PM concentration                           | 0.000<br>(0.010)       | 0.013<br>(0.012)       | −0.014<br>(0.014)      |
| Secondary-sector employment share              | −0.003<br>(0.003)      | −0.003<br>(0.003)      | 0.002<br>(0.003)       |
| Tertiary-sector employment share               | −0.004<br>(0.003)      | −0.003<br>(0.003)      | 0.000<br>(0.003)       |
| Log registered unemployment                    | 0.004<br>(0.033)       | −0.138***<br>(0.039)   | −0.000<br>(0.030)      |
| Log sales-sector employment                    | 0.018<br>(0.025)       | −0.018<br>(0.034)      | 0.022<br>(0.029)       |
| GDP growth                                     | 0.004<br>(0.003)       | −0.004<br>(0.003)      | −0.003<br>(0.003)      |
| Secondary-sector GDP share                     | −0.002<br>(0.003)      | −0.004<br>(0.004)      | −0.004<br>(0.003)      |
| Primary-sector GDP share                       | −0.013***<br>(0.004)   | −0.007<br>(0.005)      | −0.002<br>(0.006)      |
| Log land allocated for administrative purposes | −0.016<br>(0.028)      | 0.009<br>(0.040)       | −0.013<br>(0.048)      |
| Log number of large-scale firms                | 0.026<br>(0.052)       | −0.149**<br>(0.072)    | 0.111**<br>(0.047)     |
| Log real-estate investment                     | −0.009<br>(0.033)      | 0.022<br>(0.031)       | −0.035<br>(0.038)      |
| Log commodity sales                            | 0.055<br>(0.052)       | −0.032<br>(0.072)      | −0.093<br>(0.068)      |
| Log local government expenditure               | 0.101<br>(0.061)       | −0.029<br>(0.062)      | −0.045<br>(0.053)      |
| Log average wage                               | 0.142<br>(0.113)       | −0.319**<br>(0.160)    | −0.116<br>(0.084)      |
| Log retirement-insurance enrollment            | 0.027<br>(0.043)       | −0.009<br>(0.054)      | 0.007<br>(0.041)       |
| Log medical-insurance enrollment               | −0.047*<br>(0.026)     | 0.028<br>(0.030)       | 0.034<br>(0.025)       |
| Log unemployment-insurance enrollment          | −0.004<br>(0.066)      | 0.031<br>(0.059)       | −0.023<br>(0.061)      |
| N                                              | 782                    | 782                    | 782                    |
| R <sup>2</sup>                                 | 0.375                  | 0.191                  | 0.137                  |

Notes: (1) Each column reports estimates from a separate OLS regression, where the dependent variable indicates assignment to the 2014, 2015, or 2016 BCP cohort. (2) All explanatory variables are measured during the pre-treatment period. (3) All regressions include year fixed effects, province fixed effects, and the full set of city-level characteristics reported in the table. (4) Standard errors clustered at the city level are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table B3: Effects of Broadband Expansion on Strikes by Sector

|          | (1)                | (2)               | (3)               | (4)              | (5)                | (6)              | (7)              |
|----------|--------------------|-------------------|-------------------|------------------|--------------------|------------------|------------------|
| Sector   | Construction       | Education         | Manufacturing     | Mining           | Service            | Transportation   | Other            |
| $D_{ct}$ | 0.323**<br>(0.133) | -0.031<br>(0.026) | 0.301*<br>(0.165) | 0.039<br>(0.028) | 0.099**<br>(0.049) | 0.031<br>(0.051) | 0.021<br>(0.024) |
| N        | 7,680              | 7,680             | 7,680             | 7,680            | 7,680              | 7,680            | 7,680            |
| $R^2$    | 0.499              | 0.161             | 0.635             | 0.195            | 0.460              | 0.230            | 0.137            |

Notes: (1) Each coefficient is estimated from a separate OLS regression based on Equation (1). The outcome variables are numbers of labor strikes at city-quarter level by sector. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares in the secondary and tertiary sectors (percent), log registered unemployment (persons), log employment in the sales sector (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons), all obtained from the CCSY. (3) All regressions include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. Standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table B4: Effects of Broadband Expansion by Firm Type and Form of Action

|          | (1)                 | (2)               | (3)                 | (4)                | (5)                | (6)                 |
|----------|---------------------|-------------------|---------------------|--------------------|--------------------|---------------------|
|          | Firm Type           |                   |                     |                    | Form of Action     |                     |
|          | Private             | SOEs              | Foreign-funded & JV | Unknown            | Protest            | Sitting In          |
| $D_{ct}$ | 0.500***<br>(0.185) | 0.083*<br>(0.046) | -0.002<br>(0.035)   | 0.203**<br>(0.096) | 0.365**<br>(0.159) | 0.510***<br>(0.174) |
| N        | 7,680               | 7,680             | 7,680               | 7,680              | 7,680              | 7,680               |
| $R^2$    | 0.594               | 0.295             | 0.654               | 0.389              | 0.609              | 0.514               |

