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Alex Bryson, Mari Tanaka

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Authors

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RFBerlin
ROCKWOOL Foundation Berlin –
Institute for the Economy
and the Future of Work

Gormannstrasse 22, 10119 Berlin
Tel: +49 (0) 151 143 444 67
E-mail: info@rfberlin.com
Web: www.rfberlin.com

Unions in Developing Countries *

Alex Bryson[1] and Mari Tanaka[2]

[1]University College London
[2]University of Tokyo/Hitotsubashi University

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Abstract

The effects of trade unions on firm performance are theoretically ambiguous. The sizable empirical literature on their effects is almost exclusively confined to developed countries, particularly those in North America and Europe. We contribute to the literature by estimating union effects on firm performance in about 40,000 firms in 77 developing countries between 2002 and 2011. In doing so, we exploit standardized firm-level data collected by the World Bank. We find positive partial correlations between unionization and firm labor productivity and wages, especially in lower-income countries. These positive effects persist when we instrument for union presence, consistent with recent evidence of union positive effects on productivity and wages in western industrialized countries.

JEL: J51
Key Words: trade unions; productivity; wages; developing countries; enterprise data; union formation

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1 Introduction

Trade unions are membership organizations consisting of workers who, by virtue of their collective membership, can increase their bargaining power vis-a-vis employers with a view to improving their terms and conditions of employment. Unions achieve this by operating as a cartel to monopolize the supply of labor to the firm. By virtue of this function, often termed their 'monopoly face' (Freeman and Medoff, 1984a,b) unions can affect a number of firm-level outcomes which impact labor productivity and firm profitability. The "monopoly face" of trade unions is only one aspect of the union good which workers purchase on membership. A second is unions' 'voice face' through which trade unions offer a collective "voice" at the firm, representing members' interests in a number of settings beyond collective bargaining. The net effect of these functions on firm performance is theoretically ambiguous, since the mechanisms can offset one another, and firms may be heterogeneous in their responses to unions' bargaining power. The empirical research testing theoretical predictions regarding union effects on workers and firms is extensive, going all the way back to Smith (1776) and to Marx and Engels' work on factory labor in England in the 19th century (Marx, 1867; Engels, 1845). The literature has gone through many phases, with estimates reflecting changes in union strength, institutional structures, and the advent of new and better data and estimation techniques. However, this extensive empirical literature is almost exclusively confined to developed countries, mainly in North America and Europe.

We contribute to the literature in three ways. First, we estimate the partial correlation between union presence at the firm and firm performance indicators (sales per employee and payroll per employee) in about 40,000 firms in 77 developing countries surveyed by the World Bank using a common methodology and survey design.

Second, we explore heterogeneity in these associations across dimensions where theory suggests that we should find heterogeneity, such as the percentage of employees who are union members and the country's income level.

Third, we recover the causal impact of trade unions on firm-level outcomes in developing countries. In doing so, our main contribution is to develop a theoretical framework which helps explain union formation in developing countries, and use this as the basis for an instrumental variables (IV) strategy which exploits variance in the natural rate of unionization across industries to which firms belong using the unionization rate among firms in the same industry in other countries. To obtain our instrument, we interact this natural rate of unionization with the strength of a country's rule of law and freedom of association. Taken together, these create the conditions for unions to be formed.

We find the partial correlation between unionization (both union presence and union

density) is positive and sizable for labor productivity and wages. These associations are most apparent in lower-income countries. When we instrument for firm unionization, we find the positive coefficients persist. Union effects on firm labor productivity are quite large, suggesting our IV strategy is capturing a Local Average Treatment Effect (LATE) where the compliers are those firms in industries with a high natural rate of unionization where the rule of law is sufficient to create the environment in which trade unions can flourish.

2 Conceptual Framework

Our goals in this section are twofold. First, we provide a theoretical framework to address the question: "What are the preconditions necessary for a union to be formed?", particularly in the context of developing countries. Most of the literature focuses on workers' decision to join an existing union (the free-riding problem presented by Olson (1965)) rather than union formation.[1] One of our contributions to the literature is to focus on the issue of union formation and to do so in a standard economic framework. Our model allows us to derive country- and industry-specific preconditions for union formation - which we test empirically in a later section - and offers an identification strategy for exploring the impact of union presence on firm outcomes.

The second goal of this section is to summarize predictions about the impact of union formation on firm outcomes based on the prior theoretical and empirical literature in developed countries.

2.1 Union Formation

What are the preconditions necessary for a union to be formed, particularly in the context of developing countries? In this section, we derive country- and industry-specific preconditions for union formation based on a theoretical framework.

Trade unions are voluntary associations of workers constituted for the purpose of representing workers' interests. Representation can be beneficial from a worker's perspective in aggregating and conveying worker preferences to the employer ("voice") or in strengthening workers' bargaining position vis-a-vis the employer, as might be the case where workers are able to threaten collective withdrawal of their labor ("monopoly") (Freeman and Medoff, 1984b). These two functions of a labor union may generate worker demand for representation, however, its supply is not guaranteed.

[1] Although some studies empirically examine how union formation affects firm outcomes (DiNardo and Lee, 2004b), they do not answer this question.

Most of the literature has focused on the collective action problem arising from the fact that the "good" unions offer is largely a public good. The absence of private excludable goods means that workers behaving rationally might prefer to free-ride on the organizing efforts of others, rather than invest their own time and effort in forming a union. This incentive problem, which can limit the supply of worker representation by a union, is what (Olson, 1965) termed the first-order problem of collective action.[2]

However, as others have noted (Hyman, 2025), this leaves open the question as to who supplies the union good in the first instance? We begin by distinguishing between "activists" and ordinary workers. Hirschman (1970) argues that the former have different utility functions in which the returns to collective action are not financial returns minus costs - as they are for ordinary members - but instead are the *sum* of the two since a positive value is put on activism itself. Activists may thus trigger union formation in circumstances where ordinary workers may not.[3]

Although activists' utility functions suggest unions are most likely to be formed where activists are present, they are not a sufficient condition to guarantee the supply of the union good. This will depend on the actions and behaviors of two additional sets of economic actors, namely the state and employers.

It is against this background that we consider a model of union organizing in industry j and country c, in which there are four types of actors to consider, namely the state (government), employers, workers and union organizers. We take each in turn.

State (government)

Establishing a union requires a legal framework, supported by a high quality court and law enforcement system, and a political landscape that enforces rights to Freedom of Association. These conditions were absent in the first quarter of the 19th Century in England.[4] In the

[2]It can be overcome with state intervention supporting a closed shop, whereby union membership is effectively compulsory to undertake a job in a union-covered environment, or through the provision of private incentive goods depending on membership. However, as others have argued closed shop arrangements are outlawed or never existed in many countries, whilst unions' ability to offer private excludable goods is limited. Furthermore, even if coercion is a solution to the free rider problem, coercion is unlikely to be costless. Booth (1985) alternatively suggests that, even in the absence of compulsion, social customs may result in peer pressure to join a union, and in a loss of reputation associated with free riding. There can thus be an economic incentive to join a group as long as a social custom exists for doing so.

[3]Activists may also assist with what Olson (1965) refers to as the second order collective action problem, namely the costliness of continuing to provide the union good to union members. They can do so by reducing the administrative costliness to the trade union of providing the union good (Willman, 2004; Willman and Bryson, 2009).

[4]As Hyman (1975) p.33 notes: "For the first quarter of the Nineteenth Century, the notorious Combination Acts outlawed virtually every aspect of union activity or organization". He goes on to review accounts by Marx, Engels and the Webbs regarding the "often tyrannical behaviour" of employers "involving every possible effort to smash collective organization". Hyman says: "Trade unionists, if discovered, were dismissed

United States, worker demands for representation were realized only after a constitutional ruling by the Supreme Court in 1937[5] that gave effect to the Wagner Act passed by Congress in 1935 (Freeman, 1997).

In many developing countries, trade unions face major legal challenges to union formation (ITUC, 2025). In some cases, independent union formation and union activities are prohibited by law. This was the case in Myanmar prior to the Labor Organization Law in 2011 (Boudreau et al., 2025), Vietnam (until the Labor Code in 2019), and continues to be the case in countries such as Saudi Arabia, the United Arab Emirates (UAE) and Iran. Most of these countries have not ratified the International Labor Organization's (ILO)'s Freedom of Association Code.[6]

In some instances, even though countries' laws and regulations permit formation and activities of independent trade unions, they do not effectively protect independent union leaders from being harassed or dismissed by employers. A widespread issue that organizers face is that they are fired during the process of forming a union (Human Rights Watch, 2015a,b; ITUC, 2025).[7] Although leaders may appeal to the local government office or court for redress, whether they are successful will depend on the country's legal system and quality of courts and case-handling of local government offices. State accountability may also matter because employers may bribe government officers. In addition, oftentimes union activists are also leaders of broader social movements seeking societal change for all citizens, not just workers. Examples include leaders of the Solidarity Movement in Poland (Pakulski, 1986), union opposition to Franco in Spain (Fishman, 1990) and in Myanmar (Boudreau et al., 2025). For these reasons, when defining the type of rule of law that facilitates union formation, we need to consider a concept broader than freedom of association related to labor unions.

In our model, we denote the strength of rule of law and freedom of association by G_c. To keep the model simple, we take this to be exogenous and abstract away from government decisions about how to legislate on and maintain the Rule of Law.[8]

Employers

and evicted from company-owned housing; activists were blacklisted throughout whole districts; employees were forced to sign a 'document' undertaking not to become a member of any union".

[5]NLRB v. Jones & Laughlin Steel Corp

[6]The ILO identifies 29 non-signatories to Article 87 on Freedom of Association and 19 non-signatories to Article 98 on the Right to Organize and Collective Bargaining.

[7]Other recent cases reported in the press include dismissals of union activists at Goodyear workers in Mexico, and subcontracted workers at Daewoo Shipbuilding in South Korea, as well as the murder of union activists in Columbia.

[8]In reality, it may be the choice of government whether to encourage union organizing through legislative means or to repress them.

Employers may impact the cost of union organizing depending upon the extent to which they value worker representation (Bryson and Forth, 2023). Whether employers perceive unions to be beneficial or not will vary with the employer's production function and the nature of the product and labor markets it faces. The net benefits of having a union are therefore heterogeneous across employers depending, for example, on the value of the union's provision of worker voice (reflecting the costliness of worker exit, for instance) and the availability of alternative voice mechanisms (Willman et al., 2020). The cost of being unionized is an increase in labor costs arising from union collective bargaining (the union's "monopoly face").

Based on the costs and benefits they perceive, employers may try to prevent union formation, for example by dismissing organizers (before the union is formed), as noted above. How feasible it is for employers to do so depends on the government's protection of unions. Therefore, we denote employers' actions by $E(G_c)$ as a function of the country's rule of law and freedom of association.

Ordinary workers

The demand for the union good from ordinary workers, discussed above, derives from the expectations they have about the ability of the union to deliver worker representation at the workplace via "voice", and the returns to union bargaining over terms and conditions of employment, including wages. Workers face heterogeneous costs and benefits in organizing which differ according to circumstances. For instance, workers are most likely to form unions in large firms with high rents where, via bargaining, they can share those rents. Conversely, the net returns to unionization can be greatest in firms where workers face the greatest problems, such as sectors with occupational safety difficulties (mining, construction, manufacturing factories using machinery).

We denote ordinary workers' benefits from unionization as W_j and their utility as $u(W_j)$.

Union organizers

Unions will only form if potential union organizers (activists) decide to organize workers. As noted above, we argue that their utility function differs from ordinary workers because activism itself is perceived as a benefit, rather than a cost. Even so, activists may be disinclined to organize in settings where doing so exposes them or their families to personal risk.

In developed countries, union leadership is often a "job". Professional union organizers may be paid a salary by the union, which ultimately comes from the fees paid by unionized workers. Even where the union organizer is not paid for the role, and they are instead "lay" representatives of the union drawn from the ranks of workers at the firm, they may receive

facilities and time to perform their union function from the employer, or by statutory right via the state. Being a union representative can even be perceived by employers as a positive signal that the worker is prepared to take on a leadership role, a role that implies investment in the firm's workforce. As such, they may have promotion advantages at the firm after taking these positions (see, for example, Budde et al. (2025) in Germany).

However, these situations are more likely in developed countries where the institution of unions is well-developed. In the absence of state and/or employer support, union organizers are less likely to benefit financially from taking up the role. Instead, they are more likely to select into a union organizing role based on distinct personality traits (such as intrinsic motivation) to provide public goods. As shown in the context of Myanmar by Boudreau et al. (2025), union leaders tend to earn less but are more altruistic, as well as more extravert, conscientious, and neurotic - traits associated with stronger leadership — compared to other workers in the same factories.

Assuming such altruistic activists, the benefit of unionization to ordinary workers ($u(W_j)$) will feature in union activists' utility functions.[9]

There are two types of costs union organizers face when unionizing a workplace. The first we term private cost 1 (denoted by $C_1(N_j)$). It is the cost in time and effort that organizers incur to build consensus and mobilize workers (Boudreau et al., 2025). The magnitude of the cost depends on the nature of workers in the industry (denoted by N_j for industry j). In particular, homogeneity across workers in tasks and skill sets leads to homogeneity in preferences (and common sets of problems in the workplace), making it easier for union organizers to identify and aggregate worker preferences, for example, in relation to bargaining objectives. Consistent with this notion, (Biasi et al., 2025) show in the US setting that occupational wage inequality within firms undermines the solidarity that leads to union formation. The physical location of workers also matters: the location of workers on a single site lowers the costs of communication. These factors lower the marginal costs of union organizing.