Notes: (1) Each coefficient is estimated from a separate OLS regression based on Equation (1). The outcome variables are numbers of labor strikes at city-quarter level by firm type and form of action. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares in the secondary and tertiary sectors (percent), log registered unemployment (persons), log employment in the sales sector (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons), all obtained from the CCSY. (3) All regressions include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. Standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table B5: Effects of Broadband Expansion by Scale, Cause, and Resolution of Strikes

|                                    | (1)                 | (2)                       | (3)                   |
|------------------------------------|---------------------|---------------------------|-----------------------|
| <i>Panel A. Scale of Action</i>    |                     |                           |                       |
|                                    | Small (<100 people) | Medium (100-1,000 people) | Large (>1,000 people) |
| $D_{ct}$                           | 0.770***<br>(0.241) | 0.005<br>(0.075)          | 0.009<br>(0.029)      |
| N                                  | 7,680               | 7,680                     | 7,680                 |
| R <sup>2</sup>                     | 0.636               | 0.524                     | 0.363                 |
| <i>Panel B. Primary Cause</i>      |                     |                           |                       |
|                                    | Wage Arrear         | Compensation              | Pay Increase          |
| $D_{ct}$                           | 0.765***<br>(0.261) | 0.013<br>(0.055)          | -0.037<br>(0.033)     |
| N                                  | 7,680               | 7,680                     | 7,680                 |
| R <sup>2</sup>                     | 0.615               | 0.567                     | 0.339                 |
| <i>Panel C. Resolution Outcome</i> |                     |                           |                       |
|                                    | Suppression         | Police Standby            | Peaceful Ending       |
| $D_{ct}$                           | 0.056<br>(0.045)    | 0.369**<br>(0.148)        | -0.035<br>(0.035)     |
| N                                  | 7,680               | 7,680                     | 7,680                 |
| R <sup>2</sup>                     | 0.332               | 0.507                     | 0.408                 |

Notes: (1) Each coefficient is estimated from a separate OLS regression based on Equation (1). The outcome variables are numbers of labor strikes at city-quarter level by scale, cause, and outcome. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares in the secondary and tertiary sectors (percent), log registered unemployment (persons), log employment in the sales sector (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons), all obtained from the CCSY. (3) All regressions include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. Standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table B6: Heterogeneous Effects of Broadband Expansion across Pre-BCP Strike Profiles

|                                | (1)                 | (2)                 | (3)               | (4)               | (5)                 | (6)                  | (7)               | (8)               |
|--------------------------------|---------------------|---------------------|-------------------|-------------------|---------------------|----------------------|-------------------|-------------------|
|                                | Overall             | Construction        | Education         | Manufacturing     | Mining              | Service              | Transportation    | Other             |
| $D_{ct}$                       | -0.035<br>(0.192)   | -0.165<br>(0.134)   | -0.022<br>(0.024) | 0.052<br>(0.089)  | 0.140***<br>(0.046) | -0.144***<br>(0.045) | 0.075*<br>(0.044) | 0.034<br>(0.032)  |
| $D_{ct} \times \text{Level 2}$ | 0.203<br>(0.266)    | 0.213<br>(0.170)    | -0.053<br>(0.039) | 0.042<br>(0.106)  | -0.113*<br>(0.059)  | 0.119*<br>(0.064)    | -0.035<br>(0.078) | -0.054<br>(0.038) |
| $D_{ct} \times \text{Level 3}$ | 1.492***<br>(0.462) | 0.812***<br>(0.254) | 0.018<br>(0.044)  | 0.459*<br>(0.263) | -0.120*<br>(0.062)  | 0.395***<br>(0.089)  | -0.061<br>(0.088) | 0.011<br>(0.046)  |
| N                              | 7,680               | 7,680               | 7,680             | 7,680             | 7,680               | 7,680                | 7,680             | 7,680             |
| $R^2$                          | 0.692               | 0.502               | 0.162             | 0.636             | 0.196               | 0.462                | 0.230             | 0.137             |

Notes: This table reports heterogeneous effects of broadband expansion on strikes across cities with different levels of pre-BCP strike activity. (1) Coefficients in each column are estimated from a separate OLS regression based on Equation (1). The outcome variables are the total number of strikes and the number of strikes by industry. Pre-BCP strike profiles are constructed using each city's average number of strikes prior to BCP adoption. Level 1 denotes cities with no pre-BCP strikes, Level 2 denotes cities with positive strike activity below the 75th percentile (0.1 strikes per quarter), and Level 3 denotes cities above this threshold. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares in the secondary and tertiary sectors (percent), log registered unemployment (persons), log employment in the sales sector (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons), all obtained from the CCSY. (3) All regressions include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. Standard errors are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table B7: Heterogeneous Effects of Broadband Expansion across City Scales

|                               | (1)                 | (2)                 | (3)               | (4)                | (5)                | (6)                 | (7)               | (8)               |
|-------------------------------|---------------------|---------------------|-------------------|--------------------|--------------------|---------------------|-------------------|-------------------|
|                               | Overall             | Construction        | Education         | Manufacturing      | Mining             | Service             | Transportation    | Other             |
| $D_{ct}$                      | -0.188<br>(0.201)   | -0.065<br>(0.096)   | -0.017<br>(0.019) | -0.079<br>(0.119)  | 0.075**<br>(0.037) | -0.108**<br>(0.047) | -0.012<br>(0.047) | 0.032<br>(0.025)  |
| $D_{ct} \times \text{Medium}$ | 0.838***<br>(0.301) | 0.244<br>(0.149)    | -0.026<br>(0.041) | 0.395**<br>(0.190) | -0.049<br>(0.052)  | 0.234***<br>(0.065) | 0.043<br>(0.056)  | -0.045<br>(0.037) |
| $D_{ct} \times \text{Large}$  | 1.955***<br>(0.586) | 0.861***<br>(0.313) | -0.009<br>(0.046) | 0.679**<br>(0.319) | -0.049<br>(0.062)  | 0.343***<br>(0.113) | -0.011<br>(0.074) | 0.020<br>(0.050)  |
| N                             | 7,680               | 7,680               | 7,680             | 7,680              | 7,680              | 7,680               | 7,680             | 7,680             |
| $R^2$                         | 0.693               | 0.502               | 0.161             | 0.636              | 0.196              | 0.462               | 0.655             | 0.137             |

Notes: This table examines whether the effects of broadband expansion on strikes vary across cities of different sizes, where cities are classified as small, medium, or large based on their pre-treatment registered (*hukou*) population. Small cities fall below the 25th percentile of the population distribution, medium cities lie between the 25th and 75th percentiles, and large cities exceed the 75th percentile. (1) Coefficients in each column are estimated from a separate OLS regression based on Equation (1). The outcome variables are the total number of strikes and the number of strikes by industry. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares in the secondary and tertiary sectors (percent), log registered unemployment (persons), log sales employment (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons). (3) Regressions also include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. (4) Standard errors clustered at the city level are reported in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table B8: Impact of the Broadband China Program on Strikes and Labor Disputes

|                                                              | (1)                  | (2)                  | (3)                  | (4)                  |
|--------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|
|                                                              | One-year             | Two-year             | Three-year           | Overall              |
| <i>Panel A. Dependent Variable: Number of Strikes</i>        |                      |                      |                      |                      |
| $D_{ct}$                                                     | 0.692**<br>(0.308)   | 1.013***<br>(0.344)  | 0.734***<br>(0.279)  | 0.479**<br>(0.234)   |
| N                                                            | 7,680                | 7,680                | 7,680                | 7,680                |
| $R^2$                                                        | 0.661                | 0.661                | 0.661                | 0.661                |
| <i>Panel B. Dependent Variable: Number of Labor Disputes</i> |                      |                      |                      |                      |
| $D_{ct}$                                                     | 11.584***<br>(3.082) | 17.115***<br>(4.002) | 13.495***<br>(3.370) | 17.835***<br>(4.191) |
| N                                                            | 7,680                | 7,680                | 7,680                | 7,680                |
| $R^2$                                                        | 0.835                | 0.835                | 0.835                | 0.835                |