The quintessential example of a setting characterized by the homogeneous preferences of workers with high potential benefits of organizing whilst facing low marginal costs due to their physical proximity is that of dockworkers in the United States and the United Kingdom in the late 19th and early 20th Centuries (Davies et al., 2000). These dock workers queued each morning for available dock work and those picked for work received a day's pay, which

[9]It will also enter the decision-making of ordinary workers who are more likely to join a union where the benefits are greater (Lentz, 1980). This is likely to generate higher union density and thus a greater share of workers voting for unionization. The model prediction is the same even if we consider the union density as a function of W_j and assume that it also enters activists' utility. For simplicity, we abstract away from this point.

the dock employers were able to keep low due to the surplus supply of dock laborers. This spot market worked to the advantage of dock employers, but to the detriment of dock workers whose employment and wages were wholly dependent upon the daily vagaries of queuing for dock work.

A solution to this problem for the workers was the formation of a trade union capable of disrupting the supply of labor to the employer. A successful union capable of monopolizing the supply of labor to the employer could use its bargaining power to secure both higher wages for the dock workers and the establishment of more stable employment contracts, thus disrupting the spot market for dock labor (Davies et al., 2000). Similar daily-wage jobs for low-skilled workers are common in developing countries setting.

The second type of cost for organizers is what we term private cost 2 (denoted by $C_2(G_c)$) which is the risk of dismissal or demotion by the employer due to their efforts to form a union. After being fired, these workers may be black-listed in other factories and lose outside options too. These are often known as unfair employment practices. In developed countries, when workers file these cases to government offices or courts, employers can be punished and/or employment can be reinstated. In developing countries, union activists may face problems due to weak rule of law and weak protection of freedom of association. Low G_c lowers the costs employers face in opposing unions $E(G_c)$, leaving workers more vulnerable to unfair labor practices, therefore increasing the costs of unionizing for organizers $C_2(G_c)$. Thus, C_2 is a decreasing function.

In this simple framework, the decision of an organizer to unionize or not is determined by the following utility function of the potential organizer. The leader's utility when choosing to organize a union is

$$U_{jc} = u(W_j) - C_1(N_j) - C_2(G_c), \tag{1}$$

and 0 otherwise (the outside option is normalized to 0). A union leader decides to organize if this utility is positive.[10]

Based on this framework, we can derive four potential cases based on values of G_c and $u(W_j) - C_1(N_j)$.

1. (Low G_c & Low $u(W_j) - C_1(N_j)$) Weak rule of law (high private cost $C_2(G_c)$), low benefits relative to the cost for organizers to form a union: No Union

2. (Low G_c & High $u(W_j) - C_1(N_j)$) Weak rule of law (high private cost $C_2(G_c)$), high

[10]In this model, we assume that the union is formed with probability one if the organizers made the effort to form it. Alternatively, we can consider a model where the chance of formation is indicated by probability $p(G_c)$, which is an increasing function of the country's rule of law and freedom of association G_c, and redefine the organizer's utility function as $U_{jc} = u(W_j)p(G_c) - C_1(N_j) - C_2(G_c)$. The basic model predictions do not change in this alternative framework.

benefits relative to the cost for organizers to form a union: No Union because it is costly for the organizers to form a union even though workers want it ("frustrated demand for unionization")

3. (High G_c & Low $u(W_j) - C_1(N_j)$) Strong rule of law (low private cost $C_2(G_c)$), low benefits relative to the cost for organizers to form a union: No Union.

4. (High G_c & High $u(W_j) - C_1(N_j)$)) Strong rule of law (low private cost $C_2(G_c)$), high benefits relative to the cost for organizers to form a union: Union presence.

This setting suggests that low private costs of organizing and a strong rule of law are both necessary conditions for union formation. But neither are sufficient on their own. Having only one factor is not enough: it is important to have both factors for trade unions to be formed.

2.2 Predicted Impacts of Union Presence on Firms and Workers from the Literature

We turn to the predicted impact of having a union present on firm and worker outcomes. The literature on this question is thin in developing countries but extensive in developed countries, thus we summarize this literature in developed countries in this subsection.

Trade unions' ability to monopolize the supply of labor to the firm is at the heart of unions' bargaining power vis-a-vis the employer. This monopoly power may rise with the percentage of workers belonging to the union, since this increases the union's ability to credibly threaten to limit the supply of labor to the firm. The union's bargaining power can affect a number of firm-level outcomes including labor costs (via the wage premium union bargaining can procure); labor turnover (increasing tenure by reducing the attractiveness of outside options which pay market-set pay rates); the quality of hires (by offering above market-set wages); capital intensity (by shifting the price of labor relative to capital); and employment growth (the higher price of unionized labor impacting labor demand). All of these mechanisms can, in turn, impact labor productivity and firm profitability. But the net effects are theoretically ambiguous since the mechanisms can offset one another, and firms may be heterogeneous in their responses to unions' bargaining power.

Furthermore, unions perform a range of other functions which can, in theory, impact firm performance. The one that has received most attention in the literature is what Freeman and Medoff (1984a,b) call their "voice face", through which trade unions offer a collective voice at the firm, representing members' interests in a number of settings beyond collective bargaining. These include grievance and disciplinary procedures, consultation over training,

the introduction and maintenance of management practices and organizational innovations, and the provision of information to workers about firm strategy and operations which they may not have received in the absence of the union. Applying Hirschman's (1970) *Exit, Voice, Loyalty* model to employment relations, Freeman and Medoff (1984a,b) argue that trade unions, by offering workers a 'voice' at work, extend labor contracts by reducing the rate at which dissatisfied workers leave the firm. Again, this has potentially profound consequences for firm performance.

The "voice" effect of trade unions implies that firms will be more willing to invest in workers' human capital, for instance through employer-funded training, in a union setting where they anticipate an increased likelihood of recovering the returns from those investments. Worker voice can also assist firms in optimizing their organizational innovations where trade unions aggregate and communicate the tacit knowledge workers have about production which, in the absence of the union, they would have no incentive to provide. However, by slowing the rate at which dissatisfied workers exit the firm, the union can increase the stock of dissatisfied workers in the firm, with potential adverse consequences for their effort and performance. Unions may also directly impact worker dissatisfaction, for example, by providing them with information about the firm's behavior which they may not have been privy to in the absence of the union, or else via 'voice-induced complaining' (Freeman and Medoff, 1984a) whereby unions foment dissatisfaction to strengthen their position vis-a-vis the employer.

The empirical research testing theoretical predictions regarding union effects on workers and firms is possibly the most extensive empirical literature in labor economics. The early literature established a robust conditional association between unionization and higher wages, both at industry and individual worker-level (Lewis, 1963, 1986) - consistent with a monopoly face effect, together with increases in job tenure and job dissatisfaction, both of which are consistent with union 'voice' (Borjas, 1979). These associations were often accompanied by negative associations with capital innovation (Grout, 1984) and employment growth (Blanchflower et al., 1992), zero effects on firm closure (Freeman, 1997) and a wide range of results in relation to productivity (Doucouliagos and Laroche, 2003). The implication appeared to be that, in accordance with a right-to-manage model in which unions and employers bargain over wages and, conditional on those wages, employers set employment levels, trade unions were able to use their bargaining power to raise wages above market-set rates, despite a marginal impact on labor demand, but not to the point where large numbers of union members' jobs were at stake through plant closure.

The more recent literature on union effects on firms suggests that these effects are either benign, as in the case of DiNardo and Lee (2004b)'s paper for the United States using a

regression discontinuity design, or positive, as in the case of papers for the United States finding positive effects on labor productivity in nursing homes (Sojourner et al., 2015), union effects on productivity and wages in Norway (Barth et al., 2020) and unions and workplace innovation in Norway and the United Kingdom (Bryson and Dale-Olsen, 2021). It is the advent of new data and more credible identification strategies that has allowed researchers in some of these new papers to capture the causal impact of trade unions on firm performance. However, this new wave of research on union effects comes at a time of sustained union decline in many countries, and some of the new findings may partly reflect changes in union incidence and the union behavior engendered by the harsher environment they face.

This extensive empirical literature is almost exclusively confined to developed countries, mainly in North America and Europe (Doucouliagos and Laroche, 2003). The handful of papers for developing countries suggest that what has been found for developed countries does not necessarily translate directly into a developing country setting (Doucouliagos et al., 2017). This may be due to differences in institutional arrangements (e.g., the rule of law) which may affect the operation of labor markets and firm behaviors, or the nature of trade unions in those countries. [11]

There are at least three ways in which institutional differences may matter. First, as we argue further below, labor demand for unionization partly reflects how well developed the state is in its provision of welfare and other services. Where the state is less capable of providing goods that workers desire, such as job security and health and safety at work, the union may substitute for the state in offering those goods. In a more developed country, the state may offer goods which compete with those offered by unions as, for example, in the case of paid holiday leave and social insurance (Bryson and Forth, 2019; Aizawa et al., 2024). Unions may also complement state provision of worker rights, for example where trade unions play a role in enforcing statutory rights where state enforcement capabilities are weak. Either way, we might expect the demand for the union good to differ as between developed and developing nations due to differences in state welfare provision.

Second, by setting the legal conditions under which unions can come into being, and by virtue of its wider role in enforcing the rule of law, the state can affect the supply of the union good. Under certain conditions, it may be that unions' capability to affect firm-level outcomes is hamstrung by state (in)action limiting the space in which unions can function. Whilst there is a literature for developed countries suggesting state intervention in union affairs can also heavily impact union supply - for example, through the closed shop

[11] For example, Doucouliagos et al. identify a positive partial correlation between unionization and productivity in developing countries but this is based on nine single country studies for manufacturing (three for China, and one each for Uruguay, Brazil, Mexico, Peru, Guatemala and Malaysia).

provisions discussed above - it is arguable that the constraints unions face in organizing in some developing countries are considerably greater.

Third, union effects partly reflects the nature of trade union institutions. For example, in countries with extensive sectoral collective bargaining, the wage cost implications of collective agreements to a given firm are ameliorated by virtue of wide union coverage among competitor firms. Such arrangements are most common in highly developed social democratic states such as those in Scandinavia. They are virtually absent in developing countries, where union organizing is more fragmented, occurring at a firm or establishment level. In this setting, the impact of union behavior on a unionized firm can be greater than in the case where many other firms are also unionized.

Finally, we should be mindful of the fact that differences in estimated union effects between developed and developing countries might also reflect the relative paucity of papers for developing countries using credible identification strategies to tease out union causal effects.

3 Data

In this section, we introduce and provide summary statistics for the World Bank data and the World Governance Indicators which, together, are the basis for our empirical investigation.

3.1 Firm-level Data (WBES)

Our firm-level data come from the World Bank Enterprise Surveys (WBES), conducted in many developing countries. They provide nationally representative samples of formal firms from all sectors with five or more employees. Across countries and years, the surveys typically ask the same set of questions, along with country-year specific questions. Between 2002 to 2011 the surveys typically included a question about the presence and density of a union at the firm: "What percent of your workforce is unionized?".[12] Therefore, our analysis is confined to surveys conducted in this period.

Since the WBES questionnaire has changed over time in terms of the questions asked and the way in which the questions are asked, the World Bank provides the data in two formats. One format is the standardized dataset, in which surveys across economies are combined and variables are harmonized by the World Bank. This format allows cross-country comparisons and analysis. The World Bank offers two standardized datasets, covering different periods:

[12]This question is in the Core Questionnaire of WBES in 2002.

one for surveys conducted in 2002–2006 and another for those from 2006 to 2023.[13] For our analysis, we combine these two standardized datasets by harmonizing the variables we use.[14]

One shortcoming of the standardized data is that, in some countries and years, the question about union presence is included in the standardized data only for a subset of countries where it was asked in the original survey.[15] To address this issue, we additionally utilize the original, unstandardized data files provided for each country-year, which contain the full set of survey responses. Specifically, we identify the set of country-year surveys in which the same union question was asked but is missing from the standardized dataset. From these files, we extract the union information along with the firm ID (assigned by the World Bank and used to uniquely identify firms in the standardized dataset), and merge this information to our combined standardized dataset.

We construct a variable indicating that the workforce is unionized which takes the value 1 if the share of the workforce which is unionized is non-zero, and 0 otherwise.[16]

Our main outcome variables are labor productivity - which is derived by dividing annual sales in the last year by employment at the end of the year (full-time permanent and temporary workers) - and the average wage per employee, which is constructed by dividing total annual cost of labor including wages, salaries, bonuses and social payments in the last year by employment at the end of the year.

Since annual sales and total cost of labor in WBES are reported in the local currency, we use the official exchange rate at that time from the World Development Indicator (World Bank) to convert them to the United States dollars. Because these monetary-based variables are potentially subject to measurement error, we winsorize the top and bottom five percentiles of labor productivity and average wage per worker to mitigate the influence of outliers.[17]

To explore potential mechanisms by which unions may influence these outcomes, we

[13]We downloaded these standardized datasets from the World Bank website on November 17, 2023.

[14]Some surveys conducted in 2006 are included in both standardized datasets. We remove these overlapping surveys from the 2002–2006 dataset before combining it with the 2006–2023 dataset. To harmonize the variables we use across the two standardized datasets, we begin by identifying variable pairs likely to correspond to the same question and verify their consistency by comparing their values within firms using the 2006 surveys, which are included in both datasets. We find variable pairs match exactly, except for industry classification. For industry classification, we identify variable pairs that are broadly consistent, although not identical. The classification used in the 2002–2006 standardized dataset is somewhat coarser than that in the 2006–2023 dataset. Based on these correspondences, we construct a new industry classification (consisting of 24 industry categories) that closely aligns with the one used in the 2002–2006 dataset.

[15]This is possibly because the question about unions was not in the core questionnaire in some regions or years.

[16]In 514 firms in our sample, the original variable for the share of workforce unionized is coded "do not know". We treat these as cases where the union is present but the share is not known.

[17]Without winsorizing these variables, or rather dropping the top percentiles instead, our main results do not substantially change. These results are available from the authors upon request.

use three additional outcome variables. First, in light of the substantial empirical literature examining the union correlation with employment growth, we use employment growth defined as the change in permanent employees compared to three years ago. Following papers using establishment-level data to construct employment growth variables, we use the difference in employment at the end of the last year and employment three years ago, divided by the average employment over the period. Thus we define employment growth as $\frac{2(Employment_{t,i}-Employment_{t-3,i})}{Employment_{t,i}+Employment_{t-3,i}}$ for firm i and year t.[18] Second, we use information about whether the firm provides formal training to its workers. Lastly, we examine labor's share in sales, calculated as the payroll cost of labor divided by annual sales. For the employment growth and training variables, we have information to calculate these variables for about 80% of our main sample.

Our firm-level control variables are export share in sales (separately for direct and indirect exports), foreign ownership share, government ownership share, and industry classification fixed effects. We also test the sensitivity of results to the incorporation of additional control variables including obstacles the firm faces in terms of finance, tax administration, crime/theft/disorder, transportation, electricity, and finding skilled labor (all coded on a scale of 0–4 where 0=no obstacle and 4=very severe obstacle).

Our estimation sample is confined to firms in which none of our core variables are missing. In this sample, we have 45,813 firms across 77 countries from 2002 to 2011. In some countries, WBES conducts multiple surveys. In our analysis sample, we have 27 countries that are surveyed and appear multiple times in different years. Other countries appear only once.[19]

The list of countries in our analysis sample is presented in Appendix Table A.1, along with information on the number of observations and the survey year. Since the number of firm observations in the WBES varies across countries and years, we weigh observations by the inverse of the total number of firm observations in the country within our main analysis sample. In this way, each country contributes equally to our estimation.

3.2 Cross-country Data

Our country-level governance variables are from the World Governance Indicators (WGI) project, compiled by the World Bank Group (2024). The WGI reports aggregate indicators

[18]This provides the arc percentage change in employment over a period. This has two nice features. It is symmetric, whether employment rises or falls, and it allows us to calculate positive and negative values ranging between upper and lower bounds of 200 percent and -200 percent.

[19]Among the 27 countries that appear multiple times there are 14 in which firm-level panel data could be constructed within the study period using the panel identifier information in the country-wise datasets. Among these countries, the number of firms observed in multiple years (two years in most cases) is only about 1600. Due to this small number of observations, our data is not suitable for exploring within-firm dynamics.

for over 200 countries and territories, covering six dimensions of governance.

The WGI indicators are constructed using a statistical aggregation method based on an unobserved components model (UCM). This approach combines information from a wide range of underlying data sources, typically from commercial business information providers, non-governmental organizations, surveys of firms and individuals, and public sector organizations. Each indicator reflects a weighted average of the standardized scores from these sources, where weights are determined based on the precision of each source.

In our empirical analysis, we use the WGI's "Rule of Law" and "Voice and Accountability" indices to identify whether a country's governance meets the preconditions for union formation. The "Rule of Law" reflects the degree to which agents have confidence in and abide by the rules of society, including the quality of courts, contract enforcement, property rights, and the police. The underlying data sources for construction of this index include several measures of fairness, independence, and speediness of judicial process from the Economist Intelligence Unit (EIU), the Global Competitiveness Index (GCI), and the Institutional Profiles Database (IPD) among others. "Voice and Accountability" captures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. The underlying data sources for this measure include the Democracy Index of the EIU and freedom of association and expression measured by the Varieties of Democracy (V-Dem) Institute among others. For the full list of original underlying data sources for each index, see World Bank Group (2024).

Since "Rule of Law" and "Voice and Accountability" are highly correlated with each other, we construct an aggregate measure of preconditions required for union formation by taking the average of these two indicators (after standardizing each indicator to mean zero and standard deviation one) and refer to it as the "Rule of Law and Voice" index. This index is used in Section 5.

It is possible that, notwithstanding government commitments to the "Rule of Law and Voice", states may lack the capacity to adequately enforce the governance principles to which they are committed. To help tackle this issue, we capture aspects of the state's capacity to "deliver" on such commitments using additional WGI indicators in relation to the "Control of Corruption", "Regulatory Quality", and "Government Effectiveness". These indicators respectively reflect the extent to which public power is exercised for private gain, the ability of the government to formulate and implement sound policies and regulations, and the quality of public services and policy implementation. To construct a composite measure of state capacity which we refer to as the "State Capacity" index hereafter, we similarly take the average of these three governance indicators after standardization. We use this State

Capacity index to examine heterogeneity in union effects with respect to the institutional capacity of the state at Section 4.

We also derive country-year level variables from the World Bank's Development Indicators. These variables are mainly used as control variables in specifications where we only control for country fixed effects and year fixed effects, although our preferred specification controls for country-year fixed effects. These control variables are the log of GDP per capita, the primary school enrollment rate, the annual inflation rate, and six indicators of WGI.[20]

We also use an income level classification (based on 2022 country gross national income per capita) and region classification from the World Development Indicators in our analysis to examine the heterogeneity in the partial correlation between unionization and firm outcomes across country characteristics.

3.3 Descriptive statistics

Table 1 shows the descriptive statistics for the variables used in our regression analyses for our estimation sample.

A trade union is present in 30% of the firms. Mean firm-level union density is 18% among all firms including non-unionized firms but the average is driven by the 70% of firms without a union where density is zero.[21] Among unionized firms, two-thirds (67%) of workers are union members on average, but as Figure 1 indicates, there is substantial variance in union density within unionized firms. In 71% of unionized firms, the majority of workers are union members and in two-fifths (43%) over 90 percent are members, suggesting the presence of a union closed shop in many instances (where union membership is a condition of employment).

Mean firm employment is 145 permanent and temporary employees but most of the firms are either micro-firms with fewer than 10 employees (18%) or are small or medium-sized with 10-99 employees (59%).[22] Most employees are on permanent contracts: firms report a mean of around one-in-ten workers on temporary contracts. The average growth rate of employment of permanent workers over the previous three years is about 20 percentage points.

The mean annual compensation per worker is about 2,900 USD (nominal) but variance

[20]The six WGI indicators included as control variables are Voice and Accountability, Rule of Law, Regulatory Quality, Control of Corruption, Government Effectiveness, and Political Stability and Absence of Violence/Terrorism indices.

[21]There are around 500 firms where the percentage of employees who are union members is unknown

[22]The WBES only samples formal firms. A question to confirm whether the firm was formally registered with the government was asked only for 31% of the firms in our sample. Among this sample, 98% of them were formally registered at the time of the survey.

is large (with the standard deviation almost twice the mean). The average annual sales per worker (our labor productivity measure) is about 71,600 USD, a figure boosted by material and other intermediate costs which are not subtracted from the sales value.[23] Exports account for a relatively small percentage of sales (14%, either directly or indirectly). While the average labor share in sales (total compensation divided by sales) is 0.17, this variable is highly skewed to 0. Two-fifths (41%) of firms provide training to workers.

The survey includes foreign owned firms and public sector firms. The average shares of government and foreign ownership are 13% and 3% in the sample, respectively.

The sample mostly consists of low income (23%), lower middle income (39%) and upper middle income (32%) countries. Over half (53%) of the firms in the sample are in Africa, 25% in Latin America and the Caribbean, 16% in East Asia, South Asia, and the Pacific, and 7% in Europe and Central Asia.

4 Partial Correlations and Heterogeneity

We begin by exploring the partial correlation between unionization and firm outcomes, and its heterogeneity across countries.

4.1 Baseline OLS Estimates

We estimate OLS regressions of the following type:

$$Y_{ijct} = \beta Unionized_{ijct} + \alpha X_{ijct} + FE_{ct} + FE_j + e_{ijct}$$

for firm i in industry j and country c and year t. The main outcomes (Y_{ijct}) are the log of labor productivity and the log of wages (labor cost per worker). $Unionized_{ijct}$ is an indicator variable that takes the value 1 if the firm is unionized in year t.

We control for country-year fixed effects (FE_{ct}) and industry fixed effects (FE_j). In alternative specifications, we estimate results controlling for country fixed effects and year fixed effects separately with additional country-year level control variables (the log of GDP per capita, the primary school enrollment rate, the annual inflation rate, and six indicators of WGI). [24]

Regarding the firm-level control variables (X_{ijct}), our baseline control variables include

[23] We have material cost information in only a small fraction of firms. We control for industry fixed effects to take account of differences in material costs across industries.

[24] Our specifications therefore account for time variance in nominal values for both our dependent and independent variables.

the share of direct exports, the share of indirect exports, the share of foreign ownership, the share of government ownership, and the share of temporary workers. As additional control variables, we also include the degree to which firms face obstacles with regards to: finance, tax administration, crime, finding skilled labor, transport, and electricity.

Table 2 presents estimates of the partial correlation between union presence at the firm and our two dependent variables, namely log labor productivity per employee (Panel A) and log labor compensation per employee, which we label 'wage' (Panel B).

The table presents four model specifications in columns (1) to (4) adjusting the vector of controls. In doing so, the number of observations in the estimation sample varies a little due to data missingness. Model (1) controls for country and year fixed effects separately. Model (2) builds on Model (1), incorporating a set of additional firm-level controls (X_{ijct}) described above. Model (3) replaces the separate country and year fixed effects from Model (1) with country-year fixed effects. Finally, in Model (4) the vector of additional controls is added to Model (3). Our preferred specification is Model (4) because it is a more flexible specification allowing for time-variance in the country effects, whilst the vector of additional controls reduces the potential for omitted variables bias. Throughout we present the coefficient on the union presence dummy variable, together with the accompanying standard error (clustered at country level) in parentheses.

Beginning with Panel A, the models account for around half of the variance in labor productivity across firms. The partial correlation between union presence and labor productivity is positive and statistically significant and is robust to model specification. In our favored model, the coefficient is 0.275, implying that - because labor productivity is measured in logs - labor productivity in unionized firms is around 31.7 percent higher than in equivalent non-unionized firms.

Panel B uses the same approach to capture the partial correlation between union presence in the firm and wages, measured as total labor costs divided by the number of employees in the firm. These models account for roughly four-fifths of the variance in wages across firms. The union coefficient ranges between 0.143 and 0.173 across model specifications. The coefficient of 0.150 in our preferred model implies that wages in unionized firms are around 16.2 percent higher than in equivalent non-unionized firms.

The results for labor productivity and wages are similar when we control for the log of employment levels in these equations (Appendix Table A.2) and if we run unweighted regressions (Appendix Table A.3).

Before turning to heterogeneity in the partial correlation between union presence and labor productivity and wages, Table 3 explores the relationship between unionization and employment growth of permanent workers in the last three years, labor's share of sales, and

the firm's provision of formal training.

Panel A examines the correlation between union presence and employment growth using an approach common in the literature on union employment effects in the developed world. The literature adopting this approach, which dates back to Blanchflower et al. (1992), finds a negative correlation between union presence and employment growth in the range of 2.5-4 percent per year. The result has also been replicated with panel data in the UK (Bryson (2004); Addison and Belfield (2004)), the United States (Leonard (1992)) and Australia (Wooden and Hawke (2000)) in what has become known as "the one constant" (Addison and Belfield (2004)) in empirical research on union 'effects'.

When we use employment change over the last three years in Panel A of Table 3, we find a negative partial correlation between union presence and employment change over three years of around 6 percent which is fairly robust to changes in model specification. This is similar to the size of 'effects' in the English-speaking developed world, noted above, and is consistent with the proposition that union bargaining conforms to a right-to-manage model in which unions bargain over wages and the employer sets employment levels conditional on those wages. However, the model fit (R-squared) is small possibly due to omitted variables driving employment change.

As noted earlier, the literature regarding union effects on firm profitability is heavily contested. Theoretically, it is unclear a priori whether union-induced increases in the cost of labor are more than offset by productivity improvements linked to worker "voice". It is also uncertain as to whether partial correlations are a good guide to causal impacts due to the possibility that unions will seek to organize in firms with high rents to share.

Panel B of Table 3 presents the partial correlation between union presence and labor's share in sales, calculated as the payroll cost of labor divided by annual sales. This share is negative, implying that unions do not fully share in the additional sales they generate, raising firm profitability. However, the coefficient is relatively small.

Finally in Panel C of Table 3 we present partial correlations between union presence and the firm's provision of formal training. Although the early empirical literature for the United States and the United Kingdom, reviewed in Acemoglu and Pischke (1999), finds mixed evidence regarding the correlation between unionization and firm-provided training, we might expect a positive correlation between union presence and formal training for at least two reasons. First, union bargaining power can challenge the monopsony bargaining power employers derive from training their workers by virtue of raising post-training wages sufficiently high to deter quits. In this way, unions can ensure firms train the socially optimum number of workers (Booth and Chatterji (1998)). Second, unions' voice effect, by extending labor contracts, increases the length of time over which employers can recoup

their up-front training investments (Freeman (1976)). In our models, which explain around one-fifth of the variance in firm training provision, union presence is associated with a 12 percent increase in the probability of training across all model specifications.

4.2 Heterogeneity of OLS Estimates

In this section, we consider potential heterogeneity in the partial correlation between unionization and labor productivity and wages along five dimensions.

The first source of heterogeneity is union density at the firm. This is often used in the empirical literature as a proxy for the degree of union bargaining power. Unions derive that power from their ability to monopolize the supply of labor to the employer. They offer a more credible threat in doing so where they represent a majority of employees in the firm. Recent evidence for Norway confirms that the causal effect of unions on both wages and productivity rises with union density (Barth et al. (2020).) The importance of union density may explain why DiNardo and Lee (2004a) found no union effects on wages or firm performance when relying on a regression discontinuity design exploiting variance in union presence at the majority union vote margin required to obtain bargaining rights under the Wagner Act in the United States.

Figure 2 (and Appendix Table A.4) show heterogeneity in the OLS coefficients by union density for labor productivity and wages. The figure presents the estimated coefficients for indicator variables corresponding to union density ranges of 1–49%, 50–89%, and 90–100%, relative to the reference category of zero membership. Each estimate is shown with the 95 percent confidence interval.

In the case of labor productivity (presented in the left-hand chart), firms with between 1 and 49 percent membership appear to have labor productivity that is around 25 percent higher than those with no members (the reference category). The union density coefficient is a little smaller once a majority of workers in the firm are union members, at around 15-16 percent. Results do not differ by model specification.

The right-hand chart performs the same exercise, but for wages. Here, although the partial correlation is positive where a minority of workers are union members, the association is not statistically significant. The association strengthens markedly in firms where between 50 and 89 percent of employees are union members: wages in these firms are one-quarter (26%) higher than in comparable firms with no union members. However, the correlation coefficient drops markedly when density is above 90 percent, and is only on the margins of statistical significance. Again, results do not differ across model specification.

These results suggest union bargaining power may deliver higher wages for workers.

However, the effect is not monotonic, perhaps because when density approaches 100 percent it is partially driven by check-off arrangements, or closed shop arrangements, which are not necessarily conducive to solidaristic action on the part of organized labor.

The other sources of potential heterogeneity in the partial correlation between unionization and labor productivity and wages are all at the country level.

Figure 3 shows the heterogeneity of the union presence coefficients by country income level. Although the differences in the point estimates are not statistically significantly different from one another for either labor productivity or wages, regardless of model specification (see the lower part of Appendix Table A.5) there is a suggestion that the correlations are a little more positive in lower income countries. The significant wage coefficients are confined to low income and lower-middle income countries, whilst the significant labor productivity coefficients are largest in lower-middle income countries. These findings are consistent with the proposition that unions are particularly valuable for firms and workers where states are less developed. Heterogeneity in the partial correlation between union presence and labor productivity and wages is also apparent when we examine firms in different regions around the world in Figure 4 (and Appendix Table A.6). It presents point estimates for four regional categories (there is no omitted regional category), each interacted with Union Presence. The positive union coefficients are only statistically significant for labor productivity in Asia and Africa/Middle East, and those for wages are largest in African/Middle Eastern firms.

In Figure 5 and Appendix Table A.7, we divide the sample into countries that are above and below the median of state capacity. State capacity is measured by the average of "control of corruption", "regulatory quality", and "government effectiveness". The union coefficients are only statistically significant for both labor productivity and wages in countries identified as having weak state capacity. Taken together with the findings in relation to regional and income differences, it seems plausible that union presence helps substitute for the paucity of state support in creating an environment conducive to firm performance. This may occur for a variety of reasons. For instance, unions may help enforce social norms regarding compliance with the law and good governance where states lack the capacity to do so. (For a recent discussion of the challenges unions in low and middle-income countries face in this regard, see Ronconi and Raphael (2025).)

5 Union Formation and Its Impact

5.1 Empirical Specification

Based on the predictions from our conceptual framework in Section 2, we seek to 1) empirically test the determinants of union formation and 2) use these estimates as the first stage for estimating the causal impact of union presence on firm outcomes. Specifically, we use an instrumental variable interacting across-country variation in the rule of law and freedom of association (G_c) and across-industry variation in the net returns to unionization (proxying for $u(W_j) - C_1(N_j)$) which, together, determine the costs and benefits for potential organizers to organize a union.

Although our identification strategy is new to the union literature, it is similar to prior studies exploiting industry variations (typically in the United States which is treated as a relatively frictionless economy) and interacting them with country-level variation in a difference-in-difference framework (Rajan and Zingales, 1998; Haltiwanger et al., 2014). For instance, Rajan and Zingales (1998) examine the impact of financial development on industry growth by exploiting industry-level variation in external finance dependency in the United States and the degree of financial development across countries. Similarly, Haltiwanger et al. (2014) estimate the impact of labor market regulation on job reallocation using industry variation in job reallocation rates in the United States and the degree of labor market regulation across countries.

To measure the country-level variation capturing the model component G_c, in our baseline specification, we use the two indices from the Worldwide Governance Indicators (World Bank Group, 2024) "Rule of Law" and "Voice and Accountability" which we introduced in our Data section above. Although one might wish to use the two variables separately to construct two instrumental variables (interacting each with industry-level variation), these variables are highly correlated (correlation coefficient = 0.65, $p<0.01$)[25] as they may measure similar aspects of a country. Therefore, in our baseline specification, we standardize each variable and take an average of them to construct a variable we call the "Rule of Law and Voice index."

The industry-level variation $u(W_j) - C_1(N_j)$ in the model reflects the benefits of unionization relative to costs in terms of the time and effort that organizers face in forming a union. To put this idea into an empirical framework, we proxy for it by measuring how much an industry is likely to be unionized where there is strong government protection for unions - what we might think of as a "natural unionization rate". In other words, we maintain that,

[25]We take country-level average Rule of Law and Voice and Accountability using the analysis sample and calculate the correlation coefficient.

in countries with a stronger rule of law and voice, national-level obstacles to union formation are low, such that unions are formed in industries that entail higher benefits relative to the costs of union formation.

To measure the natural unionization rate, we use industry-level unionization rates in a country with strong rule of law and freedom of association. In our baseline specification, we use the industry-level union density rate in the United States in 1983 (the earliest year when the statistic is available) from the statistics provided by Hirsch et al. (2025). The presumption is that the US had a strong rule of law and freedom of association, and that this industry variation in the "natural rate" of unionization carries over to the countries in our sample. We take the 1983 rate when the industry structure and the development stage of unions as institutions might be considered to be more similar to the current circumstances in developing countries.[26]

In an alternative specification, we utilize the WBES firm-level database and use the countries which are above the 75th percentile in the Rule of Law and Voice index and take the share of unionized firms in each industry as our measure, having excluded the firms in the country in question (i.e. using the "leave one out" approach).

Figure 6 shows the industry-level variation in natural unionization rates measured in the two ways illustrated above.[27] The two measures are strongly correlated even though they are constructed based on data in different countries. Broadly speaking, manufacturing industries (such as paper, automobile, and food/beverages) tend to have higher unionization rates compared to service industries (such as hotel/restaurants and retail/wholesale).

We then interact the country-year level rule of law and voice index with the industry-level natural unionization rate to define our instrumental variable (IV_{cjt}). More specifically, we use the following equation to predict the presence of a union in firm i, industry j, country c, and year t:

$$Unionized_{ijct} = \sigma IV_{cjt} + \alpha X_{ijct} + FE_{ct} + FE_j + e_{ijct}. \quad (2)$$

Then using the above equation as the first stage, we examine the effect of union presence on

[26] One potential concern is that industry composition (i.e., the types of businesses within each industry category) differs between the U.S. in 1983 and developing countries in the 2000s. To assess this, we use a WBES subsample of roughly 5,000 firms with ISIC 4-digit industry codes and compare the distribution of firms across these categories with the employment shares in the U.S. union data from 1983. We find broadly similar compositions across most industries, except in Transport and Communication, where postal services and railways have lower shares in the WBES, while taxicabs and services incidental to transportation have much higher shares relative to the U.S. data. Because of this, for this industry we re-weight U.S. union density across ISIC 4-digit categories using firm shares from the WBES subsample. As a robustness check, we also report results from applying this re-weighting procedure to all industries in Appendix Table A.12.

[27] In this figure and in our subsequent analyses, we exclude industries categorized as "Other Service", "Other Manufacturing", and "Other (unclassified)", for which it is difficult to capture the nature of the industry.

firm outcomes:

$$Y_{ijct} = Unionized_{ijct} + \alpha X_{ijct} + FE_{ct} + FE_j + e_{ijct}. \quad (3)$$

We control for country-year fixed effects (or country fixed effects and year fixed effects separately with additional country-year level control variables[28] in an alternative specification) and industry fixed effects. The firm-level control variables (X_{ijct}) include both the baseline and additional firm-level control variables which appeared in the OLS specifications.

Standard errors are clustered in two-way clustering at the industry and country levels. As in the case of the OLS estimates, firm observations are weighted by the inverse of the total number of firm observations in the country within the analysis sample so that each country contributes equally to our estimation.

The intuition for the identification based on this difference-in-difference approach is as follows. Firm outcomes may be directly affected by country-level rule of law, or by industries' natural unionization rate. However, it is unlikely that the interaction between the Rule of Law and Voice index at country level and industries' natural rate of unionization will impact firm performance through any mechanism other than union formation.

In the presence of the interaction, the country-year fixed effect (or Rule or Law and Voice and Accountability Indices in the specification with country and year fixed effects) is controlling for the direct effect of Rule of Law and Voice index on firm performance in the absence of unions. Similarly the industry fixed effect is controlling for any direct impact of the natural unionization rate on firm performance in the absence of a union.

A potential threat to identification is that the natural unionization rate may be correlated with other industry-level features (such as firm size), and the effect of the Rule of Law and Voice index on firm outcomes (through mechanisms other than unionization) may be greater in firms in industries having these features. To tackle this issue, we control for two additional variables. First, we take the average firm size (measured by the log of employment) in each industry using the WBES data excluding the country itself (the leave-one-out method) and interacted it with the Rule of Law and Voice index, and added this as an additional control variable.[29] Appendix Figure A.1 visualizes the variation of average firm size across industries.

Second, the unionization rate may be higher in industries that are more globally-oriented (if, for instance, they respond to enforcement of labor laws in their supply chains (Boudreau, 2024; Tanaka, 2020)). Also the effect of the Rule of Law and Voice on firm outcomes (through mechanisms other than unionization) may vary across this dimension. Therefore, to account for these potential confounders, we also control for an indicator for exporting and an indicator

[28]These control variables are the log of GDP per capita, the primary school enrollment rate, the annual inflation rate, and six WGI indicators including Rule of Law and Voice and Accountability indices.

[29]We do not use the firm-level employment size as it is because it can be affected by unionization.

for foreign ownership share, both interacted with the Rule of Law and Voice index.

Third, while we use union presence as a treatment variable in our instrumental variable approach, the instrument can potentially affect the strength of the union as well, not only the presence of it, by altering the net benefits of union membership. We therefore examine the impact of our instrument on union density and an indicator of having union density above 50% and find that both of the coefficients are positive and significant for some specifications (see Appendix Tables A.9 and A.10). These results are consistent with our model framework, which suggests that the costs and benefits for organizing (captured by natural unionization rate) would also affect how much support the union leaders receive from general workers and how easy it is for the leaders to create consensus and mobilize workers. The state environment (captured by Rule of Law and Voice) may also impact union strength by protecting union activities such as strikes and improving their bargaining power.

Therefore, the instrumental variable approach using union presence as a treatment variable may violate the exclusion restriction. This is likely to lead to upward bias: the treatment coefficient on union presence may be inflated to the extent that the strength of the union additionally affects the outcome.

Since it is difficult to obtain a single treatment variable that captures both union presence and union strength, we keep the above specification using the presence of union as the treatment variable and additionally discuss the results of reduced-form specifications. For this reason, the coefficient from our second-stage estimates should be interpreted as including the effects of both union presence and union strength.

Finally, it is important to note that, given the nature of this instrument, compliers are likely to be firms in countries with relatively weak Rule of Law and Voice and in industries with higher returns from unionization for workers. The impact of union presence is likely to be larger in these firms because they have high levels of frustrated demand for unionization, that is, those with an underlying demand for unionization that remains unmet due to the absence of the Rule of Law and Voice. In such industries, higher returns to unionization could manifest in higher wages through stronger bargaining power, as well as through improved worker–employer coordination that enhances productivity once a union is established.

5.2 First-stage Results: Union Formation

Table 4 presents the result of estimating equation 2. Panel A uses the US industry-level union density in 1983 to construct the instrument, while Panel B adopts the "leave one out" approach which uses industry-level union density in the WBES data, having dropped the industry-level union density data for the country in question. Both panels present six

alternative model specifications described in the bottom section of the table.

In all twelve model specifications, the instrument is positive and highly statistically significant in predicting firm-level union presence, consistent with our model predictions. Coefficients on the instrument tend to be a little larger when controlling more flexibly for country-year fixed effects in Models (3) to (6) and in the models intended to soak up otherwise omitted variables bias with the firm size and firm export interactions with the Rule of Law and Voice.

As a robustness check, in Table A.8, we show the first-stage estimates when we separately use either one of the "Rule of Law" or "Voice and Accountability" index, each interacted with the natural unionization rate. The result shows that both of these alternative IVs positively and significantly predict union presence by itself. However, including both of these alternative IVs in a single equation results in one of the coefficients being small and insignificant. This is potentially because the two indices are highly correlated as discussed above, resulting in a multicollinearity issue.

Appendix Tables A.9 and A.10 show alternative first-stage results for union density (measured in a scale from 0 to 1, i.e. the share of unionized workforce) and an indicator variable for having union density above 0.5. As discussed above, we also find positive effects of the instrument on these variables, suggesting that the instrument also affects the strength of unions.

5.3 Second-stage Results: Impact of Unionization

Table 5 presents our main IV results where the instrument for the Rule of Law and Voice exploits variance in union density across industries taken from data for the United States in 1983. Panels A and B report results for labor productivity and wages respectively. In each case, we present six alternative model specifications in columns (1) through (6). Columns (1) to (3) enter country and year fixed effects separately, along with time-varying country level controls whereas columns (4) to (6) allow country fixed effects to be time-varying, and thus exclude country-level time-varying controls. Our preferred models are those in columns (4) to (6) since they deal more flexibly with potentially time-varying unobserved confounders at country level.[30]

The instruments pass the threshold for joint statistical significance in the first-stage equations (a Wald F statistic of 10 or above), with the specifications in columns (4) to (6) performing noticeably better.

[30]Dispensing with the time-varying country level controls also leads to a small increase in the estimation sample.

In Panel A, the instrumented union presence coefficient is positive in all six models for labor productivity, and is statistically significant in four of the six models (2, 3, 5 and 6) including our preferred estimates in Model (6) which control most flexibly for country effects and incorporate both firm-level interactions with the Rule of Law to tackle otherwise omitted variables bias. The coefficient of 1.430 implies a 317% increase in labor productivity in a firm that switches from having no union to having a union present. Whilst the size of this effect appears very large compared to the OLS estimates in Table 3, it is worth recalling two points from our earlier discussions in Section 5.1. First, this IV estimate may be inflated by the additional effect of union strength induced by the IV. Second, the IV estimate recovers a LATE in which compliers are firms with a high natural unionization rate who are marginally induced to be unionized by stronger Rule of Law and Voice. Such firms are likely to be located in countries with relatively weaker state capacity, where the impact of unionization on productivity (and wages) can be greater (as suggested by our heterogeneity analysis in Section 4.2). Firms in industries with high natural unionization rates may also experience larger impacts of unionization because these industries yield higher returns to unionization.

The wage effects of union presence, captured in Panel B, are also positive throughout and are statistically significant in all but Model 1. The coefficient of 1.248 in Model (6) implies an increase in the average compensation for a worker of 248% when the firm switches from non-union to union status.

Results are similar when using the alternative "leave one out" method to derive the "natural rate" of unionization at industry level (see Appendix Table A.11, for the results). The union presence coefficients are a little larger in the labor productivity models and are more sensitive to model specification in the wages models, with our preferred estimates in Model (6) being a little smaller.

We also obtain similar results when we use two instrumental variables constructed by taking an interaction between the Natural Unionization Rate with "Rule of Law" and "Voice and Accountability" indices, separately. The results are shown in Appendix Table A.13, indicating that the results are qualitatively unchanged.

Finally, as discussed earlier, the estimated IV coefficient potentially carries not only the impact of union presence but also union strength, both of which are likely to be affected by the IV. Given this possibility, we present results from two alternative specifications. First, instead of using union presence as the treatment variable, we use union density (defined by the share of workforce unionized) as the treatment variable using the same model specifications.

The results are presented in Appendix Table A.14, indicating positive and (in most equations) statistically significant coefficients on union density. They confirm our prediction that some part of our baseline result may come from greater union strength. Second, given

the indeterminate nature of the treatment variables, we also present reduced-form estimates where we regress the outcomes directly on the interaction between the Rule of Law & Voice and the Natural Unionization Rate in Appendix Tables A.15 and A.16. The coefficients are positive and statistically significant for most specifications. In terms of magnitudes, if we take our preferred specification in Model (6), the results indicate that the change in one standard deviation of the Rule of Law & Voice index together with the change in one standard deviation of the Natural Unionization Rate (0.10 for the variable based on US statistics) leads to a 3.6% increase in productivity and a 3.4% increase in wages.

In summary, even though the magnitudes of second-stage estimates should be taken with a grain of salt due to the difficulty of pinning down a single treatment variable and LATE, the overall directions of the results suggest that union formation and strengthening of its power result in higher productivity and wages in developing countries.

5.4 Mechanisms

Finally, we explore potential mechanisms behind the main results. Table 6 uses the same instrumentation strategy as the one deployed in Table 5 to examine the causal impact of unionization on three additional firm-level outcomes to shed light on the mechanisms behind the union effects on productivity and wages.

The three outcomes are employment growth among the firm's permanent workers over the last three years (Panel A); labor's share of sales (Panel B); and whether the firm provides formal training to its employees (Panel C). The table presents three model specifications, all of which permit country effects to be time-varying. The instrument performs well in terms of its statistical significance in the first-stage equation.

Panel A indicates that union presence does not appear to have a causal impact on firm-level employment growth among permanent employees. This finding contrasts to the negative and statistically significant associations in Panel A in Table 3 which treated union presence as exogenous. The implication is that, once one accounts for the endogeneity of union presence, there is no negative impact of unionization on employment growth. One potential explanation is that union formation occurs at a time when firms' employment is on a downward trajectory.

Panel B indicates that, although union presence results in an increase in labor's share, the coefficients are small and do not approach statistical significance. These findings contrast with the negative and statistically significant coefficients in Panel B of Table 3 which treated union presence as exogenous. The implication is that, once we account for the endogeneity of union presence, unionized workers are able to use their bargaining power to convert their

additional productivity into wage gains, and are able to do so such that their additional productivity does not provide excess surplus for the firm.

Finally, Panel C indicates that union presence has a sizable and statistically significant impact on the propensity of firms to train their employees. The coefficient is stable across all three model specifications. The finding is consistent with predictions of the voice-exit model discussed earlier in which unions' voice function increases the length of employment contracts, thus raising employers' incentive to invest in their workers' human capital. This, in turn, may be expected to result in higher productivity, directly through the improvement in workers' skills and potentially through other routes such as worker sorting across firms with and without training provision.

6 Conclusion

To our knowledge, this is the first paper in the literature to systematically evaluate union effects on firms in developing countries. It does so with standardized firm-level data collected by the World Bank for 77 developing countries. These data provide information that allow us to examine the relationship between unionization and multiple firm-level outcomes, notably productivity and wages, together with some of the potential mechanisms linking unionization to firm performance including employment growth, labor's share and training provision.

First, we present partial correlations between union presence and these firm-level outcomes, and consider heterogeneity in those partial correlations according to firm-level and country-level characteristics.

But our chief contribution is to develop a theoretical model predicting union formation in developing countries as a function of industry-level variance in the "natural rate" of unionization and country-level Rule of Law and Voice. We argue that both are necessary for union formation but neither are sufficient on their own. We use this intuition to motivate an instrumental variables strategy to identify the causal impact of union presence on firm-level outcomes, where the instrument is the interaction between the industry-level natural rate of unionization and country-level variance in the Rule of Law and Voice.

In our empirical analyses, we show that union presence leads to increases in both sales per employee and wages, and that labor's share is unaffected, implying that unions use their bargaining power to recover most of the growth in productivity via wages. We also show that, despite evidence pointing to higher union presence in larger firms, and a partial correlation between union presence and lower employment growth, there is no causal relationship between union presence and firm-level employment growth. The implication is that unions are able to increase productivity, share in that productivity through higher wages, but to do so

in a manner consistent with efficient bargaining, such that employment remains unaffected.

The size of the union effects on productivity and wages recovered from our instrumental variables estimation is considerably larger than the partial correlation when treating unionization as exogenous. We account for this difference in two ways. First, we argue that the IV recovers a LATE where compliers are firms operating in industries with high natural unionization rates and states with 'weak capacity' where the returns to unionization may be large. In these firms, the advent of a shift in the Rule of Law is likely to release pent-up frustrated demand for unionization. Second, we are unable to discount the possibility that our instrument drives not only union presence, but union strength, as indicated by workers' propensity to join a union when formed. We show this to be the case by switching to a treatment based on union density rather than simply union presence. We show strong effects of union density on both productivity and wages, in keeping with recent evidence from developed countries.

After considering these factors, which suggest discounting the estimated effects, the results fall within a plausible range given the large dispersion of productivity across firms in developing countries. Hsieh and Klenow (2009) document that the ratio of the 90th to the 10th percentile of Total Factor Productivity within narrowly defined industries is 5.0 in India, 4.9 in China, and 3.3 in the United States. Our evidence suggests that unions may account for a part of these dispersions.

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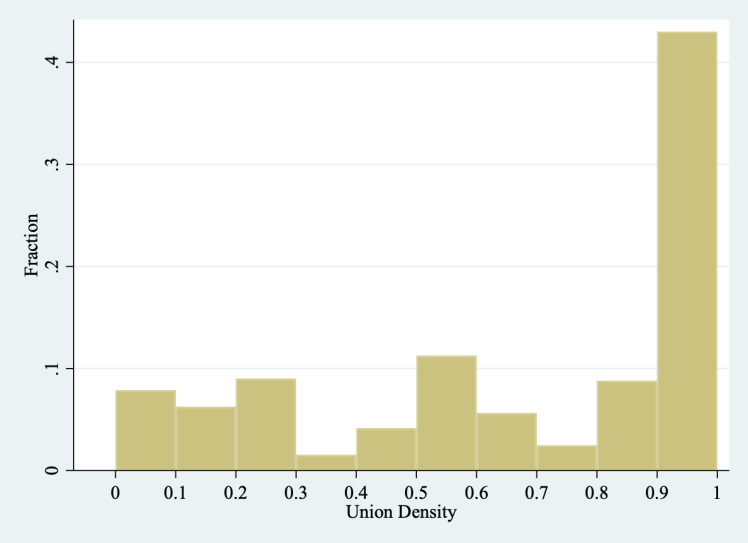
7 Main Tables and Figures

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Main variables					
Union Presence	0.3	0.458	0	1	45813
Union Density	0.184	0.347	0	1	45304
Employment	144.586	870.136	5	67516	45813
Employ 5-9	0.189	0.391	0	1	45813
Employ 10-99	0.587	0.492	0	1	45813
Employ 100-999	0.201	0.401	0	1	45813
Employ above 1000	0.024	0.153	0	1	45813
Wage (USD)	2961.23	4867.382	0.028	21000.572	45813
Log Wage (USD)	5.872	3.527	-2.858	9.959	45813
Labor Productivity (USD)	71591.143	160512.475	612.257	605751.125	45813
Log Labor Productivity (USD)	9.452	1.841	6.444	13.322	45813
Labor share in sales	0.171	0.181	0	1	45813
Firm provides formal training	0.406	0.491	0	1	34662
Employment growth of permanent workers	0.202	0.499	-2	2	38216
Control variables					
Export share in sales (direct)	0.109	0.269	0	1	45813
Export share in sales (indirect)	0.031	0.143	0	1	45813
Foreign ownership share	0.126	0.312	0	1	45813
Government ownership share	0.025	0.144	0	1	45813
Share of temporary workers	0.107	0.19	0	1	45813
Obstacle in finance	1.803	1.506	0	4	42967
Obstacle in tax administration	1.591	1.386	0	4	45261
Obstacle in crime, theft, disorder	1.498	1.408	0	4	44037
Obstacle in transportation	1.208	1.306	0	4	45031
Obstacle in electricity	1.877	1.539	0	4	45689
Obstacle in finding skilled labor	1.403	1.328	0	4	45361
Country composition					
Low income country	0.237	0.425	0	1	45813
Lower middle income country	0.382	0.486	0	1	45813
Upper middle income country	0.316	0.465	0	1	45813
High income country	0.066	0.248	0	1	45813
Africa	0.539	0.498	0	1	45813
Latin America & Caribbean	0.25	0.433	0	1	45813
South Asia, East Asia & Pacific	0.145	0.352	0	1	45813
Europe & Central Asia	0.25	0.433	0	1	45813
World Governance Indicators					
Rule of Law & Voice	0	1	-2.266	2.785	45813
State Capacity	0	1	-2.091	3.096	45785

Notes. "Union Presence" is an indicator variable that equals 1 if the share of the firm's workforce unionized ("Union Density") is non-zero. "Wage" is the annual compensation per worker measured in USD. "Labor productivity" is annual sales per worker measured in USD. See Section 3 for more details and the definitions of other variables.

Figure 1: Union density (excluding non-unionized firms)



Notes: This figure shows the distribution of firm union density in the WBES sample, excluding firms with zero density.

Table 2: OLS Estimates

	(1)	(2)	(3)	(4)
Panel A: Labor Productivity				
Union Presence	0.307***	0.303***	0.283***	0.275***
	(0.0473)	(0.0457)	(0.0472)	(0.0471)
R-squared	0.539	0.551	0.573	0.581
Panel B: Wage				
Union Presence	0.167***	0.143**	0.173***	0.150***
	(0.0556)	(0.0541)	(0.0517)	(0.0514)
R-squared	0.808	0.805	0.831	0.821
Number of obs.	43392	38291	45498	40230
Country FE, Year FE	Y	Y	N	N
Additional controls	N	Y	N	Y
Country-Year FE	N	N	Y	Y

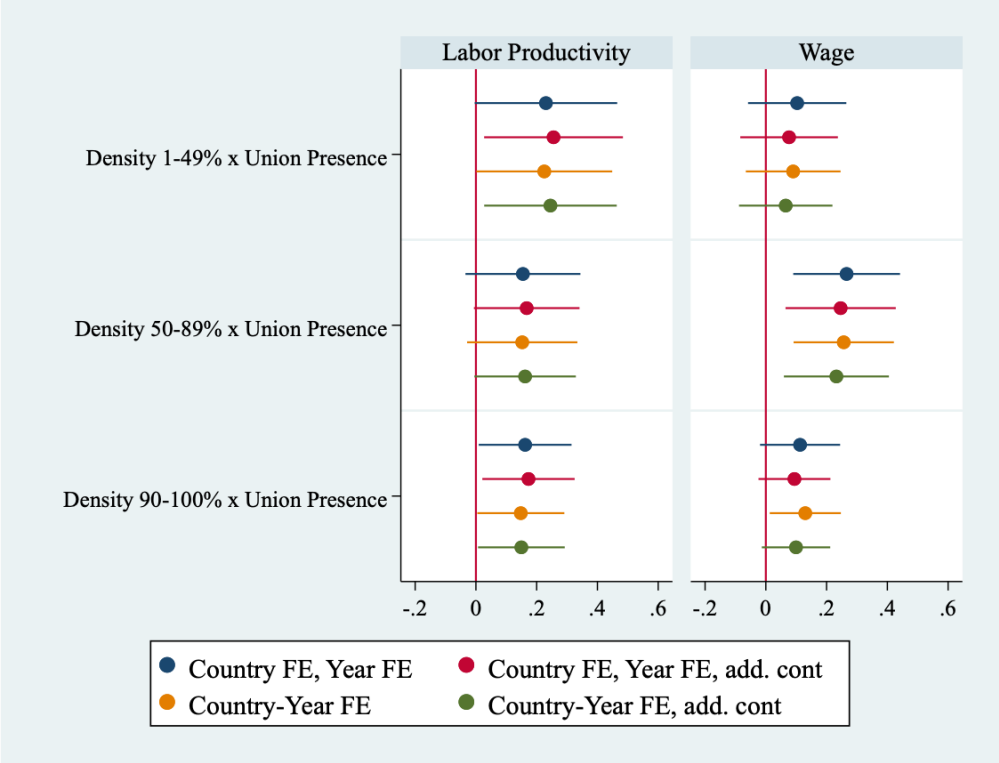
Notes. This table shows OLS estimates of regressing log labor productivity (Panel A) and log wage (Panel B) on union presence in the firm. Columns (1)–(2) include country and year fixed effects separately, along with time-varying country-level controls, while columns (3)–(4) include year-specific country fixed effects. Columns (2) and (4) additionally control for firm-level covariates as described in Section 4.1. All specifications include industry fixed effects. Standard errors are clustered at the country level. Weights are the inverse of the total number of observations in each country. Asterisks denote levels of statistical significance, with *** denoting significance at a 99 percent confidence interval and ** denoting significance at a 95 percent confidence interval.

Table 3: OLS Additional outcome variables

	(1)	(2)	(3)	(4)
Panel A: Employment growth of permanent workers				
Union Presence	-0.0552***	-0.0627***	-0.0584***	-0.0684***
	(0.0136)	(0.0149)	(0.0129)	(0.0147)
R-squared	0.050	0.052	0.060	0.063
Number of obs.	36079	32062	37157	33060
Panel B: Labor share in sales				
Union Presence	-0.00988*	-0.0106**	-0.00866*	-0.00843*
	(0.00503)	(0.00487)	(0.00495)	(0.00496)
R-squared	0.258	0.258	0.273	0.270
Number of obs.	43392	38291	45498	40230
Panel C: Training				
Union Presence	0.124***	0.122***	0.117***	0.114***
	(0.0162)	(0.0165)	(0.0163)	(0.0165)
R-squared	0.196	0.199	0.197	0.199
Number of obs.	32660	29804	34347	31367
Country FE, Year FE	Y	Y	N	N
Additional controls	N	Y	N	Y
Country-Year FE	N	N	Y	Y

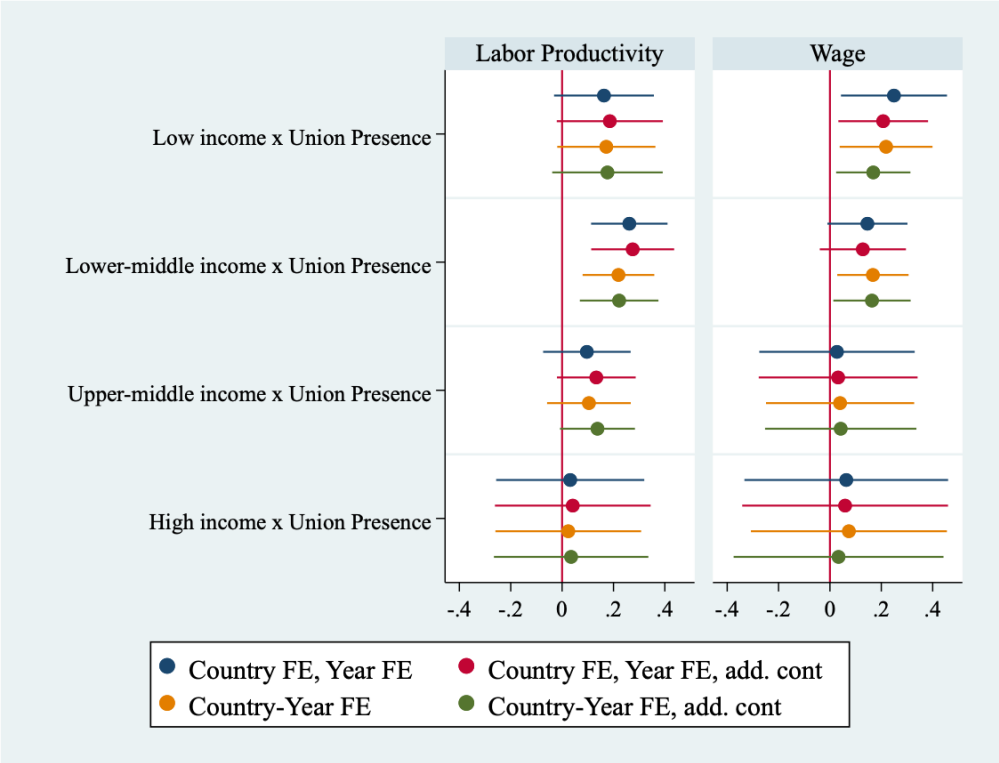
Notes. This table presents the OLS results for additional outcome variables. It reports employment growth among the firm's permanent workers over the last three years (Panel A); labor's share of sales (Panel B); and whether the firm provides formal training to its employees (Panel C). Model specifications are the same as those in Table 2.

Figure 2: OLS coefficients by union density



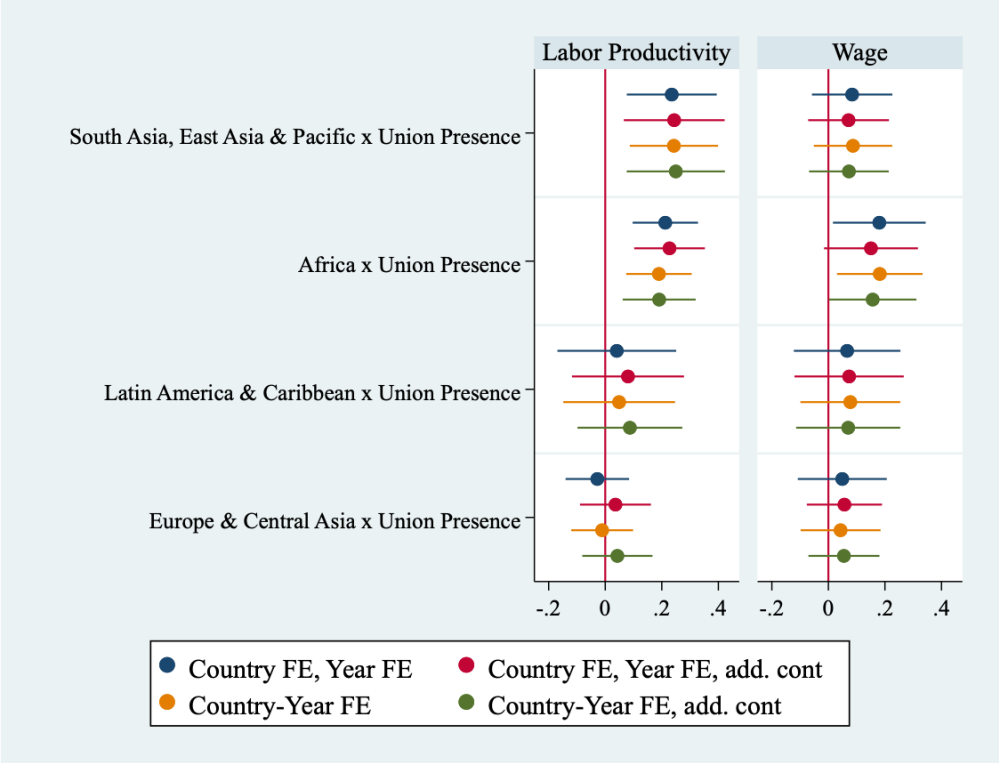
Note: This figure shows heterogeneity in the OLS coefficients for labor productivity and wages by union density. The figure presents the point estimates for three categories of union densities, relative to the reference category of zero membership. Whiskers indicate 95 percent confidence intervals. We use the same model specifications as in Columns (1)– (4) of Table 2. The precise point estimates are shown in Appendix Table A.4.

Figure 3: OLS coefficients by income level



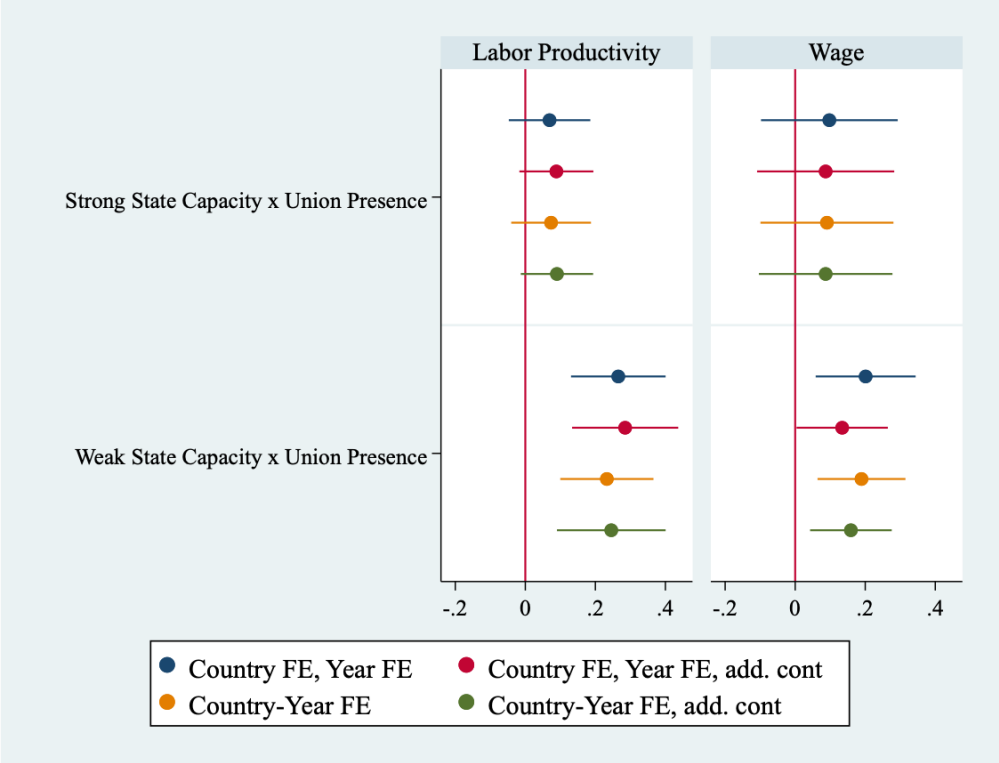
Note: This figure shows heterogeneity in the OLS coefficients for labor productivity and wages by the country's income level. It presents point estimates for four income-level categories, each interacted with Union Presence. Whiskers indicate 95 percent confidence intervals. We use the same model specifications as in Columns (1)– (4) of Table 2. Exact point estimates are reported in Appendix Table A.5.

Figure 4: OLS coefficients by region



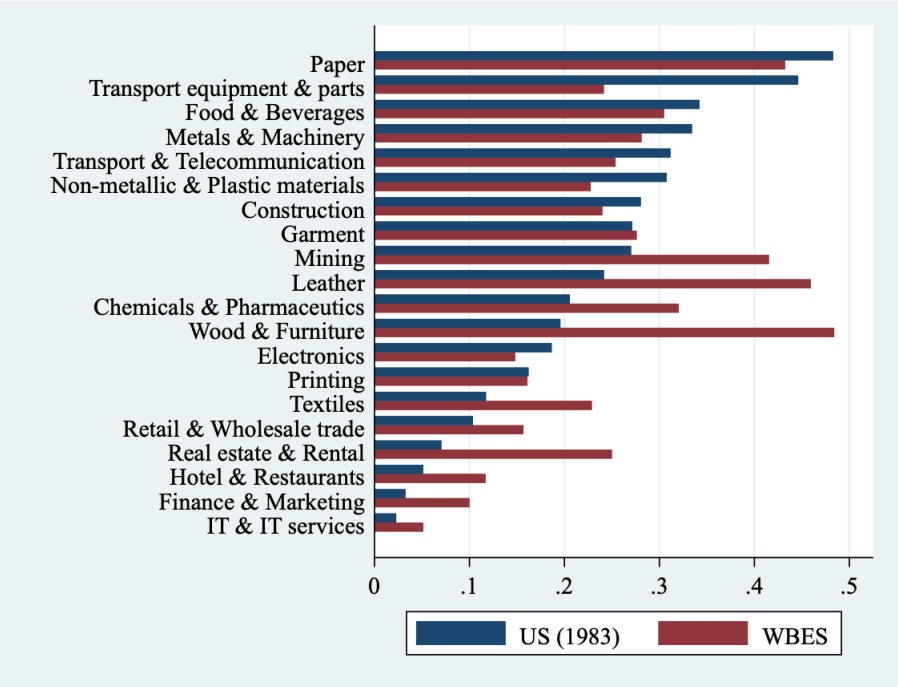
Note: This figure shows heterogeneity in the OLS coefficients for labor productivity and wages by the country's region. It presents point estimates for four regional categories (there is no omitted regional category), each interacted with Union Presence. Whiskers indicate 95 percent confidence intervals. We use the same model specifications as in Columns (1)– (4) of Table 2. Exact point estimates are reported in Appendix Table A.6.

Figure 5: OLS coefficients by state capacity



Note: This figure shows heterogeneity in the OLS coefficients for labor productivity and wages by the country's state capacity. It presents point estimates for two groups—above and below the median state capacity—each interacted with Union Presence. State capacity is measured as the average of "control of corruption," "regulatory quality," and "government effectiveness" from the World Governance Indicators (WGI). Whiskers indicate 95 percent confidence intervals. We use the same model specifications as in Columns (1)– (4) of Table 2. Exact point estimates are reported in Appendix Table A.7.

Figure 6: Natural Unionization Rates across industries



Notes: This figure shows the industry-level natural unionization rates. "US (1983)" shows the industry-level union density in the United States in 1983. "WBES" shows the share of unionized firms in each industry using the WBES firm-level database, focusing on the countries which are above the 75th percentile in the Rule of Law and Voice index.

Table 4: Union Formation (first-stage results)

	Union Presence					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using US data for natural unionization rate (baseline specification)						
Rule of Law & Voice × Natural Unionization Rate	0.161***	0.227***	0.224***	0.209***	0.253***	0.253***
	(0.0540)	(0.0537)	(0.0496)	(0.0524)	(0.0481)	(0.0452)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Using WBES data for natural unionization rate						
Rule of Law & Voice × Natural Unionization Rate	0.125**	0.133**	0.130**	0.149***	0.141***	0.138***
	(0.0483)	(0.0563)	(0.0555)	(0.0458)	(0.0455)	(0.0449)
Observations	34977	34977	34977	36856	36856	36856
Country FE, Year FE	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the OLS estimates of regressing the union presence in the firm on the country's Rule of Law and Voice index interacted with the industry's natural unionization rate. In Panel A, the natural unionization rate is defined as the industry's union density in the United States in 1983. In Panel B, it is defined as the industry's union density in the WBES data, calculated based on countries with a high Rule of Law and Voice index excluding data from the country itself. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country. Asterisks denote levels of statistical significance, with *** denoting significance at a 99 percent confidence interval and ** denoting significance at a 95 percent confidence interval.

Table 5: IV Estimates (baseline specification)

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Productivity						
Union Presence	0.774	1.394*	1.332*	0.881	1.490**	1.430**
	(0.885)	(0.724)	(0.727)	(0.646)	(0.599)	(0.603)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Wage						
Union Presence	0.878	1.253**	1.136**	1.023*	1.346**	1.248**
	(0.704)	(0.576)	(0.522)	(0.522)	(0.507)	(0.462)
Number of obs.	34991	34991	34991	36870	36870	36870
Kleibergen-Paap rk Wald F	10.52	20.03	22.50	15.87	27.73	31.37
Country FE, Year FE	Y	Y	Y	N	N	N
Country-year control	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the second-stage results using the instrumental variable defined by the country's Rule of Law and Voice index interacted with the industry's union density in the United States in 1983. Panels A and B report results for the log of labor productivity and the log of wages (labor cost per worker), respectively. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country. Asterisks denote levels of statistical significance, with *** denoting significance at a 99 percent confidence interval and ** denoting significance at a 95 percent confidence interval.

Table 6: IV Estimates: additional outcome variables

	(1)	(2)	(3)
Panel A: Employment growth of permanent workers			
Union Presence	-0.0514	0.00510	0.0688
	(0.139)	(0.238)	(0.215)
Observations	31226	31226	31226
Panel B: Labor Share in sales			
Union Presence	0.0230	0.0262	0.0197
	(0.0888)	(0.0717)	(0.0664)
Observations	36870	36870	36870
Panel C: Training			
Union Presence	0.981***	0.960***	0.972***
	(0.305)	(0.220)	(0.259)
Number of obs.	29731	29731	29731
Kleibergen-Paap rk Wald F	12.62	24.71	30.15
Country FE, Year FE	N	N	N
Country-year control	N	N	N
Country-Year FE	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y

Notes. This table presents the second-stage results for additional outcome variables. It reports the results for employment growth among the firm's permanent workers over the last three years (Panel A); labor's share of sales (Panel B); and whether the firm provides formal training to its employees (Panel C). The rest of the model specifications are the same as Columns (4)–(6) in Table 5. Asterisks denote levels of statistical significance, with *** denoting significance at a 99 percent confidence interval and ** denoting significance at a 95 percent confidence interval.

A Appendix

A.1 OLS

Table A.1: List of countries

Country	Region	Income group	No. obs	Year
Cambodia	East Asia & Pacific	Lower middle income	301	2003
China	East Asia & Pacific	Upper middle income	1409	2002
Indonesia	East Asia & Pacific	Upper middle income	660	2003
Malaysia	East Asia & Pacific	Upper middle income	4	2002
Mongolia	East Asia & Pacific	Lower middle income	158	2004
Philippines	East Asia & Pacific	Lower middle income	610	2003
Thailand	East Asia & Pacific	Upper middle income	1378	2004
Vietnam	East Asia & Pacific	Lower middle income	1101	2005
Bulgaria	Europe & Central Asia	Upper middle income	220	2004
Lithuania	Europe & Central Asia	High income	187	2004
Montenegro	Europe & Central Asia	Upper middle income	32	2003
Serbia	Europe & Central Asia	Upper middle income	285	2003
Turkey	Europe & Central Asia	Upper middle income	820	2005
Argentina	Latin America & Caribbean	Upper middle income	848	2006
Bolivia	Latin America & Caribbean	Lower middle income	479	2006
Brazil	Latin America & Caribbean	Upper middle income	1571	2003
Chile	Latin America & Caribbean	High income	1737	2004,2006
Colombia	Latin America & Caribbean	Upper middle income	922	2006
Costa Rica	Latin America & Caribbean	Upper middle income	53	2005
Dominican Republic	Latin America & Caribbean	Upper middle income	75	2005
Ecuador	Latin America & Caribbean	Upper middle income	894	2003,2006
El Salvador	Latin America & Caribbean	Upper middle income	1109	2003,2006
Guatemala	Latin America & Caribbean	Upper middle income	940	2003,2006
Guyana	Latin America & Caribbean	High income	89	2004
Honduras	Latin America & Caribbean	Lower middle income	827	2003,2006
Jamaica	Latin America & Caribbean	Upper middle income	39	2005
Mexico	Latin America & Caribbean	Upper middle income	1313	2006
Nicaragua	Latin America & Caribbean	Lower middle income	879	2003,2006
Panama	Latin America & Caribbean	High income	432	2006
Paraguay	Latin America & Caribbean	Upper middle income	348	2006
Peru	Latin America & Caribbean	Upper middle income	667	2002,2006
Uruguay	Latin America & Caribbean	High income	394	2006
Algeria	Middle East & North Africa	Lower middle income	491	2002
Egypt	Middle East & North Africa	Lower middle income	914	2004
Jordan	Middle East & North Africa	Lower middle income	477	2006
Lebanon	Middle East & North Africa	Lower middle income	201	2006
Morocco	Middle East & North Africa	Lower middle income	825	2004
Syria	Middle East & North Africa	Low income	113	2003

(Table A.1 continued)

Country	Region	Income group	No. obs	Year
Bangladesh	South Asia	Lower middle income	2449	2002,2007
India	South Asia	Lower middle income	3400	2002,2006
Pakistan	South Asia	Lower middle income	1672	2002,2007
Sri Lanka	South Asia	Lower middle income	401	2004
Angola	Sub-Saharan Africa	Lower middle income	721	2006,2010
Benin	Sub-Saharan Africa	Lower middle income	285	2004,2009
Botswana	Sub-Saharan Africa	Upper middle income	550	2006,2010
Burkina Faso	Sub-Saharan Africa	Low income	356	2006,2009
Burundi	Sub-Saharan Africa	Low income	270	2006
Cameroon	Sub-Saharan Africa	Lower middle income	431	2006,2009
Burkina Faso	Sub-Saharan Africa	Low income	127	2011
Chad	Sub-Saharan Africa	Low income	124	2009
Côte d'Ivoire	Sub-Saharan Africa	Lower middle income	502	2009
DRC	Sub-Saharan Africa	Low income	563	2006,2010
Eritrea	Sub-Saharan Africa	Low income	121	2002,2009
Eswatini	Sub-Saharan Africa	Lower middle income	296	2006
Ethiopia	Sub-Saharan Africa	Low income	753	2002,2011
Gambia	Sub-Saharan Africa	Low income	172	2006
Ghana	Sub-Saharan Africa	Lower middle income	494	2007
Guinea	Sub-Saharan Africa	Lower middle income	223	2006
Guinea Bissau	Sub-Saharan Africa	Low income	149	2006
Kenya	Sub-Saharan Africa	Lower middle income	817	2003,2007
Lesotho	Sub-Saharan Africa	Lower middle income	158	2003,2009
Madagascar	Sub-Saharan Africa	Low income	550	2005,2009
Malawi	Sub-Saharan Africa	Low income	280	2005,2009
Mali	Sub-Saharan Africa	Low income	721	2003,2007,2010
Mauritania	Sub-Saharan Africa	Lower middle income	229	2006
Mauritius	Sub-Saharan Africa	Upper middle income	144	2005
Mozambique	Sub-Saharan Africa	Low income	479	2007
Namibia	Sub-Saharan Africa	Upper middle income	311	2006
Niger	Sub-Saharan Africa	Low income	113	2009
Nigeria	Sub-Saharan Africa	Lower middle income	1891	2007
Rwanda	Sub-Saharan Africa	Low income	392	2006,2011
Senegal	Sub-Saharan Africa	Lower middle income	712	2003,2007
South Africa	Sub-Saharan Africa	Upper middle income	565	2003
Tanzania	Sub-Saharan Africa	Lower middle income	592	2003,2006
Togo	Sub-Saharan Africa	Low income	125	2009
Uganda	Sub-Saharan Africa	Low income	765	2003,2006
Zambia	Sub-Saharan Africa	Lower middle income	154	2002

Notes. This table lists the countries used in the analysis. Region and Income group are defined by the World Bank Development Indicator. "No. obs" indicates the total number of observations in the country. "Year" indicates the survey year(s).

Table A.2: OLS controlling for firm employment size

	(1)	(2)	(3)	(4)
Panel A: Labor Productivity				
Union Presence	0.161***	0.180***	0.148***	0.158***
	(0.0443)	(0.0445)	(0.0428)	(0.0451)
R-squared	0.548	0.557	0.581	0.587
Panel B: Wage				
Union Presence	0.124**	0.102*	0.128**	0.108**
	(0.0563)	(0.0546)	(0.0518)	(0.0514)
R-squared	0.808	0.805	0.831	0.821
Number of obs.	43392	38291	45498	40230
Country FE, Year FE	Y	Y	N	N
Additional controls	N	Y	N	Y
Country-Year FE	N	N	Y	Y

Notes. This table presents the OLS results additionally controlling for the log of firm employment size. The rest of the specifications are the same as those in Table 2.

Table A.3: OLS Estimates (without weights)

	(1)	(2)	(3)	(4)
Panel A: Labor Productivity				
Union Presence	0.323***	0.304***	0.315***	0.294***
	(0.0402)	(0.0398)	(0.0372)	(0.0382)
R-squared	0.441	0.452	0.469	0.476
Panel B: Wage				
Union Presence	0.177***	0.166***	0.191***	0.180***
	(0.0387)	(0.0409)	(0.0357)	(0.0397)
R-squared	0.816	0.816	0.860	0.856
Number of obs.	43392	38291	45498	40230
Country FE, Year FE	Y	Y	N	N
Additional controls	N	Y	N	Y
Country-Year FE	N	N	Y	Y

Notes. This table presents the OLS results without using weights. The rest of the specifications are the same as those in Table 2.

A.2 Heterogeneity

Table A.4: OLS estimates: Heterogeneity by union density

	Labor Productivity	Wage
	(1)	(2)
Density 1-49% × Union Presence	0.245**	0.0655
	(0.109)	(0.0771)
Density 50-89% × Union Presence	0.162*	0.232***
	(0.0837)	(0.0866)
Density 90-100% × Union Presence	0.150**	0.0994*
	(0.0715)	(0.0565)
R-squared	0.587	0.821
Number of obs.	39759	39759
Country-Year FE	Y	Y

Notes: This table shows heterogeneity in the OLS coefficients by union density. Instead of a single indicator for Union Presence, it includes three variables indicating union density of 1–49%, 50–89%, and 90–100%, respectively, with zero membership as the reference category. All other specifications follow Column (4) of Table 2. Corresponding point estimates are plotted in Figure 2.

Table A.5: OLS estimates: Heterogeneity by income group

	Labor Productivity	Wage
	(1)	(2)
Low income × Union Presence	0.177	0.169**
	(0.108)	(0.0725)
Lower-middle income × Union Presence	0.222***	0.164**
	(0.0767)	(0.0754)
Upper-middle income × Union Presence	0.138*	0.0420
	(0.0731)	(0.148)
High income × Union Presence	0.0351	0.0336
	(0.151)	(0.205)
R-squared	0.579	0.819
Number of obs.	40230	40230
p-value: Union × Low inc. = Union × High inc.	0.445	0.548
p-value: Union × Lower-middle inc. = Union × High inc.	0.291	0.573
p-value: Union × Upper-middle inc. = Union × High inc.	0.534	0.973
Country-Year FE	Y	Y

Notes: This table shows heterogeneity in the OLS coefficients by the country's income level. It presents point estimates for four income-level categories, each interacted with Union Presence. We use the same model specifications as in Column (4) of Table 2. Corresponding point estimates are plotted in Figure 3.

Table A.6: OLS estimates: heterogeneity by region

	Labor Productivity	Wage
	(1)	(2)
South Asia, East Asia & Pacific × Union Presence	0.250***	0.0726
	(0.0871)	(0.0707)
Africa × Union Presence	0.191***	0.157**
	(0.0647)	(0.0775)
Latin America & Caribbean × Union Presence	0.0873	0.0701
	(0.0929)	(0.0923)
Europe & Central Asia × Union Presence	0.0431	0.0550
	(0.0622)	(0.0629)
R-squared	0.579	0.818
Number of obs.	40230	40230
p-value: Union × Asia = Union × Europe & CA	0.051	0.848
p-value: Union × Africa & ME = Union × Europe & CA	0.112	0.278
p-value: Union × Latin America inc. = Union × Europe & CA	0.656	0.897
Country-Year FE	Y	Y

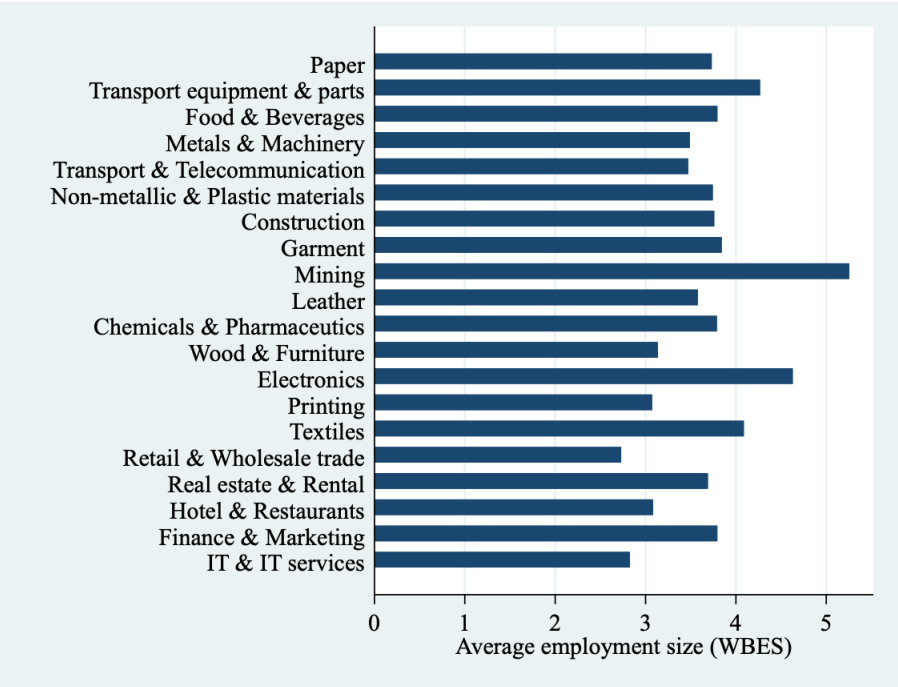
Notes: This table shows heterogeneity in the OLS coefficients by the country's region. It presents point estimates for four regional categories, each interacted with Union Presence. We use the same model specifications as in Column (4) of Table 2. Corresponding point estimates are plotted in Figure 4.

Table A.7: OLS estimates: heterogeneity by state capacity

	Labor Productivity	Wage
	(1)	(2)
Weak State Capacity × Union Presence	0.246***	0.159***
	(0.0778)	(0.0584)
Strong State Capacity × Union Presence	0.0904*	0.0870
	(0.0518)	(0.0956)
R-squared	0.580	0.818
Number of obs.	40230	40230
p-value: Union × High GOV = Union × Low GOV	0.109	0.525
Country-Year FE	Y	Y

Notes: This table shows heterogeneity in the OLS coefficients by the country's state capacity. It presents point estimates for two categories of countries - above and below the median state capacity - each interacted with Union Presence. State capacity is measured as the average of "control of corruption," "regulatory quality," and "government effectiveness" from the World Governance Indicators (WGI). We use the same model specifications as in Column (4) of Table 2. Corresponding point estimates are plotted in Figure 5.

Figure A.1: Average employment size across industries



Notes: This figure shows the average of the log employment size in each industry using the firm-level WBES data. Industries are shown in descending order of the natural unionization rate measured from the US data.

A.3 IV

Table A.8: First Stage Estimates Separately for Rule of Law and Voice/Accountability

	Union Presence					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Rule of Law						
Rule of Law × Natural Unionization Rate	0.315***	0.425***	0.410***	0.364***	0.457***	0.447***
	(0.0856)	(0.0715)	(0.0728)	(0.0855)	(0.0715)	(0.0721)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Voice and Accountability						
Voice & Accountability × Natural Unionization Rate	0.174*	0.241**	0.240**	0.263***	0.290***	0.291***
	(0.0867)	(0.107)	(0.0992)	(0.0886)	(0.0944)	(0.0879)
Observations	34991	34991	34991	36870	36870	36870
Panel C: Rule of Law, Voice and Accountability						
Rule of Law × Natural Unionization Rate	0.353**	0.446***	0.414***	0.269*	0.394***	0.371***
	(0.125)	(0.128)	(0.131)	(0.139)	(0.126)	(0.127)
Voice & Accountability × Natural Unionization Rate	-0.0450	-0.0250	-0.00457	0.107	0.0653	0.0822
	(0.107)	(0.126)	(0.117)	(0.134)	(0.122)	(0.114)
Observations	34991	34991	34991	36870	36870	36870
Country FE, Year FE	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
RoL or/and VA × Ave. firm size	N	Y	Y	N	Y	Y
RoL or/and VA × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents OLS estimates of regressing union presence on the country's Rule of Law index (Panel A), Voice and Accountability index (Panel B), and both indices jointly (Panel C), each interacted with the industry's union density in the United States in 1983. All other specifications follow Table 4.

Table A.9: First stage with union density

	Union Density					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using US data for natural unionization rate (baseline specification)						
Rule of Law & Voice × Natural Unionization Rate	0.0671	0.112**	0.106**	0.0917*	0.127***	0.124***
	(0.0422)	(0.0469)	(0.0444)	(0.0438)	(0.0438)	(0.0420)
Observations	34631	34631	34631	36476	36476	36476
Panel B: Using WBES data for natural unionization rate						
Rule of Law & Voice × Natural Unionization Rate	0.0543**	0.0650**	0.0615**	0.0659**	0.0696**	0.0661**
	(0.0209)	(0.0282)	(0.0258)	(0.0257)	(0.0295)	(0.0273)
Observations	34617	34617	34617	36462	36462	36462
Country FE, Year FE	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the OLS estimates of regressing the union density in the firm on the country's Rule of Law and Voice index interacted with the industry's natural unionization rates. In Panel A, the natural unionization rate is defined as the industry's union density in the United States in 1983. In Panel B, it is defined as the industry's union density in the WBES data, calculated based on countries with high Rule of Law and Voice index excluding data from the country itself. All other specifications follow Table 4.

Table A.10: First stage with an indicator for union density above 50%

	Union Density ≥ 50					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using US data for natural unionization rate (baseline specification)						
Rule of Law & Voice × Natural Unionization Rate	0.0773	0.132**	0.121**	0.103**	0.148***	0.140***
	(0.0478)	(0.0487)	(0.0444)	(0.0476)	(0.0434)	(0.0389)
Observations	34631	34631	34631	36476	36476	36476
Panel B: Using WBES data for natural unionization rate						
Rule of Law & Voice × Natural Unionization Rate	0.0635***	0.0773**	0.0743**	0.0759**	0.0823**	0.0795**
	(0.0215)	(0.0325)	(0.0284)	(0.0266)	(0.0329)	(0.0291)
Observations	34617	34617	34617	36462	36462	36462
Country FE, Year FE	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the OLS estimates of regressing an indicator of union density of at least 50% on the country's Rule of Law and Voice index interacted with the industry's natural unionization rates. In Panel A, the natural unionization rate is defined as the industry's union density in the United States in 1983. In Panel B, it is defined as the industry's union density in the WBES data, calculated based on countries with high Rule of Law and Voice index excluding data from the country itself. All other specifications follow Table 4.

Table A.11: IV estimates: Natural unionization rate measured using WBES

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Productivity						
Union Presence	1.403	1.813*	1.656*	1.181	1.647**	1.521*
	(1.118)	(0.885)	(0.894)	(0.942)	(0.786)	(0.797)
Observations	34977	34977	34977	36856	36856	36856
Panel B: Wage						
Union Presence	1.414**	1.671***	1.653***	0.903***	1.111***	1.094***
	(0.657)	(0.435)	(0.499)	(0.268)	(0.338)	(0.364)
Number of obs.	34977	34977	34977	36856	36856	36856
Kleibergen-Paap rk Wald F	11.14	8.76	8.66	10.60	9.61	9.47
Country FE, Year FE	Y	Y	Y	N	N	N
Country-year control	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the second-stage results using the instrumental variable defined by the country's Rule of Law and Voice index interacted with the industry's union density in the WBES data, calculated based on countries with a high Rule of Law and Voice index excluding data from the country itself. Panels A and B report results for the log of labor productivity and the log of wages (labor cost per worker), respectively. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country.

Table A.12: IV Estimates: US union density reweighted to match industry structures in developing countries

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Productivity						
Union Presence	0.644	1.377*	1.336*	0.747	1.412**	1.369**
	(0.967)	(0.749)	(0.747)	(0.675)	(0.614)	(0.613)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Wage						
Union Presence	0.918	1.362*	1.288*	1.037	1.397**	1.331**
	(0.878)	(0.655)	(0.628)	(0.626)	(0.586)	(0.557)
Number of obs.	34991	34991	34991	36870	36870	36870
Kleibergen-Paap rk Wald F	8.86	12.23	13.50	11.98	15.62	16.98
Country FE, Year FE	Y	Y	Y	N	N	N
Country-year control	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Note. This table presents the second-stage results using the instrumental variable defined by the countries' Rule of Law and Voice indices with U.S. industry union density in 1983. Unlike the baseline, this version re-weights U.S. union density across ISIC 4-digit industries using firm shares from a WBES subsample to better match industry structures in developing countries. Panels A and B report results for the log of labor productivity and the log of wages (labor cost per worker), respectively. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country.

Table A.13: IV Estimates using Two IVs: Rule of Law and Voice/Accountability, each interacted with industry's union density in the US.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Productivity						
Union Presence	2.110*	2.322**	2.035**	1.186	2.047**	1.797**
	(1.155)	(0.983)	(0.845)	(0.690)	(0.776)	(0.660)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Wage						
Union Presence	1.370	1.499*	1.329*	1.190**	1.593**	1.445**
	(0.873)	(0.724)	(0.682)	(0.542)	(0.558)	(0.507)
Number of obs.	34991	34991	34991	36870	36870	36870
Kleibergen-Paap rk Wald F	7	19	17	9	22	22
Country FE, Year FE	Y	Y	Y	N	N	N
Country-year control	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Note. This table reports second-stage results using two instruments: the country's Rule of Law index and Voice index, each interacted with industry's union density in the United States in 1983. Panels A and B report results for the log of labor productivity and the log of wages (labor cost per worker), respectively. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country.

Table A.14: IV estimates using union density as treatment variable

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Productivity						
Union Density	2.301	3.100*	3.065	2.444	3.222**	3.158*
	(1.747)	(1.570)	(1.819)	(1.450)	(1.498)	(1.656)
Observations	34631	34631	34631	36476	36476	36476
Panel B: Wage						
Union Density	1.686	2.450**	2.322***	1.924*	2.573**	2.451***
	(1.203)	(0.900)	(0.810)	(1.043)	(0.936)	(0.827)
Number of obs.	34631	34631	34631	36476	36476	36476
Kleibergen-Paap rk Wald F	2.55	5.81	5.78	4.37	8.45	8.67
Country FE, Year FE	Y	Y	Y	N	N	N
Country-year control	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the second-stage results using the instrumental variable defined by the country's Rule of Law and Voice index interacted with the industry's union density in the United States in 1983. Unlike baseline estimates (Table 5), which uses union presence as the treatment variable, this table uses union density as the treatment variable. Panels A and B report results for the log of labor productivity and the log of wages (labor cost per worker), respectively. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country.

Table A.15: Reduced form: Labor Productivity

	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using US data for natural unionization rate (baseline specification)						
Rule of Law & Voice × Natural Unionization Rate	0.125	0.316*	0.298*	0.184	0.377**	0.362**
	(0.155)	(0.173)	(0.165)	(0.153)	(0.163)	(0.160)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Using WBES data for natural unionization rate						
Rule of Law & Voice × Natural Unionization Rate	0.175	0.241*	0.215	0.176	0.232*	0.210
	(0.138)	(0.129)	(0.126)	(0.123)	(0.124)	(0.122)
Observations	34977	34977	34977	36856	36856	36856
Country FE, Year FE	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table presents the OLS estimates from regression of labor productivity (defined as the log of sales per worker) on the firm on the country's Rule of Law and Voice index interacted with the industry's natural unionization rates. In Panel A, the natural unionization rate is defined as the industry's union density in the United States in 1983. In Panel B, it is defined as the industry's union density in the WBES data, calculated based on countries with a high Rule of Law and Voice index excluding data from the country itself. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country.

Table A.16: Reduced form: Wage

	Wage					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using US data for natural unionization rate (baseline specification)						
Rule of Law & Voice × Natural Unionization Rate	0.141	0.284	0.254	0.214	0.341**	0.315**
	(0.139)	(0.168)	(0.147)	(0.131)	(0.147)	(0.129)
Observations	34991	34991	34991	36870	36870	36870
Panel B: Using WBES data for natural unionization rate						
Rule of Law & Voice × Natural Unionization Rate	0.177**	0.222***	0.215***	0.135***	0.157***	0.151***
	(0.0788)	(0.0746)	(0.0737)	(0.0178)	(0.0485)	(0.0432)
Observations	34977	34977	34977	36856	36856	36856
Country FE, Year FE	Y	Y	Y	N	N	N
Country-Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
RoL & Voice × Ave. firm size	N	Y	Y	N	Y	Y
RoL & Voice × Export,FDI	N	N	Y	N	N	Y

Notes. This table reports the OLS estimates from regressions of log wage (measured as labor cost per worker) on the interaction between the country's Rule of Law and Voice indices and the industry's natural unionization rate. In Panel A, the natural unionization rate is defined as the industry's union density in the United States in 1983. In Panel B, it is defined as the industry's union density in the WBES data, calculated based on countries with a high Rule of Law and Voice index excluding data from the country itself. Columns (1)–(3) include country and year fixed effects separately, along with time-varying country-level controls, whereas columns (4)–(6) include year-specific country fixed effects. Columns (2) and (5) additionally control for average firm size in each industry, interacted with the Rule of Law and Voice index. Columns (3) and (6) further add indicators for exporting and foreign ownership share, both interacted with the Rule of Law and Voice index. All specifications control for industry fixed effects and firm-level control variables as described in Section 4.1. Standard errors are two-way clustered by industry and country. Weights are the inverse of the total number of observations in each country.