Notes: (1) The estimates are obtained using the estimator proposed by Sun and Abraham (2021). Each reported coefficient is the average of the event-study coefficient estimates over the indicated post-treatment period from the same event-study regression. (2) Covariates include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares employed in the secondary and tertiary sectors (percent), log registered unemployment (persons), log sales employment (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons). Regressions also include year-quarter fixed effects, city fixed effects, and province-specific linear time trends. (3) Standard errors clustered at the city level are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B9: Robustness to Alternative Specifications of City-Level Characteristics

|                                                              | (1)                     | (2)                                  | (3)                                                  | (4)                                                                       |
|--------------------------------------------------------------|-------------------------|--------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------|
| Model setting                                                | No city characteristics | Contemporaneous city characteristics | 2011 city characteristics $\times$ linear time trend | Pre-treatment city (2011–2013) characteristics $\times$ linear time trend |
| <i>Panel A. Dependent Variable: Number of Strikes</i>        |                         |                                      |                                                      |                                                                           |
| $D_{ct}$                                                     | 0.664***<br>(0.177)     | 0.797***<br>(0.278)                  | 0.888***<br>(0.300)                                  | 0.953***<br>(0.289)                                                       |
| N                                                            | 14,480                  | 7,680                                | 10,520                                               | 11,360                                                                    |
| $R^2$                                                        | 0.558                   | 0.690                                | 0.584                                                | 0.590                                                                     |
| <i>Panel B. Dependent Variable: Number of Labor Disputes</i> |                         |                                      |                                                      |                                                                           |
| $D_{ct}$                                                     | 31.574***<br>(7.237)    | 6.328*<br>(3.584)                    | 4.592<br>(3.717)                                     | 5.280<br>(3.502)                                                          |
| N                                                            | 14,480                  | 7,680                                | 10,520                                               | 11,360                                                                    |
| $R^2$                                                        | 0.682                   | 0.912                                | 0.893                                                | 0.890                                                                     |

Notes: (1) Each coefficient is estimated from a separate OLS regression. (2) City characteristics include log GDP (current-year prices, 10,000 yuan), real net income (RNI, %), log end-of-year population (10,000 persons), log highway traffic flow (10,000 persons), log PM concentration ( $\mu\text{g}/\text{m}^3$ ), population shares employed in the secondary and tertiary sectors (percent), log registered unemployment (persons), log sales employment (persons), GDP growth (percent), GDP shares of the primary and secondary sectors (percent), log land allocated for administrative purposes ( $\text{km}^2$ ), log number of large-scale firms, log real estate investment (10,000 yuan), log commodity sales (10,000 yuan), log local government expenditure (10,000 yuan), log average wage (yuan), and log enrollments in retirement, medical, and unemployment insurance programs (persons). (3) Regressions in columns (2)–(4) also include year-quarter fixed effects, city fixed effects, and city-specific linear time trends. (4) Standard errors clustered at the city level are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B10: Heterogeneous Treatment Effects by Education

| Dependent variable                     | (1)<br>Consumption<br>(log) | (2)<br>Earnings (log) | (3)<br>Working Hours<br>(log) | (4)<br>Hourly Wage<br>Rate (log) |
|----------------------------------------|-----------------------------|-----------------------|-------------------------------|----------------------------------|
| $D_{ct}$                               | −0.005<br>(0.012)           | −0.006<br>(0.011)     | −0.016**<br>(0.008)           | 0.031**<br>(0.013)               |
| $D_{ct} \times \text{Higher-educated}$ | 0.077***<br>(0.019)         | 0.072***<br>(0.013)   | −0.015***<br>(0.006)          | 0.076***<br>(0.013)              |
| Observations                           | 978,053                     | 931,535               | 792,091                       | 785,024                          |
| $R^2$                                  | 0.341                       | 0.212                 | 0.135                         | 0.298                            |

Notes: (1) Each coefficient estimate is from a separate OLS regression. Models are weighted based on individual sample weight. (2) All specifications control for individual age, square terms of age, gender, education, ethnicity (Han or not), marital status, employer status, self-employed status, household size, workers' average wage (log), employment density (log), the number of large firms (log), and the number of broadband subscribers (log). (3) All specifications also control for fixed effects of city, survey years, and workers' birth years, province-specific linear time trend, and city-level urban unemployment rate. (4) The distributions for lower-educated and higher-educated worker cohorts are 64.64% and 35.36%, respectively. (5) Due to data availability, the estimations reported in columns (3) and (4) are based on the 2011–2013 and 2015–2018 waves of the CMDS. (6) Clustered standard errors at the city level are reported in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .